Fall 2025 Graduate Research Symposium

October 18, 2025

Morning Sessions - 8 AM to 12 PM

Networking Lunch - 12 PM to 1 PM

Afternoon Sessions - 1 PM to 4 PM

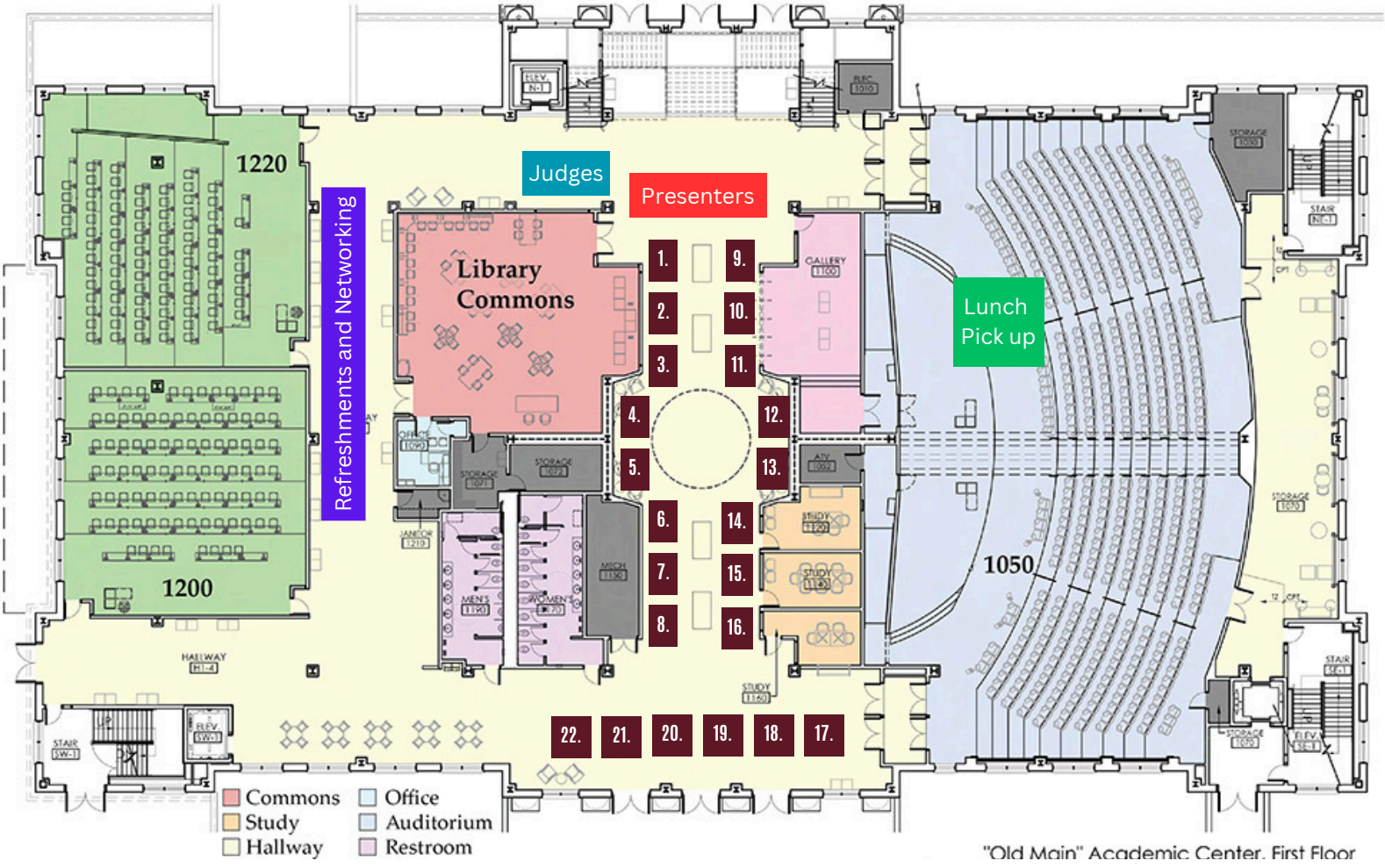
Old Main Academic Center

Poster Presentations - 1st Floor Lobby

Oral Presentations - 1st and 2nd Floor Classrooms

MISSISSIPPI STATE UNIVERSITY™ GRADUATE STUDENT ASSOCIATION

MISSISSIPPI STATE UNIVERSITY™ THE GRADUATE SCHOOL

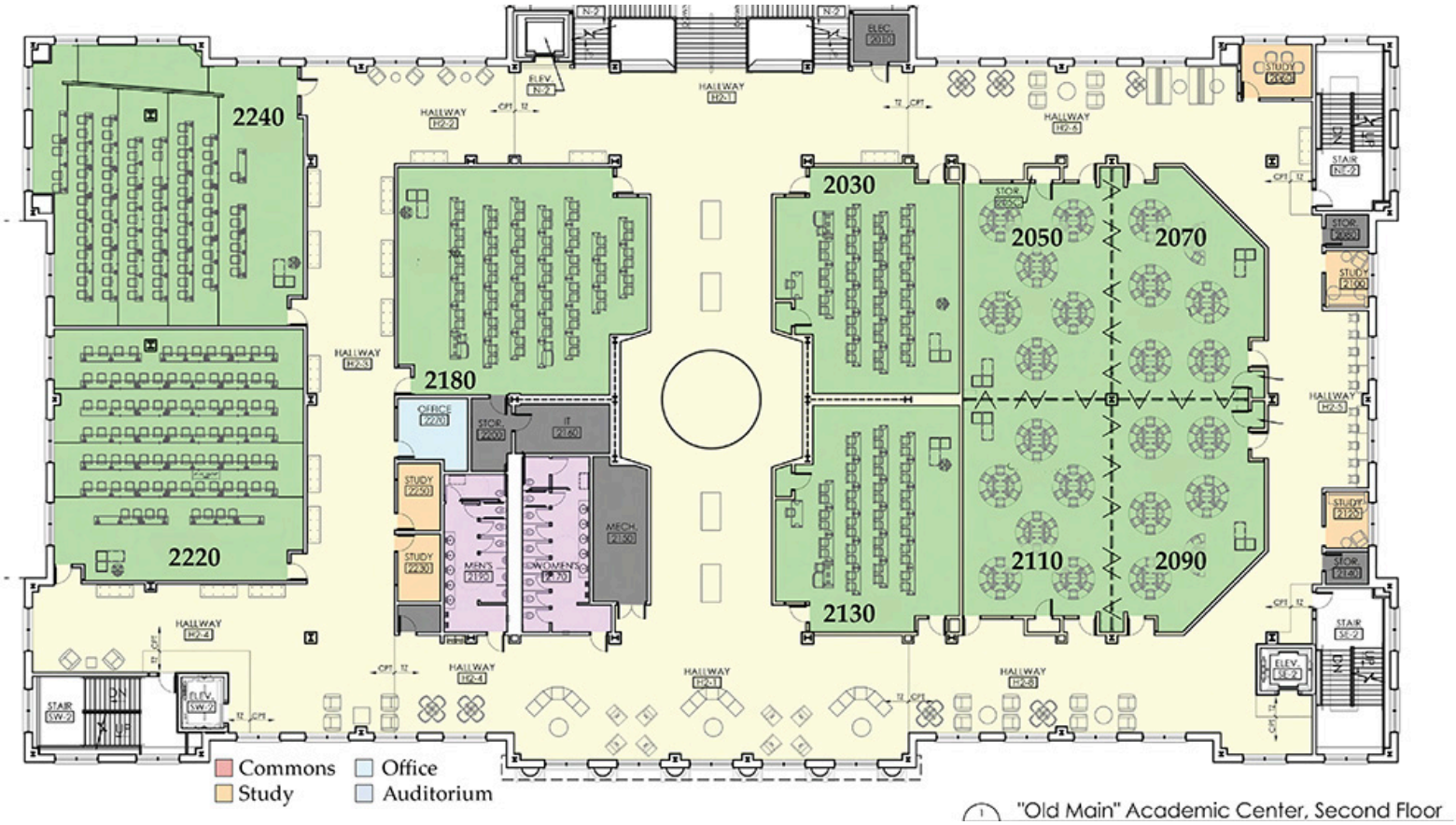


Presenters Oral and Poster Presenter Check-in

Judges Judges and Moderator Check-in

Lunch Pick up Lunch for participants and judges will be ready for pick up at 12 noon in room 1030

Refreshments and Networking Space to network and enjoy refreshments between sessions



Session Schedule Outline

Session	Session Code	Location	Time	Sign in Time
AM Poster 1	MP1	1st Floor Lobby	8 AM – 9:30 AM	7:45 AM
AM Poster 2	MP2	1st Floor Lobby	8 AM – 9:30 AM	7:45 AM
AM Poster 3	MP3	1st Floor Lobby	8 AM – 9:30 AM	7:45 AM
AM Poster 4	MP4	1st Floor Lobby	10:00 AM – 11:45 AM	9:45 AM
AM Poster 5	MP5	1st Floor Lobby	10:00 AM – 11:45 AM	9:45 AM
AM Poster 6	MP6	1st Floor Lobby	10:00 AM – 11:45 AM	9:45 AM
AM Oral 1	MO1	Room 1220	8 AM – 9:30 AM	7:45 AM
AM Oral 2	MO2	Room 1200	8 AM – 9:30 AM	7:45 AM
AM Oral 3	MO3	Room 2180	8 AM – 9:30 AM	7:45 AM
AM Oral 4	MO4	Room 2240	8 AM – 9:30 AM	7:45 AM
AM Oral 5	MO5	Room 2130	8 AM – 9:30 AM	7:45 AM
AM Oral 6	MO6	Room 1220	10 AM – 11:30 AM	9:45 AM
AM Oral 7	MO7	Room 1200	10 AM – 11:30 AM	9:45 AM
AM Oral 8	MO8	Room 2180	10 AM – 11:45 AM	9:45 AM
AM Oral 9	MO9	Room 2240	10 AM – 11:45 AM	9:45 AM
AM Oral 10	MO10	Room 2130	10 AM – 11:45 AM	9:45 AM
PM Poster 1	AP1	1st Floor Lobby	1:00 PM – 2:20 PM	12:45 PM
PM Poster 2	AP2	1st Floor Lobby	1:00 PM – 2:20 PM	12:45 PM
PM Poster 3	AP3	1st Floor Lobby	2:30 PM – 4:00 PM	2:15 PM
PM Poster 4	AP4	1st Floor Lobby	2:30 PM – 4:00 PM	2:15 PM
PM Oral 1	AO1	Room 1220	1 PM – 2:15 PM	12:45 PM
PM Oral 2	AO2	Room 1200	1 PM – 2:15 PM	12:45 PM
PM Oral 3	AO3	Room 2180	1 PM – 2:15 PM	12:45 PM
PM Oral 4	AO4	Room 1220	2:45 PM – 4:00 PM	2:30 PM
PM Oral 5	AO5	Room 1200	2:45 PM – 4:00 PM	2:30 PM
PM Oral 6	AO6	Room 2180	2:45 PM – 4:00 PM	2:30 PM

MORNING SESSION: 8 AM—12 PM

Poster Sessions

Poster Session 1

8 AM – 9:45 AM

1st Floor Lobby – Posters 1-8

Moderator: Prachi Pannu

Evaluators:

1. Chrysta Beck
2. Prakash Jha

Participants:

1. Bipin Paudel, Forestry, *Denoising UAV-based Hyperspectral Imagery: A Deep Learning Approach*
2. Carlos Rivera, Forestry, *Deep learning with synthetic data improves tree ring detection*
3. J. Christopher Jacobson, Forestry, *Loblolly Pine Secondary Growth Responses to Fire and Herbicide: a Dendrochronological Analysis*
4. Muhammad Husnain Manzoor, Sustainable Bioproducts, *Extraction of Hemicellulose Sugars from Corncobs by Hydrothermal Pretreatment*
5. Samadhi Nisansala Nawalage, Sustainable Bioproducts, *Effect of Biochar Particle Size on the Carbothermal Synthesis of Graphene-Shelled Zero-Valent Iron for Copper Removal*
6. Samjhana Panthi, Forestry, *Timber price trends, transmission, and the impact on loblolly pine plantation management in the United States South*
7. Simran Pandey, Forestry, *The economic footprint of natural disturbances: A case study of Southern Pine Beetle in Mississippi's pine forests*

Poster Session 2

8 AM – 9:45 AM

1st Floor Lobby – Posters 9-14

Moderator: Prachi Pannu

Evaluators:

1. Beth Peterman
2. Galen Collins

Participants:

1. Khadija Ferdous, Clinical Sciences, *Effects of amoxicillin/clavulanic acid and enrofloxacin on fecal microbiota composition and ESBL-producing E. coli carriage in healthy dogs*
2. Kendall N. McKinnon, Comparative Biomedical Sciences, *Dose-Dependent Effects of the Organophosphorus Insecticide Metabolite Chlorpyrifos-oxon on Cholinesterase Activity in Juvenile Rats Following Acute Exposure*
3. Lydia Ogebule, Comparative Biomedical Science (CBMS) & Center for Environmental Health Sciences (CEHS), *Impact of Acute Organophosphate (NIMP) Exposure on Gene Expression and Neurodegeneration in an Atropinized Rat Model, and the Therapeutic Influence of Oxime 20 on this Expression*
4. Olawale Ajisafe, Comparative Biomedical Science, *Drug-Drug Interaction Potential of Novel Oxime-20: A Promising Compound for Organophosphate Poisoning Treatment*
5. Rideeta Islam Aishy, Comparative Biomedical Sciences, *Insights into Adaptive Evolution and Fitness Trade-offs in Aeromonas hydrophila under Oxytetracycline Dihydrate Stress*

Poster Session 3

8 AM – 9:45 AM

1st Floor Lobby – Posters 17-22

Moderator: Prachi Pannu

Evaluators:

1. Rubaiya Zannat
2. Zahed Arman

Participants:

1. Achini Ovitigala, Physics and Astronomy, *Molecular insights into the redox of atmospheric mercury through laser spectroscopy*
2. Maia McLin, Psychology, *Resilience, Racial Identity, and Memory in Marginalized Caregiving Grandparents: The Role of Physical Activity*
3. Nishat Shermin, Geosciences, *From Fine-Scale UAV Observations to Regional-Scale Satellite Models: An Integrative Machine Learning Framework for Classifying Rangeland Vegetation Cover*
4. Richard Boateng, Biological Sciences, *Calcium-mediated loss of actin cables correlates with occidiofungin resistance*
5. Tanveer Shaikh, Chemistry, *Structural Characterization of Complement C3 Variants and Nanoparticle Interactions*

Poster Session 4

10 AM – 11:45 AM

1st Floor Lobby – Posters 1-8

Moderator: Hajar Youssfi

Evaluators:

1. Jiaxu Li
2. Madhav Dhakal
3. Renganathan Vellaichamy Gandhimeyyan

Participants:

1. Alekhya Chakravaram, Plant and Soil Sciences, *Harnessing Natural Variation in Photosynthetic Pigments to Improve Heat Tolerance in Rice*
2. Anitha Madapakula, Plant and Soil Sciences, *Optimizing Soybean Phenology and Yield Forecasts in Mississippi CSM-CROPGRO Model Application*
3. Abhishek Panchadi, Plant and Soil Sciences, *Can Sentinel-2's Multispectral Imagery be Converted into EnMAP's Hyperspectral Data?*
4. Bala Subramanyam Sivarathri, Plant and Soil Sciences, *Soybean Cold Tolerance: The Power of Seed Priming with Biostimulants*
5. Chami Rampati Dewage, Plant and Soil Sciences, *Enhancing Soybean Seedling Salinity Tolerance Using Biostimulants*
6. Dingiswayo Mwanza, Plant and Soil Sciences, *Evaluating High-Yielding Corn Hybrids for Waterlogging Tolerance*
7. Manoj Kumar Reddy Allam, Plant and Soil Sciences, *Evaluation of Rice Genotypic Variability for Drought Tolerance*
8. Mohan K. Bista, Plant and Soil Sciences, *Pollen-Pistil Interactions as Reproductive Barriers under Drought in Cotton*

Poster Session 5

10 AM – 11:45 AM

1st Floor Lobby – Posters 9-16

Moderator: Hajar Youssfi

Evaluators:

1. Dong Chen
2. Ke Yuan
3. Vitor Souza Martins

Participants:

1. Amirhossein Eskorouchi, Industrial and Systems Engineering*, Enhanced DETR-Based Framework for Automated Wood Chip Size Distribution Estimation in High Volume Biomass Manufacturing*
2. Cassia B. Caballero, Agricultural and Biological Engineering, *Enhancing Coastal Monitoring in the Mississippi Sound Using Sentinel-3 S3CARD and a Virtual Buoy Network*
3. Chamika A. Silva, Agricultural and Biological Engineering, *Rapid nutrient profiling in cotton: evaluating visible and infrared spectroscopy for fresh and dry plant tissues*
4. Fasiha Zainab, Electrical and Computer Engineering, *Uncertainty-aware Wildfire Risk Mitigation Approach in Power System*
5. Hossein Mohammadi, Electrical and Computer Engineering, *Deep Reinforcement Learning for Spectrum Coexistence: RFI-Resilient Passive Sensing in Shared 5G Environments*
6. Juliana Araujo, Agricultural and Biological Engineering, *The First Global 10 m Agricultural Mask from Satellite Imagery and AI-Based Segmentation for Digital Agriculture Applications*
7. Moeen Ul Islam, Agricultural and Biological Engineering, *An AI-enhanced Soft Robotic System for Selective Strawberry Harvesting*
8. Rejane Paulino, Agricultural and Biological Engineering, *Unlocking aquatic spectral features with orthogonal transformations*

Poster Session 6

10:00 AM-11:45 AM

1st Floor Lobby – Posters 17-22

Moderator: Hajar Youssfi

Evaluators:

1. Misbah Munir
2. Tibor Pechan

Participants:

1. Emma Farnlacher, Animal and Dairy Sciences, *Relationship between Stress and Salivary Serotonin and Dopamine Concentrations within College Students participating in a Campus-Based Equine-Assisted Intervention Program*
2. Guyue Tang, Animal and Dairy Sciences, *Effects of ammonia stress on the growth performance, fillet quality, and gut microbiota of channel and hybrid catfish*
3. Notsile Dlamini, Animal and Dairy Sciences, *Unlocking metabolic signatures of boar semen quality using untargeted metabolomics*
4. Rezwana Rahman Setu, Biochemistry, Nutrition and Health Promotion, *Analysis of Systemic Acquired Resistance by Monitoring Redox-Mediated Transcriptional Dynamics in Arabidopsis*
5. Seth Givens, Agricultural and Biological Engineering*, Integrating Handheld Sensors and 3D Scanning with Phenospex system to Assess Heat and Drought Stress in Soybean*

ORAL SESSIONS 8-9:30 AM

Oral Session 1

8 AM – 9:30 AM

Room 1220

Moderator: Hemraj Kathayat

Evaluators:

1. Cory Gallo
2. George Awuni

Participants:

1. Alekhya Chakravaram, Plant and Soil Sciences, *Rice Responses to Abiotic Stresses During Anthesis and Grain Filling*
2. Bala Subramanyam Sivarathri, Plant and Soil Sciences, *Seed Priming with Biostimulant: Enhancing Soybean Drought Tolerance*
3. Chami Rampati Dewage, Plant and Soil Sciences, *From Germination to Growth: A Search for Salt-Tolerant Soybean Genotypes*
4. Dingiswayo Mwanza, Plant and Soil Sciences, *Physiological and Morphological Responses of Maize to Early-Season Waterlogging*
5. Mohan K. Bista, Plant and Soil Sciences, *Productivity vs. stability: Genotype × Environment Interaction in cotton lint yield and quality traits*
6. Oluwadamilare E. Oloyede, Plant and Soil Sciences, *Can Tailwater Recirculation in Row Rice Reduce Water and Methane Fluxes Without a Yield Penalty?*

Oral Session 2
8 AM – 9:30 AM

Room 1200

Moderator: Ana-Maria Valencia

Evaluators:

1. Tim Boltz
2. Juan Silva

Participants:

1. Faria Noshin, Agricultural Science and Plant Protection, *Management of Rotylenchulus reniformis on Sweetpotato using Non-fumigant Nematicides and Bio-Nematicides*
2. Himani Joshi, Animal and Dairy Sciences, *Identification of rumen microbial genes and their hosts involved in neurotransmitter production*
3. Cooper Little, Agricultural and Biological Engineering, *Relation of Soil Moisture to Iron Deficiency Chlorosis in Soybean*
4. Maryam Javanpour, Biochemistry, Nutrition, and Health Promotion, *Activation of the 26S Proteasome by the Secondary Messenger cGAMP*
5. Sam Theobald, Agricultural and Biological Engineering, *Case Study on Variable Rate Irrigation in Northeast Mississippi*
6. Susmita Ghimire, Biochemistry, Health Promotion, and Nutrition, *Overexpression and Knockdown of RALF8 and H2B genes in rice to modulate drought stress response*

Oral Session 3

8 AM – 9:30 AM

Room 2180

Moderator: Lucas Evanko

Evaluators:

1. Donna Pierce
2. Yukai Ai

Participants:

1. Chathuri Peiris, Chemistry, *PFAS-Free Packaging with Improved Water and Oil Resistance via Metal Ions and Cellulose Nanofibers*
2. Olufemi Farotimi, Chemistry, *Viability of Predictable HDX in Narrowing the Possible Number of Metabolite Identities of a Known m/z: An Exploratory Study*
3. Chibuike Onyeogulu, Chemistry, *Temperature Dependence of Ionic Liquid Pyrolysis Products*
4. Emmanuel Ankomah, Chemistry, *Design and synthesis of NIR/SWIR probes for Biological Imaging*
5. Palani Ganesh Karthikeyan, Chemistry, *Extended Non-Covalent Interaction–Driven Organic A-Site Emission in Hybrid Low-Dimensional Organic–Inorganic Cadmium Halides*
6. Taofiq Abdulraheem, Chemistry, *Gas-phase Dissociation and Thermal Decomposition of Ionic Liquids*

Oral Session 4

8 AM – 9:30 AM

Room 2240

Moderator: Leticia Orellana

Evaluators:

1. Sujan Ranjan Anreddy
2. Sheida Riahi

Participants:

1. Yasas Gamagedara, Agricultural and Biological Engineering, *Leveraging MIR Spectroscopy and Machine Learning to Predict Soil Hydraulic Properties*
2. Alejandro Galindo, Richard A. Rula School of Civil and Environmental Engineering, *Curve Number Calibration Through Event Selection: Maximum vs. All Precipitation Events in the Southeastern U.S.*
3. Jesus Ortiz, Richard A. Rula School of Civil and Environmental Engineering, *Determination of statistical parameters in Curve Number Adjustments*
4. Mohammad Abdus Shahid Rafi, Electrical and Computer Engineering, *High-resolution soil moisture measurement using UAS-based GNSS-R: findings from an agricultural field campaign*.
5. Md Mehedi Hasan Khan Shaon, Richard A. Rula School of Civil and Environmental Engineering, *A Multi-Parameter Ranking Framework for Evaluating Bio-based Recycling Agents in High RAP Binder*
6. Yue Zhao, Richard A. Rula School of Civil and Environmental Engineering, *Evaluating attention allocation in Human-Robot Collaboration in construction tasks*

Oral Session 5

8 AM – 9:30 AM

Room 2030

Moderator: Morgan Elmore

Evaluators:

1. Sara Campbell
2. Rajeev Bhattarai

Participants:

1. Basant Pant, Wildlife, Fisheries and Aquaculture, *Understanding What Drives Black Bear Hunting Intention Among Mississippi Resident Hunters*
2. Cristian Suarez Barazeta, Wildlife, Fisheries, and Aquaculture, *Optimizing Carbohydrate and Lipid Ratios in Channel Catfish Feeds to Enhance Physiological and Immunological Responses, and Resistance Against Edwardsiella Ictaluri*
3. Daniel Egerson, Wildlife, Fisheries and Aquaculture, *From Knowledge Gaps to Informed Choices: Addressing Barriers to Landowner Decision-Making in the U.S. Conservation Reserve Program*
4. Jing Huang, Wildlife, Fisheries, and Aquaculture, *Exploring Carbohydrate Ingredients for Potential Synbiotic Interaction with Autochthonous Lactococcus lactis MA5 in Diets for Hybrid Catfish (Ictalurus punctatus × I. furcatus)*
5. Abigael Laisa, Sustainable Bioproducts, *Exploring Guayule Resin as a Sustainable Preservative for Improving Termite Resistance of Wood*

Oral Session 6

10:00AM – 11:30 AM

Room 1220

Moderator: Maria Haider

Evaluators:

1. Cory Gallo
2. George Awuni

Participants:

1. Bipin Bastakoti, Plant and Soil Sciences, *Developing Integrated Machine Learning and Geospatial Framework for Net Carbon Balance Assessment in the Mississippi Delta*
2. Manoj Kumar Reddy Allam, Plant and Soil Sciences, *Responsiveness Of Rice Genotypes to Elevated CO_2 Growing Conditions*
3. Pankaj Prashad Joshi, Plant and Soil Sciences, *Mitigating Greenhouse Gas Emissions from Corn Through Protected Fertility Management*
4. Prasanna Bayalusime, Plant and Soil Sciences, *Simulating Nitrogen Leaching from Southern Mississippi Croplands and Its Impact on the Mississippi Sound Using Crop Model and Remote Sensing*
5. Ruchita Bhattarai, Plant and Soil Sciences*, Calibration and Validation of CERES-Maize for Simulating Corn Phenology and Yield in Mississippi*
6. Trisa Das, Plant and Soil Sciences, *Phenolic Bioherbicides: Advancing Sustainable Management of Herbicide-Resistant Palmer Amaranth in Southern U.S. Soybean Production*

Oral Session 7

10 AM – 11:30 AM

Room 1200

Moderator: Clara Cobb

Evaluators:

1. Andy Parra Martinez
2. DeeDee Baldwin
3. Heath Anderson
4. Michelle Taylor
5. Nathan Hammond

Participants:

1. Pengyu Wu, Finance and Economics, *Incoming CEO Power and Corporate Tax Aggressiveness*
2. Emily Creel, Psychology, *Insights from the Past: Does access to unsuccessful problem attempts facilitate restructuring in insight problems?*
3. Katy Kemalyan, Historic Preservation*, Responding to the urban canvas: Murals, placemaking, and preservation in Meridian, MS*
4. Lydia Bailey, Anthropology and Middle Eastern Cultures, *Assessing impacts of the Great Depression on childhood health using bioarchaeological perspectives*
5. Melvin L. Smith Jr., Instructional Technology and Workforce Development*, Improving Patient Outcomes through Provider Continuing Education*
6. Pengyu Wu, Finance and Economics, *Effective Tax Rate and Insider-Informed Stock Option Exercise*

Oral Session 8
10 AM – 11:45 AM

Room 2180

Moderator: Kristina Schoenthaler

Evaluators:

1. Rajeev Bhattarai
2. Sujan Ranjan Anreddy

Participants:

1. Anthony Obinna Umeojiakor, Forestry, *Establishing Baseline Forest Conditions for Evaluating Midstory Removal Effects in Upland Hardwood Forest of Northern Mississippi*
2. Elizabeth A. Esser, Forestry, *Impact of soil type on autotoxicity of cogongrass (Imperata cylindrica) leachates*
3. Getrude Aturu, Forestry, *The Influence of Genetics and Foliar Nutrients on Conelet Survival in Three Lodgepole Pine Orchards*
4. Muhammad Usama, Forestry, *Physiological evaluation and screening of drought tolerant genotypes of P. deltoides*
5. Prattay Dey, Biological Sciences, *Epitope Mapping of PsaA defines its interaction with Annexin A2 in Pneumococcal Adhesion*
6. Suharsha Baskarla, Forestry, *Climate Effects on Forest Carbon Sequestration: A National-Scale Analysis of the U.S. Forests*
7. Udit Bhatta, Geosciences, *Measuring Flood Readiness Gaps: An Index Framework for Community Preparedness and Resilience in Mississippi*

Oral Session 9

10 AM – 11:45 AM

Room 2240

Moderator: Sujan Poudel

Evaluators:

1. Sheida Riahi
2. Mohammad Khalid

Participants:

1. Abid Hassan, Industrial and Systems Engineering, *OSHA Severe Injury Reports to QA: Building a Large Corpus with a Hybrid Curation Framework for Construction Safety LLMs*
2. Abhro Shome Pias, Industrial and Systems Engineering, *Toward Sleep Biomarkers of ADHD: A Machine Learning Approach*
3. Dakota Hester, Agricultural and Biological Engineering, *Learning with less: label-efficient land cover classification at very high spatial resolution using self-supervised deep learning*
4. Dongmin (Ethan) Kang, Industrial and Systems Engineering, *Saving Storage Space with Principal Component Analysis Methods for Thermal Images in Additive Manufacturing*
5. Kodai Watanabe, Agricultural and Biological Engineering, *Generation of Synthetic Image Data in a Simulated Agricultural Environment Using MAVS: A Case Study and Evaluation on Deep Learning-Based Cotton Boll Detection*
6. Riku Kikuta, Center for Advanced Vehicular Systems, *Dynamic Pedestrian Trajectory Estimation for Autonomous Vehicle Using Risk Potential Theory*
7. Thainara Lima, Agricultural and Biological Engineering, *Exploring the Potential of Medium-Resolution Satellites for Algal Bloom Detection in Nearshore Waters: A Benchmark Study of CNN and Transformer Models*

Oral Session 10

10 AM – 11:45 AM

Room 2030

Moderator: Mohammad Alizadeh Poshtiri

Evaluators:

1. Santhana Boopalan
2. Juan Silva

Participants:

1. Arpita Deb, Comparative Biomedical Sciences, *AHR ligands attenuate IgG2a- and IgG2b-induced inflammatory signaling in innate immune cells*
2. Hemraj Kathayat, Comparative Biomedical Sciences, *TolC Efflux Channel Contributes to Efflux Activity and Biofilm Formation in Edwardsiella ictaluri*
3. Muhammad Hamza, Sustainable Bioproducts, *Rapid Removal of Perfluoroalkyl Substances from Water Using Nanocellulose-Derived Aerogel*
4. Oluwabori Adekanye, Comparative Biomedical Sciences, *Caspase 1 downstream of NLRP3 inflammasomes is more expressed and catalytically active in CES1KD macrophages*
5. Sujita Balami, Pathobiology and Population Medicine, *Evaluating an Orally Delivered Bivalent Vaccine against Edwardsiellosis in Channel Catfish (Ictalurus punctatus)*
6. Sijin Guo, Sustainable Bioproduct, *Green Graphene for Grey Infrastructure: Sustainable Nanomaterials in Cement*

AFTERNOON SESSION: 1:00 – 4:00 PM

Poster Sessions

Poster Session 1

1:00 PM – 2:20 PM

1st Floor Lobby – Posters 1-6

Moderator: Sumaira Kutub

Evaluators:

1. Maryam Mohammadi-Aragh
2. Sayantan Samanta

Participants:

1. Cristian Suarez Barazeta, Wildlife, Fisheries and Aquaculture, *Evaluation of the Antimicrobial Activity of Phytocompounds Against Fish Bacterial Pathogens*
2. Cecilia Kankam Kusi, School of Human Sciences, *Literacy as a Bridge out of Poverty: A Systematic Review and Research Agenda*
3. Cheng Ouyang, Agricultural and Biological Engineering, *Direct Data-Driven Predictive Control for a Three-dimensional Cable-Driven Soft Robotic Arm*
4. Daniel Egerson, Wildlife, Fisheries, and Aquaculture, *Addressing Knowledge Gaps in the U.S. Conservation Reserve Program: Developing the CRP Menu Tool for Enhanced Decision-Making*
5. Etseoghena Oladejo, School of Human Sciences/Human Development and Family Science, *Buffering the effects of family adversity: The role of parental monitoring and supportive relationships on academic performance among Black/African American Students*
6. Minel Guler, School of Human Sciences, *Solo and Social Video Gaming Patterns: The Role of Motivation*

Poster Session 2

1:00 PM – 2:20 PM

1st Floor Lobby – Posters 9-14

Moderator: Sumaira Kutub

Evaluators:

1. Gwendolyn Boyd-Shields
2. Young Kyung Park
3. Rizwan Farooqui

Participants:

1. Muhammad Hamza, Sustainable Bioproducts, *Sustainable Nano-Cellulose Aerogel for PFAS Removal from Water*
2. Nauman Ahmed, Sustainable Bioproducts, *Chitosan nanoparticles encapsulated with lemongrass essential oil as wood preservative*
3. Nkolika Omoni, Sustainable Bioproducts, *Non-destructive Evaluation of Wood Properties of Fire-damaged Hard Pine (Ponderosa Pine) in Plumas National Forest, Carlifornia USA*
4. Oluwabori Adekanye, Comparative Biomedical Sciences, *Lipid peroxidation triggers IL1B release in CES1KD Macrophages*
5. Sujita Balami, Pathobiology and Population Medicine, *Identification of Potential Live-Attenuated Vaccine Candidate Against Edwardsiella piscicida in Catfish*
6. Saida Zinnurine, Comparative Biomedical Sciences, *Characterization of RTX and Chitinase-deficient mutants of virulent Aeromonas hydrophila*

Poster Session 3

2:30 PM – 4:00 PM

1st Floor Lobby – Posters 1-7

Moderator: Hemraj Kathayat

Evaluators:

1. Seungil Kim
2. Soroush Korivand

Participants:

1. Bishal Adhikari, Agricultural and Biological Engineering, *A Comprehensive Evaluation of YOLO-based Deer Detection Performance on Edge Devices*
2. Laith Odeh Bani Khaled, Electrical and Computer Engineering, *FlashLightNet: An End-to-End Deep Learning Framework for Real-Time Detection and Classification of Static and Flashing Traffic Light States*
3. Md Abdul Kium Hridoy, Electrical and Computer Engineering, *A Compact, Single Stage, Medium-Voltage Line Impedance Stabilization Network*
4. Nathaniel Bosque, Agricultural and Biological Engineering, *Cytocompatibility of gold nanoparticles with protein coatings for use in photothermal therapy against bacterial biofilm*
5. Sifat Zina Karim, Electrical and Computer Engineering, *Attention Enhanced Perceptual Image Anomaly Detection for Ultrasound Imagery*
6. Sachin Promodh Cooray, Agricultural and Biological Engineering, *Optimizing ROI Size and Sampling Strategies in Hyperspectral Imaging for Greenhouse Plant Phenotyping*
7. Yehani Thamokshya Ekanayake, Agricultural and Biological Engineering, *Predicting Soil Fertility Properties from Fresh Soil Spectra Using MIR and Vis–NIR Spectroscopy with Machine Learning*

Poster Session 4

2:30 PM – 4:00 PM

1st Floor Lobby – Posters 9-13

Moderator: Hemraj Kathayat

Evaluators:

1. Elaine Wei
2. Iva Ballard
3. Jenna DePasquale

Participants:

1. Elizabeth Fox, Anthropology and Middle Eastern Cultures, *Buried in a well: An osteobiographical study of two non-adult individuals from Roman period Mursa (Osijek, Croatia)*
2. Leila Kargaripadar and Sayed In Abdullah, Counseling, Higher Education Leadership, Educational Psychology, and Foundations, *Mapping courage: A cross-disciplinary Systematic Literature Review*
3. Luis Caballero Choy, Chemistry, *Zinc(II) binding of a γ-CA-like protein from a hyperthermophilic archaeon*
4. Swayamjit Saha, Building Construction Science, *Interpretable Per-Person Safety Assessment from CCTV Frames with Pose-Guided Heuristics*
5. Jessie Hassan, Anthropology and Middle Eastern Cultures, *We The People: Tracing Marginalization in Forensic Anthropology*

Oral presentations 1:00 – 4:00 PM

Oral Session 1

1:00 PM – 2:15 PM

Room 1220

Moderator: Jahnavi Srija

Evaluators:

1. Kalyn Coatney
2. Ridwan Ayinla

Participants:

1. Bipin Paudel, Forestry, *UAV-Based Hyperspectral Sensing for Photosynthetic Trait Analysis in Populus deltoides Hybrids*
2. Carlos Rivera, Forestry, *From clones to lineages: forensic reconstruction of genetic history in a USDA Forest Service eastern cottonwood collection*
3. Luke Ferguson, Forestry, *Generalized aboveground biomass equations for eastern cottonwood and black willow*
4. Vandana Dharan, Wildlife, Fisheries, and Aquaculture, *Hematological and Biochemical Analysis of Ictalurid Herpesvirus I (IcHV1) Infection in Channel Catfish, Ictalurus punctatus*

Oral Session 2

1:00 PM – 2:15 PM

Room 1200

Moderator: Ethan Kang

Evaluators:

1. Libby O'Neil
2. Mary Catington
3. Neil Deochand

Participants:

1. Gbenga I. Elufisan, Sociology, *Farming challenges in Mississippi: cooperative, black farmers' haven*
2. Haomiao Li, Psychology, *The effect of information entropy on recognition memory for words*
3. Madeline Ballinger, Anthropology and Middle Eastern Cultures, *Extracted Coal, Extracted Health: A Geospatial Analysis of Thyroid Cancer Rates and Mountain-Top Coal Mining in Kentucky*
4. Oluwatobi Abiola, Human Development and Family Science, *Childhood trauma and its influence on adult decision-making: A conceptual framework*
5. Richard H. Lloyd, III, History, *Words of the Nation: Irish Women and the Politics of Language Revival*

Oral Session 3

1:00 PM – 2:15 PM

Room 2180

Moderator: Nishat Shermin

Evaluators:

1. Maryam Mirabolghasemi
2. Yueran Zhuo

Participants:

1. Honor Elchos, Agricultural and Biological Engineering, *Cell seeding efficiency is enhanced with an oscillatory perfusion method and with nanohydroxyapatite coating*
2. Iffat Ara Ebu, Electrical and Computer Engineering, *Large-Scale Underwater Multi-Fish Tracking Using the ByteTrack Algorithm*
3. Parastou Ahadpour Bakhtiari, Agricultural and Biological Engineering, *Evaluating MAVS as a ROS2-Compatible Platform for Agricultural SLAM*
4. Riku Kikuta, Computational Engineering, *A Study on Parameter Optimization for Robust Motion Control Using Taguchi Method*

Oral Session 4

2:45 PM – 4:00 PM

Room 1220

Moderator: Mohammad Nafe Assafi

Evaluators:

1. Michail Panagiotidis
2. Ridwan Ayinla

Participants:

1. Aldwin Mendoza, Agriculture Science and Plant Protection, *Current Status Of Soybean Plant-Parasitic Nematodes In Mississippi*
2. Anitha Madapakula, Plant and Soil Science, *Precision Water Management of Soybean Mississippi Combining Remote Sensing and Crop Modelling*
3. Rideeta Islam Aishy, Comparative Biomedical Sciences, *Adaptive Evolutionary Dynamics and Associated Fitness costs in Edwardsiella ictaluri under Colistin Stress*
4. Ryanne Murray, Pathobiology and Population Medicine, *Analysis of PCBs, naphthalene, and heavy metals in common bottlenose dolphins (Tursiops truncatus) and their prey species in the Mississippi Sound*
5. Saida Zinnurine, Comparative Biomedical Sciences, *Vaccine Optimization and Virulence Modulation of Virulent Aeromonas Hydrophila with Mutations in RTX Toxin genes*

Oral Session 5

2:45 PM – 4:00 PM

Room 1200

Moderator: Md. Sazedur Rahman

Evaluators:

1. Darcie Sidelinger
2. Shainy Sambyal

Participants:

1. Courtney Wynn, Biochemistry, Nutrition, and Health Promotion, *Molecular and behavioral analysis of the Pheromone Biosynthesis Activating Neuropeptide (PBAN) and its receptor (PBANR) in the Soybean Looper (Chrysodeixis includens)*
2. Michelle Roy, Biochemistry, Nutrition, and Health Promotion, *Targeted preservation of the mitochondrial vesicle: bovine serum albumin extends Fowler's toad sperm motility and integrity*
3. Rezwana Rahman Setu, Biochemistry, Nutrition, and Health Promotion, *Analysis of Systemic Acquired Resistance by Monitoring Redox-Mediated Transcriptional Dynamics in Arabidopsis*
4. Seung Heon Lee, Biochemistry, Nutrition and Health Promotion, *Functional Insights into PBAN and PBAN-r across Developmental Stages of Helicoverpa Zea via RNAi and CRISPR*

Oral Session 6

2:45 PM – 4:00 PM

Room 2180

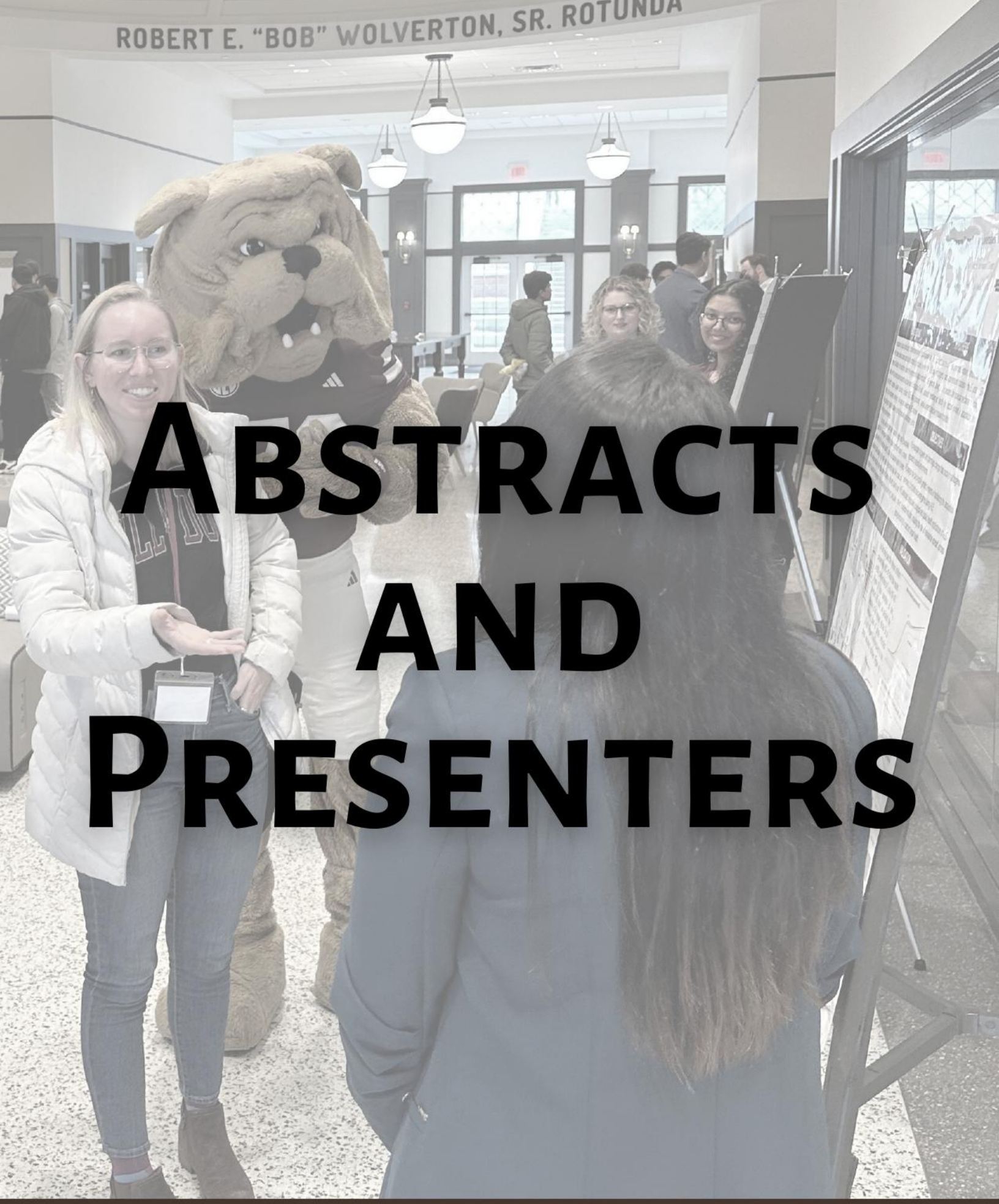
Moderator: Himani Joshi

Evaluators:

1. Donna Gordon
2. Stephanie Mallette

Participants:

1. Achini Ovitigala, Physics and Astronomy, *Absolute measurements of absorption cross-sections of BrHg and kinetic insights into the atmospheric redox chemistry of mercury*
2. Hannah Lawson, Chemistry, *Toward Separation and Detection of Ionic Liquid Cations by Ultra High-Performance Liquid Chromatography (UHPLC) using a Pentafluorophenylpropyl (PFPP) Column with Mass Spectrometric Detection*
3. Mohammad Alizadeh Poshtiri, Physics and Astronomy, *Speckle-Free Imaging of Biological Samples using Random laser illumination*
4. Tanveer Shaikh, Chemistry, *Engineering Protein Corona Composition to Modulate the Biological Response to Nanoparticles*



Abstracts and Presenters

MISSISSIPPI STATE UNIVERSITY™
GRADUATE STUDENT ASSOCIATION

MISSISSIPPI STATE UNIVERSITY™
THE GRADUATE SCHOOL

Presenter: Abhishek Panchadi

Presentation Session: MP4

Level of Study: PhD

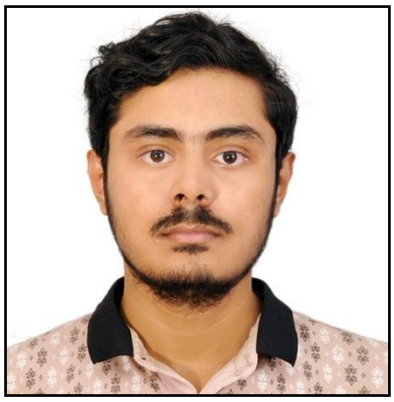
Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash Kumar Jha, Assistant Professor, Plant and Soil Sciences

Title: Can Sentinel-2's Multispectral Imagery be Converted into EnMAP's Hyperspectral Data?

Abstract: Hyperspectral satellite imagery provides contiguous narrow bands essential for quantifying soil properties, agricultural applications, and monitoring environmental conditions. However, the availability of spaceborne hyperspectral data is restricted by limited mission lifetimes and revisit frequency. Whereas, multispectral sensors such as Sentinel-2 provide consistent global coverage but with coarser spectral resolution. The lack of spectral detail in the shortwave infrared (SWIR) region is particularly limiting, as SWIR absorption features are critical for soil applications. This gap motivated the reconstruction of hyperspectral information from widely available multispectral observations. This study evaluated the potential to transform Sentinel-2 imagery into EnMAP's hyperspectral data using the Universal Pattern Decomposition Method (UPDM). UPDM decomposes multispectral reflectance as a linear combination of universal spectral patterns, and enable the reconstruction of continuous hyperspectral bands across the EnMAP spectral range. Sentinel-2 reflectance was decomposed with UPDM and reconstructed into full spectra, which was validated against an original EnMAP image over the study area. Results indicated that UPDM-reconstructed spectra preserved the absorption features in the visible, NIR, and SWIR regions with good accuracy and correlations. This work demonstrated the potential of spectral reconstruction to reduce the gap between multispectral and hyperspectral domains. Future studies will apply these reconstructed hyperspectral datasets to soil and agricultural applications, including soil carbon assessment, crop monitoring, and discrimination.



Presenter: Abhro Shome Pias

Presentation Session: MO9

Level of Study: PhD

Department: Industrial and Systems Engineering

Category: Engineering

Advisor: Dr. Haifeng Wang, Industrial and Systems Engineering

Title: Toward Sleep Biomarkers of ADHD: A Machine Learning Approach

Abstract: Attention Deficit/Hyperactivity Disorder (ADHD) is found as one of the most common neurological disorders among preschoolers, school-aged children as well as teenagers. Children and adolescents with ADHD face several sleep related issues such as daytime sleepiness, anomaly in several sleep metrics like sleep efficiency, sleep latency, sleep onset etc. ADHD shows electrophysiological differences during sleep, yet specific markers remain underused in classification. We analyzed a Polysomnographic dataset of full night sleep study on patients who were referred for sleep disorders (e.g. Sleep Apnea, Snoring, Restless Leg Syndrome etc.), aged between 6 to 18 years with an aim of predicting ADHD and identifying potential sleep biomarkers from handcrafted features. Feature extraction spanned time, frequency, and connectivity domains. Extensive experiments showed, a Support Vector Machine model trained on rapid eye movement (REM) sleep stage features performed best with a 72.2% Accuracy, 69.7% Precision and 81.1% Recall on a 5-fold cross validation. Feature importance ranked the chin EMG pair (CHIN1–CHIN2), cardiac activity (EKG1–EKG2), and bilateral EOG highest, with right central and left frontal EEG among the most informative cortical leads. These results indicate that REM-stage connectivity and peripheral physiology carry useful signal for ADHD classification.

Presenter: Abid Hassan

Presentation Session: MO9

Level of Study: Master's

Department: Industrial and Systems Engineering

Category: Engineering

Advisor: Dr. Rizwan U. Farooqui, Assistant Professor, Building Construction Science

Co-Advisor: Asad Malik, Assistant Research Professor, nSPARC

Title: OSHA Severe Injury Reports to QA: Building a Large Corpus with a Hybrid Curation Framework for Construction Safety LLMs

Abstract: Construction remains one of the most hazardous industries, with thousands of severe injuries reported to the Occupational Safety and Health Administration (OSHA) each year. The reports contain valuable details, but they are not structured or labeled in a way that large language models (LLMs) can be fine-tuned directly. This has left a gap in structured resources for advancing AI-driven methods in accident analysis, prevention, and generative AI–based worker support. This study introduces a novel algorithm and a large question–answer (QA) dataset derived from OSHA Severe Injury Reports. Nearly 96,000 records were reviewed, and construction-related cases were identified using NAICS code 23, yielding 17,158 incidents. Each case was processed through a hybrid algorithm that combined rule-based extraction and standardized taxonomy–based verification. The process reformulated incidents into QA pairs across four categories central to OSHA/BLS classifications: Event or Exposure, Nature of Injury, Body Part Affected, and Source of Injury. On average, each record generated four to five pairs, resulting in a dataset of over 70,000 entries. The contribution of this work lies in both the algorithmic framework and the dataset, which together establish a foundation for applying LLMs to construction safety. This baseline effort is part of a broader initiative to create intelligent safety assistants and on-site decision-making support systems aimed at reducing preventable injuries and improving worker well-being.

Presenter: Abigael Laisa

Presentation Session: MO10

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Laya Khademibami, Assistant Research Professor. Department of Sustainable Bioproducts.

Title: Exploring Guayule Resin as a Sustainable Preservative for Improving Termite Resistance of Wood

Abstract: The vulnerability of wood products to termite attack highlights the urgent need for sustainable protective strategies beyond traditional chemical preservatives, which are often associated with environmental and health concerns. Guayule (Parthenium argentatum) resin, containing bioactive compounds such as sesquiterpenes and triterpenoids, represents a promising bio-based alternative as a sustainable wood preservative. This study evaluated the effectiveness of guayule resin against Coptotermes formosanus termites in yellow poplar (Liriodendron tulipifera) and southern pine (Pinus spp.) species. Specimens were treated at 0.5% and 5% resin concentrations using acetone and toluene as carrier solvents through vacuum impregnation process. Termite resistance was evaluated using no-choice feeding test in accordance with AWPA Standard E1-23 (2024). Performance was assessed through mass loss percentage, termite mortality, and visual ratings, with data analyzed using two-way ANOVA. Results indicated significant interactions between resin concentration and wood species. The 5% guayule resin in toluene yielded the lowest mass loss, providing the highest protection across both species. Visual ratings showed moderate to severe termite damage in pine (6.8–7.0) but only slight to moderate attack in yellow poplar (8.6–9.0). Termite mortality remained low across all treatments, suggesting that guayule resin functions primarily as an antifeedant rather than a toxicant. These findings demonstrate that guayule resin, particularly at higher concentrations, can improve the resistance of wood to termite degradation and represent a promising bio-based approach to sustainable wood protection.

Presenter: Achini Ovitigala

Presentation Session: AO6

Level of Study: PhD

Department: Physics and Astronomy

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Chuji Wang, Professor, Physics and Astronomy

Title: Absolute measurements of absorption cross-sections of BrHg and kinetic insights into the atmospheric redox chemistry of mercury

Abstract: Mercury is a global pollutant and neurotoxin that affects both human health and ecosystems. Gaseous elemental mercury (Hg(0)) is the main form emitted to the atmosphere, its oxidation to mercury complexes (Hg(II)) plays a key role in determining where mercury accumulates. The redox chemistry of atmospheric mercury is the simplest part of its complex environmental cycle, yet large uncertainties remain in its reaction rates. Reported rate constants can differ by up to two orders of magnitude, partly because side reactions complicate kinetic studies, Accounting for the effects of side reactions requires knowing initial concentrations, especially that of BrHg and its photolytic precursor, HgBr2. Our ignorance of the absorption cross-sections of HgBr2 and BrHg prevents us from learning these concentrations. We used cavity ringdown spectroscopy to monitor HgBr2, BrHg, and Hg(0) in the wavelength range from 253.0 nm to 257.5 nm. BrHg is produced by photolyzing $HgBr_2$ at 266 nm. We measured ringdown spectra of 10 vibronic bands of the BrHg ($D^2\Pi_3/2 - X^2\Sigma^+$) system. Wavelength-dependent absorption cross-sections for $HgBr_2$ and BrHg were determined at 10 different wavelengths, and results are compared with those in literature. Laser-induced fluorescence was used to monitor [BrHg] in kinetic studies across a range of temperatures and pressures for systems containing BrHg, BrHgO, O, O3, In particular, we carried out the first experimental investigation into the temperature dependence of the rate constant for the reaction $BrHg + O_3 \rightarrow BrHgO + O_2$ [R1]

This reaction is key in oxidizing atmospheric Hg(I) to Hg(II). Rate constants for this reaction, along with those for the side reactions: $BrHg + O \rightarrow Hg + BrO$ [R2] and $BrHgO + O \rightarrow BrHg + O_2$ [R3] were derived from numerical modeling of [BrHg] over time. We observed a modest temperature dependence [R1], which is consistent with recent computational studies. These findings provide important data to help reduce uncertainties in the redox chemistry of mercury in the atmosphere. The work is supported by NSF via grants 2108712 and 2108826.

Presenter: Achini Ovitigala

Presentation Session: MP3

Level of Study: PhD

Department: Physics and Astronomy

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Chuji Wang, Professor, Physics and Astronomy

Title: Molecular insights into the redox of atmospheric mercury through laser spectroscopy

Abstract: Mercury is a global pollutant and neurotoxin that affects both human health and ecosystems. Gaseous elemental mercury (Hg(0)) is the main form emitted to the atmosphere, its oxidation to mercury complexes (Hg(II)) plays a key role in determining where mercury accumulates. The redox chemistry of atmospheric mercury is the simplest part of its complex environmental cycle, yet large uncertainties remain in its reaction rates. Reported rate constants can differ by up to two orders of magnitude, partly because side reactions complicate kinetic studies, Accounting for the effects of side reactions requires knowing initial concentrations, especially that of BrHg and its photolytic precursor, HgBr2. Our ignorance of the absorption cross-sections of HgBr2 and BrHg prevents us from learning these concentrations. We used cavity ringdown spectroscopy to monitor HgBr2, BrHg, and Hg(0) in the wavelength range from 253.0 nm to 257.5 nm. BrHg is produced by photolyzing $HgBr_2$ at 266 nm. We measured ringdown spectra of 10 vibronic bands of the BrHg ($D^2\Pi_3/2 - X^2\Sigma^+$) system. Wavelength-dependent absorption cross-sections for $HgBr_2$ and BrHg were determined at 10 different wavelengths, and results are compared with those in literature. Laser-induced fluorescence was used to monitor [BrHg] in kinetic studies across a range of temperatures and pressures for systems containing BrHg, BrHgO, O, O3, In particular, we carried out the first experimental investigation into the temperature dependence of the rate constant for the reaction $BrHg + O_3 \rightarrow BrHgO + O_2$ [R1]

This reaction is key in oxidizing atmospheric Hg(I) to Hg(II). Rate constants for this reaction, along with those for the side reactions: $BrHg + O \rightarrow Hg + BrO$ [R2] and $BrHgO + O \rightarrow BrHg + O_2$ [R3] were derived from numerical modeling of [BrHg] over time. We observed a modest temperature dependence [R1], which is consistent with recent computational studies. These findings provide important data to help reduce uncertainties in the redox chemistry of mercury in the atmosphere. The work is supported by NSF via grants 2108712 and 2108826.

Presenter: Aldwin Mendoza

Presentation Session: AO4

Level of Study: Master's

Department: Agriculture Science and Plant Protection

Category: Agriculture and Life Sciences

Advisor: Dr. Chang Liu, Assistant Professor, Agriculture Science and Plant Protection

Title: CURRENT STATUS OF SOYBEAN PLANT-PARASITIC NEMATODES IN MISSISSIPPI

Abstract: Mississippi is the 12th largest soybean-producing state in the United States, yielding around 127.7 million bushels over 2.3 million acres. Despite this, plant-parasitic nematodes present a major threat to soybean production, causing significant yield losses and diminishing the soybean supply for both local and global markets. In northern Mississippi, soybean farms are frequently rotated with cotton, corn, and other row or cover crops. Knowing the specific nematode present in a field is crucial for growers to implement effective management strategies. This study examined five years (2020–2024) of data from 2,118 soybean field soil samples collected from farms in 34 Mississippi counties. Samples were obtained both through submissions to the Mississippi State University Plant Disease and Nematode Diagnostic Laboratory and by project personnel actively sampling growers' fields. The study reports the total number of samples, the percentage containing plant-parasitic nematodes, and the populations that exceed economic damage threshold levels (EDT) nematodes per 100 cm^3 of soil). Twelve genera of plant-parasitic nematodes were identified: Heterodera glycines, Meloidogyne spp., Rotylenchulus reniformis, Helicotylenchus spp., Hoplolaimus spp., Tylenchorhynchus spp., Pratylenchus spp., Paratrichodorus spp., Xiphinema spp., Mesocriconema spp., Hemicycliophora spp., and Belonolaimus spp. Distribution maps of these nematodes were created for soybean farms across the state. Among those identified, spiral nematodes (Helicotylenchus spp.) were the most prevalent, followed by reniform nematodes and soybean cyst nematode (SCN). Although root-knot nematodes (Meloidogyne spp.) were detected least frequently, they had the highest percentage of samples above the EDT, followed by soybean cyst and reniform nematodes. For SCN-positive samples in 2024, HG Typing was conducted to characterize SCN populations in Mississippi. An ongoing survey is also underway across the state's soybean farms to further assess nematode population profiles and their impacts on soybean production. The outcomes of this work aim to help Mississippi growers develop better management plans.

Presenter: Alejandro Galindo

Presentation Session: MO4

Level of Study: Master's

Department: Civil and Environmental Engineering

Category: Engineering

Advisor: Dr. John J. Ramirez-Avila, Professor, Civil and Environmental Engineering

Title: Curve Number Calibration Through Event Selection: Maximum vs. All Precipitation Events in the Southeastern U.S.

Abstract: The Curve Number (CN) method remains one of the most widely used approaches for estimating direct runoff from rainfall events, yet its performance is sensitive to how precipitation data are selected and processed. This study evaluates whether calibrating CN values using only the maximum precipitation events (Pmax) for specific periods of time yields better hydrologic model performance than using all available precipitation events (Pall). Using rainfall–runoff data from the southeastern United States, CN values were estimated under annual and seasonal groupings using Least Squares Error (LSE) minimization and three initial abstraction ratios ($\lambda = 0.2$, 0.05, and an optimized λ). The analysis tested various configurations combining precipitation thresholds ($P > 0$ mm and $P \geq 25.4$ mm) and abstraction ratios.

The results show that CN values calibrated using the maximum precipitation events consistently outperform those calibrated using all available precipitation events across all temporal and spatial scales. These findings support the original design assumption of the CN method as an event-based tool for significant storms. While CN values derived from all available precipitation events were generally inflated by low-intensity, abstraction-dominated storms—especially under fixed λ values—filtering for only the maximum event minimized this distortion and improved runoff model reliability. In situations where the use of the maximum precipitation event is constrained by limited data, filtering all available events with a minimum threshold of $P \geq 25.4$ mm offers a practical alternative with improved calibration fidelity. This study underscores the importance of event selection strategies in CN-based modeling and affirms that calibration using the maximum precipitation events provides a more hydrologically robust foundation for estimating runoff. These insights offer practical guidance for enhancing CN calibration methodologies.

Presenter: Alekhya Chakravaram

Presentation Session: MO1

Level of Study: PhD

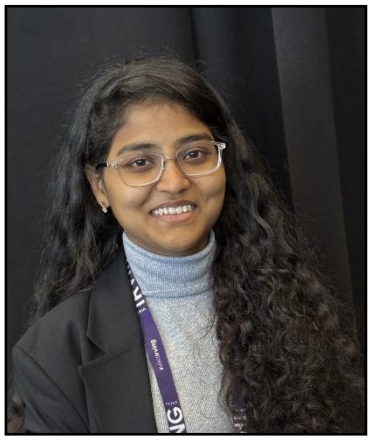
Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Research Professor, Plant and Soil Sciences

Title: Rice Responses to Abiotic Stresses During Anthesis and Grain Filling

Abstract: Exposure of high-yielding rice (Oryza sativa L.) to abiotic stresses significantly impacts growth and yield potential. Understanding the adaptations of yield-determining traits to these stresses is crucial for identifying multiple stress-tolerant rice genotypes and their underlying mechanisms. This study investigated the effects of common abiotic stressors on rice physiology, pigments, and yield parameters. At the flowering stage, seven high-yielding rice genotypes were subjected to four growing conditions: control (daytime temperature of 32°C and flooded), drought (32°C, 50% of control irrigation), salinity (32°C, 8 dS/m NaCl), and heat (38°C, flooded) until maturity, with a uniform nighttime temperature of 24°C. Physiological and yield parameters showed significant variations among genotypes across treatments. Chlorophyll reductions were most significant under drought conditions (5.4% at 21 days compared to 14 days), followed by salinity (10.2% at 21 days compared to 14 days). Salt stress caused the greatest reduction in stomatal conductance and transpiration (>85%), resulting in a ~45% decline in grain yield. Drought-induced changes in physiology caused a ~37% reduction in grain yield. In contrast to the other stressors, heat-stressed plants exhibited a ~4% increase in transpiration yet resulted in a 28% reduction in grain yield. Overall, significant genotypic variation yields potential under stressors, highlighting potential candidates for rice genotypes that can adapt to varied production conditions.



Presenter: Alekhya Chakravaram

Presentation Session: MP4

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Research Professor, Plant and Soil Sciences

Title: Harnessing Natural Variation in Photosynthetic Pigments to Improve Heat Tolerance in Rice

Abstract: Rice is relatively tolerant to heat stress during the vegetative stage, however, temperatures above optimum during anthesis and grain filling can have a severe impact on rice yield and quality. On the other hand, these are complex traits controlled by multiple genes. Thus, identifying loci associated with secondary traits linked to higher yield potential under heat stress would help develop reproductive stage heat-tolerant varieties. In this study, a diversity panel comprising 320 genotypes was phenotyped for pigment traits under control (32°C; daytime temperature) and heat stress (38°C) conditions during the anthesis and post-anthesis stages. Under control conditions, a decline in chlorophyll index from 14 to 28 days ranged from 11% to 72%, anthocyanin from 30% to 138%, flavonoids from 12% to 57%, and the Nitrogen Balance Index (NBI) from 0.1% to 82%, indicative of natural senescence. Under heat stress, marked reductions were noted: chlorophyll (7-75%), anthocyanin (38-100%), flavonoids (34-88%), and NBI (7-85%) declined significantly from 14 to 28 days. A comparative analysis of control and heat-stressed plants indicated that reductions in pigment content were consistently greater under heat stress, reflecting a rapid decline in photosynthetic capacity, nitrogen metabolism, and oxidative stress scavenging mechanisms. However, certain genotypes maintained relatively stable pigment profiles, indicating an inherent heat tolerance. These findings highlight the dual aspects of heat stress impact and genotypic variability in photosynthetic pigment responses. Future research aims to identify genomic regions linked to heat stress-induced alterations in photosynthetic pigments and yield components.

Presenter: Amirhossein Eskorouchi

Presentation Session: MP5

Level of Study: PhD

Department: Industrial and Systems Engineering

Category: Engineering

Advisor: Dr. Haifeng Wang

Title: Enhanced DETR-Based Framework for Automated Wood Chip Size Distribution Estimation in High Volume Biomass Manufacturing

Abstract: Accurate estimation of wood chip geometric properties is crucial for high-volume biomass manufacturing, where chip size and shape directly impact energy efficiency, product quality, and process optimization. Traditional measurement methods are labor-intensive, inconsistent, and fail to capture chip variability in large-scale industrial settings. This study presents an enhanced DEtection TRansformer (DETR)-based framework for automated wood chip size estimation, offering a scalable, precise, and real-time solution. We develop a comprehensive dataset of 300 images with over 7,100 annotated wood chips collected from multiple mills in the Southeast USA. The proposed approach consists of (1) deep learning-based object detection using an improved DETR model and (2) size distribution estimation via histograms and statistical metrics. 5-fold cross-validation on the test set achieves mAP50 of 90%, mAP50-95 of 63%, and recall50-95 of 0.68, demonstrating accuracy and robustness. This research advances flexible automation and intelligent manufacturing, enabling data-driven process optimization for industrial biomass applications.

Presenter: Anitha Madapakula

Presentation Session: AO4

Level of Study: Master's

Department: Plant and Soil Science

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash Kumar Jha, Assistant Professor, Department of Plant and Soil Science

Co-Advisor: Dr. Mike Mulvaney, Dr. Drew Gholson, Dr. Raju Beemanhalli

Title: Precision Water Management of Soybean Mississippi Combining Remote Sensing and Crop Modelling

Abstract: This study develops a crop coefficient (Kc) curve using satellite based evapotranspiration (ET) products and calibrated crop models to enhance irrigation scheduling for soybean fields in Mississippi. The research integrates satellite-derived ET estimates from Satellite products (SEBAL, MODIS), and FAO-Kc models with reference ET from GRIDMET to generate field specific Kc curves. These curves are incorporated into a water balance model to simulate soil moisture dynamics and predict water stress during critical growth stages. The framework is validated using in-situ soil moisture sensors and yield data from selected irrigated soybean fields under various irrigation systems. A web based decision support system is developed to provide real time, field specific irrigation recommendations based on the integrated ET Kc framework. The study's outcomes include improved irrigation scheduling accuracy, validation of remote sensing products, site specific crop coefficient refinement, and a scalable decision support framework for farmers. This research demonstrates the potential of combining satellite based ET products and crop models for precision irrigation management, contributing to sustainable water resource use in Mississippi soybean production.

Presenter: Anitha Madapakula

Presentation Session: MP4

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash Kumar Jha, Assistant Professor , Department of Plant and Soil Science

Co-Advisor: Dr. Mike Mulvaney, Dr. Drew Gholson, Dr. Raju Bheemanhalli Rangappa

Title: Optimizing Soybean Phenology and Yield Forecasts in Mississippi CSM-CROPGRO Model Application

Abstract: The CROPGRO-Soybean model in DSSAT simulates soybean growth, development, and yield based on genotype, environment, and management factors. This study calibrates and validates the model to improve soybean phenology and yield predictions across Mississippi environments. Field data from soybean varietal trials during 2024 growing seasons were used. GENCALC and GLUE tools estimated cultivar-specific genetic coefficients for maturity group IV . Model performance was evaluated using statistical metrics (R, MBE, RMSE, d-index). The study aims to provide accurate genetic coefficients for major soybean cultivars, validate model performance across diverse environments, and calibrate the model for integration with satellite-based evapotranspiration data to derive region-specific crop coefficients. This research will support the development of climate-resilient, resource-efficient soybean production strategies and precision agriculture applications in Mississippi.

Presenter: Anthony Obinna Umeojiakor

Presentation Session: MO8

Level of Study: PhD

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Courtney Siegert Professor, Forestry

Co-Advisor: Dr. Joshua Granger, Associate Professor, Forestry

Title: Establishing Baseline Forest Conditions for Evaluating Midstory Removal Effects in Upland Hardwood Forest of Northern Mississippi.

Abstract: Oak regeneration in upland hardwood forests has declined in recent decades due to increased competition and changes in disturbance regimes. Midstory removal is a silvicultural technique aimed at reducing competition and enhancing light availability to promote oak seedling growth and recruitment as well as sustaining forest productivity. This study establishes baseline forest conditions prior to midstory removal treatments in Upland Hardwood Forest of Northern Mississippi. This study was conducted at Spirit Hill Farm in Tate County, MS on 234 hectares of hardwood forest which were grouped into four replicates (REP1, REP2, REP3, and REP4). Each replicate was randomly assigned to three silvicultural treatment units (T1, T2, T3). T1 – (Uniform shelterwood) Hack and squirt was used to remove all non-oak tree species below 20.32 cm in diameter at breast height (DBH). T2 – (Irregular shelterwood) Hack and squirt to remove all non-oak midstory under 20.32 cm in DBH. T3 – (Untreated Control). In each treatment unit, five randomly selected plots were inventoried. Data were collected from plots, including species composition, DBH, tree height (HT)and estimate of basal area (BA), diversity index, above and below ground biomass and carbon storage (CS). Data was analyzed using R statistics. The baseline analysis reveals oak species dominance at overstory plots with 52.93% over non-oak 47.07%. We found that DBH, BA, TB and CS except the HT were significantly higher in REP 2 treatment 1 than all other REP and treatments. The initial findings provide a quantitative foundation for assessing treatment effects.

Presenter: Arpita Deb

Presentation Session: MO10

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Barbara Kaplan

Title: AHR ligands attenuate IgG2a- and IgG2b-induced inflammatory signaling in innate immune cells

Abstract: Multiple sclerosis (MS) is an autoimmune disorder characterized by the demyelination of neurons in the central nervous system (CNS). Experimental autoimmune encephalomyelitis (EAE), a widely used murine model of MS, can be induced by immunization with myelin oligodendrocyte glycoprotein (MOG). In EAE, MOG-specific IgG antibodies can potentially be pathogenic by recruiting cytolytic cells to destroy MOG-expressing cells comprising myelin. Our pilot studies have shown that the aryl hydrocarbon receptor (AHR) ligand 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) suppressed MOG (disease)-specific IgG2a and IgG2b antibody production in EAE. Our next objective was to determine if TCDD and other AHR ligands also inhibit IgG2a- and IgG2b-mediated signaling in innate cells. In this study, we investigated whether non-toxic AHR ligands could similarly reduce IgG2a/IgG2b production and subsequent downstream signaling in innate immune cells. First, EAE was induced in female C57BL/6 mice, followed by oral administration of the non-toxic AHR ligand indole-3-carbinol (I3C). We found that I3C treatment led to reduced levels of MOG-specific IgG2a and IgG2b antibodies. To investigate antibody-mediated signaling, we generated immune complexes using streptavidin and biotinylated IgG2a and IgG2b (Strept-Biotin IgG2a and Strept-Biotin IgG2b) and exposed them to various innate immune cells in vitro. Our ELISA analysis results showed Strept-Biotin IgG2a selectively activated CNS-specific macrophage-like BV-2 microglial cells, while Strept-Biotin IgG2b triggered immune responses in splenocytes, RAW macrophages, and BV-2 cells, as indicated by elevated IL-6, TNFα, and C3a levels. Next, cells were treated with AHR ligands to assess if the IgG2a and IgG2b-triggered signaling was compromised. Our data indicated that the I3C and 2-(1H-Indol-3-ylcarbonyl)-4-thiazolecarboxylic acid methyl ester (ITE), which is an endogenous AHR ligand, moderately attenuated IgG2a and IgG2b-induced inflammatory responses. These findings suggest that non-toxic AHR ligands can suppress the production of pathogenic antibodies in EAE and subsequently suppress pro-inflammatory signaling in innate cells. This highlights their potential as immunomodulatory agents for the treatment of MS.

Presenter: Bala Subramanyam Sivarathri

Presentation Session: MO1

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Research Professor, Plant and Soil Sciences

Title: Seed Priming with Biostimulant: Enhancing Soybean Drought Tolerance

Abstract: Unpredictable drought during the vegetative growth stage can significantly hinder soybean development, physiology, and yield stability. Agronomic practices, such as the use of biostimulants, offer promising strategies to enhance plant resilience to abiotic stress. Among these practices, seed priming stands out as a practical, cost-effective, and innovative technique that promotes better establishment and early vigor. This study investigated the effectiveness of priming soybean seeds with ten different biostimulants in mitigating the effects of drought. Both primed and non-primed seeds were exposed to two moisture conditions: a control (CNT) and drought stress (DS) at the V4 growth stage for 14 days. Drought stress significantly reduced stomatal conductance by 68% and transpiration by 28%. Morphological traits showed substantial declines compared to the CNT, including plant height (20%), leaf area (46%), branch number (31%), shoot biomass (37%), and root biomass (25%). In contrast, the root-to-shoot ratio increased by 18%, indicating a shift in resource allocation towards root development. After 14 days of stress, a subset of the plants was allowed to recover, similar to control plants, until harvest. During the recovery period, biomass allocation shifted from the root system to shoot growth, as evidenced by a 15% decline in the root-to-shoot ratio. Among the biostimulants studied, seed priming with Fortified Stimulate Yield Enhancer Plus and Azterknot demonstrated the potential to alleviate drought-induced physiological and morphological changes, thus improving recovery capacity.

Presenter: Bala Subramanyam Sivarathri

Presentation Session: MP4

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Research Professor, Plant and Soil Sciences

Title: Soybean Cold Tolerance: The Power of Seed Priming with Biostimulants

Abstract: Sowing time, seed quality, and environmental conditions influence soybean seed germination. Rise in temperatures during the reproductive stage significantly affects soybean flowering, pod development, and seed filling. Early sowing might mitigate these effects, but suboptimal temperatures can still impede germination and seedling establishment. Seed enhancement strategies and biostimulants could benefit in improving the germination ability and seedling growth. Two independent germination assays were conducted to evaluate the effects of seed treatment and priming with ten commercial biostimulants on germination traits under low temperature (15 °C, LT) and optimal temperature (25 °C, day/night; OT). Under LT, seed priming enhanced the germination percentage by ~7%, reduced mean germination time by ~24 h, and shortened the time required for 50% of seeds to germinate compared to seed treatment. Furthermore, radicle length and biomass were significantly reduced under LT; however, seed priming improved these traits by 8% compared to seed treatment. Notably, the seedling vigor index increased by 15% under priming compared to non-primed seed treatment. Seed priming improved all germination traits compared to seed treatment under OT. These results highlight that seed priming with biostimulants enhances germination and seedling vigor, offering a practical approach to increase soybean tolerance under chilled soil conditions.

Presenter: Basant Pant

Presentation Session: MO5

Level of Study: PhD

Department: Wildlife, Fisheries and Aquaculture

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Kevin M. Hunt, Professor, Wildlife, Fisheries and Aquaculture

Title: UNDERSTANDING WHAT DRIVES BLACK BEAR HUNTING INTENTION AMONG MISSISSIPPI RESIDENT HUNTERS

Abstract: The sustainable management of an increasing black bear population includes the active role of recreational hunters. This study extended the Theory of Planned Behavior to assess the attributes of Mississippi resident hunters to determine their intention to hunt black bears in Mississippi if a future hunting season became available. We surveyed 4,000 licensed resident hunters from the 2023 Mississippi Department of Wildlife, Fisheries, and Parks license database to explore their characteristics, attributes and intentions. The survey followed Dillman's Tailored Design Method and received 624 usable responses from licensed hunters. The structural equation model accounted for 40.6% of the variation in the intention to hunt. The result revealed that majority (57.4%) resident hunters showed positive intent to hunt black bears if a season was available. Attitudes emerged as the strongest predictor of hunting intention, followed by subjective norm, and the nominal impact of perceived behavioral control, which was negatively affected by the level of education. We did not find any significant effect of social trust, perceived benefit, and perceived risks on intention. The plausible reason may be that the current black bear population is low and hunting them is currently banned within the state's jurisdiction. With a low black bear population in Mississippi, the agency may face challenges related to hunting demand and hunting tag availability. A mismatch of demand and availability may erode the agency's societal license to manage black bears. Therefore, the agency should prioritize strategies that enhance social trust, communicate clearly about the population management goals of hunting, and engage educated people to encourage public support for black bear conservation.

Presenter: Bipin Bastakoti

Presentation Session: MO6

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash K Jha, Assistant Professor, Plant and Soil Sciences

Title: Developing Integrated Machine Learning and Geospatial Framework for Net Carbon Balance Assessment in the Mississippi Delta

Abstract: This research addresses the critical need for a spatially explicit tool to evaluate carbon balance in agricultural systems, with the objective of developing a novel Carbon Sustainability Index (CSI) and an integrated decision-support dashboard for the Mississippi Delta. The methodology was based on advanced geospatial science, commencing with the development of a calibrated machine learning model to predict and map Soil Organic Carbon (SOC) distribution across the region, validated via cross-validation and uncertainty analysis. This robust SOC map was then harmonized with Aboveground biomass (LiDAR-based GEDI data), Belowground biomass (statistically derived based on root-to-shoot ratio), and Dead Organic Carbon (IPCC-based) within the InVEST Carbon Storage Model to establish a comprehensive baseline of carbon sequestration across different land-uses. The CSI was derived by calculating the net carbon balance between the storage capacities and downscaled, satellite-based CO2 and CH4 emission data. The results yielded precise geospatial indicators, identifying "hotspots" of carbon loss and carbon gain. In conclusion, this interdisciplinary project provided policymakers and conservation planners with a data-driven, strategic dashboard to effectively prioritize and monitor "carbon credit" allocation to growers based on net carbon balance, rather than commodity-focused allocation.

Presenter: Bipin Paudel

Presentation Session: AO1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Heidi J. Renninger, Associate Professor, Department of Forestry

Co-Advisor: Dr. Rajeev Bhattarai, Assistant Professor, Department of Forestry - Dr. Krishna Poudel, Associate Professor, Department of Forestry - Dr. Qian (Jenny) Du, Professor, Department of Electrical and Computer Engineering

Title: UAV-Based Hyperspectral Sensing for Photosynthetic Trait Analysis in Populus deltoides Hybrids.

Abstract: Populus deltoides and its hybrids are high-yield short-rotation woody crops with strong potential in bioenergy and industrial applications. Their genetic diversity demands a rapid and non-invasive tool for assessing physiological traits to identify productive genotypes for bioenergy plantation. Hyperspectral remote sensing facilitates early and non-destructive estimation of key photosynthetic traits. However, their accurate and rapid estimation remains challenging, particularly due to the model non-transferability across species, environments, and experiments. To address this, the study aims to develop a robust framework to predict plant traits using UAV-based canopy hyperspectral reflectance (397.865–1001.51 nm) in P. deltoides and its hybrids. Ground truth data for three taxa (D×D, D×M, and D×T), including six clones, were collected under monoclonal and polyclonal strategies across two sites in Mississippi to capture physiological variation from clonal diversity, endophyte inoculation and site effects. Machine learning algorithms were implemented along with statistical techniques, using spectral reflectance, spectral derivatives along with trait-responsive vegetation indices. Preliminary findings showed that photosynthetic related trait exhibited strong spectral association in visible (400–700 nm), red-edge (~700 nm), and near-infrared (NIR) regions. These results support the use of hyperspectral information, underscoring its potential for genotype selection and physiological trait analysis in Populus.

Presenter: Bipin Paudel

Presentation Session: MP1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Heidi J. Renninger

Title: Denoising UAV-based Hyperspectral Imagery: A Deep Learning Approach

Abstract: Recent years have witnessed substantial progress in remote sensing techniques and sensor capabilities, facilitating the acquisition of high-fidelity data with varied spatial, spectral, and temporal scales. One of the prominent approaches includes the Hyperspectral Imaging (HSI) System, which acquires full spectral signatures at every spatial position. However, HSI is prone to noise because radiance detected by the sensor is often degraded by atmospheric interferences, processing anomalies, and sensor imperfections, leading to compromised image analysis. Therefore, this study aims to utilize a deep learning algorithm: a denoising autoencoder, to minimize noise in spectral signals and identify spectral intervals exhibiting dependable signal-to-noise (SNR) improvement. Hyperspectral Image for developing this framework was captured with a Headwall Photonics Nano Hyperspec VNIR mounted to a DJI MATRICE M600 Pro Unmanned Aerial Vehicle. The dataset consists of 270 spectral bands spanning 397.865–1001.51 nm with a spectral resolution of approximately 2.24nm. Preliminary results demonstrated comparable improvement in SNR for the denoised image. Across the visible spectrum, denoising reduced noise-induced oscillations while preserving pigment-related absorption. In the near-infrared region, the denoised spectrum showed pronounced reflectance exhibiting enhanced smoothness and stable representation of structural canopy features. It highlights the potential of a deep learning framework to enhance the reliability of hyperspectral data for future applications.

Presenter: Bishal Adhikari

Presentation Session: AP3

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Dong Chen, Assistant Professor, Agricultural and Biological Enigineering

Title: A Comprehensive Evaluation of YOLO-based Deer Detection Performance on Edge Devices

Abstract: The escalating economic losses in agriculture due to deer intrusion, estimated to be in the hundreds of millions of dollars annually in the U.S., highlight the inadequacy of traditional mitigation strategies such as hunting, fencing, use of repellents, and conventional scare tactics. Since these methods are expensive and inefficient, there is a critical need for intelligent, autonomous solutions capable of real-time wildlife detection and deterrence. But the progress in this field is impeded by a significant gap in the literature, mainly the lack of a domain-specific, practical dataset and limited study on the viability of deer detection systems on edge devices. Addressing this gap, this study presents a comprehensive evaluation of state-of-the-art deep learning models for deer detection in challenging real-world scenarios. We introduce a curated, publicly available dataset of 3,095 annotated images with bounding box annotations of deer. Then, we provide an extensive comparative analysis of 12 model variants across four recent YOLO architectures (v8 to v11). Finally, we evaluated their performance on two representative edge computing platforms: the CPU-based Raspberry Pi 5 and the GPU-accelerated NVIDIA Jetson AGX Xavier to assess feasibility for real-world field deployment. Results show that the real-time detection performance is not feasible in Raspberry Pi without hardware-specific model optimization, while NVIDIA Jetson provides greater than 30 FPS with ‘s’ and ‘n’ series models. This study also reveals that smaller, architecturally advanced models such as YOLOv11n, YOLOv8s, and YOLOv9s offer the optimal balance of high accuracy (AP@.5 > 0.85) and computational efficiency (FPS > 30).

Presenter: Carlos Rivera

Presentation Session: AO1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Heidi Renninger, Associate Professor, Forestry

Title: From clones to lineages: forensic reconstruction of genetic history in a USDA Forest Service eastern cottonwood collection

Abstract: The U.S. Forest Service has maintained a breeding collection of Populus deltoides for over six decades, originally assembled from natural stands across the southeastern United States. However, repeated propagation, transfers, and long-term management practices raise concerns about mislabeling, contamination, and loss of genetic integrity. For this project, we used a custom 5K SNP panel targeting coding regions on 341 ramets, representing 286 putative clones from the collection and ex situ repositories, to refine clonal identities and reconstruct kinship relationships. After filtering, 20,593 high-quality biallelic SNPs remained, spread across the genome. Identity-by-descent and Nei's genetic distance analyses confirmed that 96% of the individuals (275 genotypes) were correctly labeled as unique clones. About 15% of pairwise comparisons showed inconsistencies; most could be explained by operational errors such as cross-labeling during DNA extraction or sampling. Network analysis incorporating metadata and external datasets (UF collection) was essential for resolving ambiguous cases. A small subset of samples (around 4%) could not be resolved and will need resampling. Notably, kinship analysis revealed at least four natural families within the collection, with relatedness ranging from half-sib to full-sib levels. This underscores the historical selection of related material and suggests potential for pedigree-based breeding. Our findings demonstrate that the P. deltoides Forest Service collection largely maintains strong genomic integrity, with most errors arising from technical issues rather than biological differences. The curated dataset provides a solid foundation for future studies on diversity, inheritance, and trait associations in eastern cottonwood.

Presenter: Carlos Rivera

Presentation Session: MP1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Heidi Renninger, Associate Professor, Forestry

Title: Deep learning with synthetic data improves tree ring detection

Abstract: The study of tree rings helps understand the growth and development of forest species and their interaction with the environment. Software tools have been developed to automate the ring measurement process, but many still require expert intervention and supervision. For this reason, in recent years, new approaches such as deep learning have gained importance due to their greater ability to generalize the problem to be solved. However, one limitation when training these neural networks is the limited number of observations in the training set. Some authors have tried data augmentation methods that have not improved the models' accuracy. Consequently, for this work, we propose a method that combines traditional image processing techniques to reduce data complexity, enabling us to train a generative conditional adversarial neural network (cGAN) from simulated data. The cGAN reconstructs missing ring segments, which are then used as an intermediate step in ring detection and segmentation. Our results show high pixel-wise accuracy (>0.97) and Intersection-over-Union (IoU) scores (>0.7). Pixel-wise accuracy increased with more discontinuities and decreased as the number of simulated rings grew. In contrast, the IoU remained stable regardless of the number of rings and increased with more discontinuities. This approach demonstrates the effectiveness of combining traditional image processing methods to simplify tasks and simulate synthetic data to train deep learning models for improved tree-ring segmentation.

Presenter: Cassia B. Caballero

Presentation Session: MP5

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Vitor S. Martins, Assistant Professor, Agricultural and Biological Engineering

Title: Enhancing Coastal Monitoring in the Mississippi Sound Using Sentinel-3 S3CARD and a Virtual Buoy Network

Abstract: The Mississippi Sound is a dynamic estuarine system that supports valuable ecological and economic resources, including oyster reefs and local fisheries. However, the region is vulnerable to occasional freshwater inflows, such as those caused by the Bonnet Carré Spillway openings, which introduce large volumes of sediment- and nutrient-rich water affecting salinity, clarity, and nutrient balances. These events present challenges for water quality monitoring, as in situ networks provide limited spatial coverage and are costly to maintain. To address this gap, we applied the newly developed Sentinel-3 Coastal Analysis Ready Data (S3CARD) framework, which combined radiative transfer–based atmospheric correction with glint, adjacency, and quality filtering to generate analysis-ready surface reflectance designed for optically complex coastal waters, such as the Mississippi Sound. Using a dataset of 119 in situ samples, we trained Mixture Density Networks (MDNs) to retrieve turbidity, Secchi disk depth, total suspended solids, chlorophyll-a, and absorption of colored dissolved organic matter (aCDOM). These products were incorporated into a Virtual Buoy Observation Network, a satellite-based system that simulates traditional buoys by providing continuous time series of water quality at fixed locations. Our results demonstrated that S3CARD enhanced the reliability of Sentinel-3 observations, enabling the detection and quantification of abrupt changes associated with the opening of spillways. This framework provided continuous, spatially extensive observations that improved water quality assessments and delivered actionable information for coastal management, restoration, and resilience planning in the northern U.S. Gulf Coast.

Presenter: Cecilia Kankam Kusi

Presentation Session: AP1

Level of Study: PhD

Department: School of Human Sciences

Category: Agriculture and Life Sciences

Advisor: Dr Lori Elmore-Staton, School of Human Sciences

Title: Literacy as a Bridge out of Poverty: A Systematic Review and Research Agenda

Abstract: Early literacy is a foundation for lifelong learning and a determinant of economic mobility (Attanasio et al., 2022). Shared book reading (SBR) supports language development, strengthens caregiver–child interactions (Fitton et al., 2018), and mitigates socioeconomic disadvantage (Klass et al., 2024). However, research on early literacy remains fragmented across disciplines, limiting its application in scalable interventions and policies. This study aimed to synthesize 25 peer-reviewed studies published between 2010 and 2024 on parent-child reading in the early years and later economic mobility. The review focused on three dimensions: (1) mechanisms linking SBR to children's developmental outcomes, (2) interventions integrating literacy into homes, health systems, and communities, and (3) theoretical models framing them. Studies were coded by year, methodology, unit of analysis, journal outlet, and geography.

Review findings indicate that parent-child SBR during the early years enhances cognitive functioning and strengthens the attachment bond, ultimately serving as a protective mechanism for economic outcomes later in life. Results highlighted interventions and community-based programs that demonstrate scalable models (Canfield et al., 2020; Klass et al., 2024), while theories including Bronfenbrenner's Ecological Systems (1979) and the Family Stress Model (Conger et al., 1994) situate SBR within broader contexts (Bendickson, 2020; Grolig, 2020).

The study concludes with a forward-looking agenda, highlighting cross-cultural perspectives, longitudinal connections between literacy and economic outcomes, and the role of structural inequities in SBR This review positions SBR as a critical equity strategy linking early literacy to long-term opportunity.

Presenter: Chami Rampati Dewage

Presentation Session: MO1

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr.Raju Bheemanahalli Rangappa,Associate Professor,Plant and Soil Sciences

Title: From Germination to Growth: A Search for Salt-Tolerant Soybean Genotypes

Abstract: Salinity significantly limits soybean production by affecting germination, growth, and yield. This study aimed to identify soybean genotypes with multi-stage salt tolerance, examining how tolerance varies across growth stages. Experiments were conducted during the germination, emergence, and seedling stages under varying sodium chloride (NaCl) concentrations, specifically 0-20 dS/m for germination and 0-10 dS/m for emergence and seedling growth. Increased salt levels decreased the germination rates of soybeans grown in petri dishes. While the germination percentage and mean germination time were not significantly affected, radicle length and dry weight decreased significantly ($p < 0.05$), showing reductions of nearly 8% and 22% at 60 mM NaCl, and over 50% at 120 mM NaCl. Furthermore, significant differences in relative emergence rates were observed in soybeans subjected to various NaCl levels in the soil, with no emergence or less than 50% emergence observed at 6 dS/m. Above-ground parameters, such as leaf area, shoot length, and shoot dry weight, as well as below-ground traits including root weight, number of root tips, total root length, and surface area, all declined with increasing salt concentrations. Reduced stomatal conductance and evapotranspiration, along with elevated canopy temperature, were also observed. Overall, the results suggest that plant performance declined with increasing salt stress. In future studies, the diverse soybean genotypes will be phenotyped for salt tolerance during the seedling and reproductive stages to identify salt-sensitive and salt-tolerant genotypes.

Presenter: Chami Rampati Dewage

Presentation Session: MP4

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr.Raju Bheemanahalli Rangappa,Associate Professor,Plant and Soil Sciences

Title: Enhancing Soybean Seedling Salinity Tolerance Using Biostimulants

Abstract: Soil salinity is a growing global threat to soybean production, affecting plants at multiple stages of growth. Soybeans are moderately sensitive to excess sodium (Na^+) and chloride (Cl^-), with varying levels of susceptibility among genotypes. Biological products have shown promise in enhancing plant resilience under saline conditions. Soaking seeds or coating with biostimulant solutions before planting can facilitate tolerance to stress and improve initial growth. This study investigated the effect of seed priming with biostimulants on soybean tolerance to salinity stress (NaCl, 6 dS/m). Twelve biological products were tested as seed coatings or priming treatments in a petri dish and pot experiment. Under NaCl stress, key germination traits, including radicle length (43%), radicle dry weight (27%), and seedling vigor (32%), were significantly reduced compared to the control. In the pot experiment, plants stressed with NaCl exhibited decreased photosynthetic performance and chlorophyll content. These disruptions cumulatively limited shoot biomass by restricting leaf area and accelerating senescence of older leaves. The study highlights the potential of seed treatment and biostimulants to enhance soybean resilience to salinity, providing insights for effective seed treatment strategies.

Presenter: Chamika A. Silva

Presentation Session: MP5

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Nuwan K. Wijewardane, Assistance Professor, Department of Agricultural and Biological Engineering

Title: Rapid nutrient profiling in cotton: evaluating visible and infrared spectroscopy for fresh and dry plant tissues

Abstract: Cotton represents the world's most widely cultivated natural fiber, and yield optimization requires precise nutritional management throughout distinct developmental phases. Traditional laboratory-based nutrient assessment methods have significant limitations including extended processing times, high costs, and delays that compromise timely agricultural decisions critical for maximizing productivity. The study evaluated the potential of visible near-infrared (VisNIR) and mid-infrared (MIR) spectroscopy as rapid, economical, and environmentally sustainable alternatives for nutrient quantification using Attenuated Total Reflectance (ATR) and Diffuse Reflectance (DR) modes. The study focused on estimating eleven essential macro and micronutrients (N, P, K, Ca, Mg, S, Fe, Mn, B, Cu, Zn) in both fresh and dry ground cotton plant tissues. Three modeling approaches were evaluated: Partial Least Squares Regression (PLSR), Cubist regression trees, and Support Vector Regression (SVR), with model calibration performed using 75% of the collected data. While PLSR and Cubist demonstrated equivalent predictive capabilities, PLSR was selected due to its superior computational efficiency. Dried leaf analysis using VisNIR spectroscopy achieved exceptional accuracy for all macronutrients (R^2 = 0.75–0.96) and for three micronutrients: boron, manganese, and copper (R^2 = 0.78–0.93). Fresh tissue models exhibited reduced accuracy attributed to moisture interference, limiting field applicability. Dried leaf datasets were spiked (extra weights) with fresh leaf and dried stem and burs spectra which notably enhanced predictive performance. Thus, this study suggests that calibration transfer strategies can substantially improve the prediction consistency across various tissue matrices and moisture levels which proved the potential of the real-time nutrient profiling in cotton plant tissues.

Presenter: Chathuri Peiris

Presentation Session: MO3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Todd Mlsna, Department of Chemistry

Title: PFAS-Free Packaging with Improved Water and Oil Resistance via Metal Ions and Cellulose Nanofibers

Abstract: The global shift away from plastic tableware has intensified the demand for biodegradable, high-performance food packaging. Although lignocellulosic fibers offer a renewable and sustainable alternative, their hydrophilic nature and weak wet strength remain critical limitations. This study proposes a sustainable approach to produce water, oil, and grease-resistant fiber sheets and molded fiber products via use of metal ions (Mx+) and cellulose nanofibrils (CNF) without the requirement of additional hydrophobic sizing chemicals. Metal cations (Fe^{3+}, Zr^{4+}) coordinated with fiber polar groups, inducing self-assembly of cellulose nanofibrils into compact structures that reduced hydroxyl availability, lowered surface energy, and enhanced hydrophobicity. In addition, incorporating CNF blocks fiber pores and forms a barrier to oil penetration, thereby improving oil resistance. Direct treatment of fibers with Zr^{4+} and Fe^{3+} ions improved water resistance, with Zr^{4+} achieving a $Cobb_{60}$ reduction from 464 to below 30 g/m^2 at just 4 mg/g fiber, while Fe^{3+} required 10 mg/g for comparable results. Effects of drying method (oven vs. hot pressing) on the metal ion modification were systematically studied. Oven drying produced superior water resistance compared to hot pressing, identifying it as the most effective drying method. Oil and grease resistance was achieved using CNF via coating and blending, with coatings of ≥6 wt% CNF (13 g/m^2) yielding oil $Cobb_{60}$ values of ~25–50 g/m^2, a kit value of 12, and oil hold-up times over 2 h. Additionally, higher lignin content favored improved hydrophobicity in Mx^+-SNE-treated fibers. Overall, Mx^+-SNE and CNF incorporation offers a simple and scalable route for producing sustainable and water and oil-resistant, paper-based tableware.

Presenter: Cheng Ouyang

Presentation Session: AP1

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Agriculture and Life Sciences

Advisor: Dr. Dong Chen, Assistant Professor, Agricultural and Biological Engineering

Title: Direct Data-Driven Predictive Control for a Three-dimensional Cable-Driven Soft Robotic Arm

Abstract: Soft robots offer significant advantages in safety and adaptability, yet achieving precise and dynamic control remains a major challenge due to their inherently complex and nonlinear dynamics. Recently, DeePC has emerged as a promising model-free approach that bypasses explicit system identification by directly leveraging input–output data. While DeePC has shown success in other domains, its application to soft robots remains underexplored, particularly for three-dimensional (3D) soft robotic systems. Our work addresses this gap by developing and experimentally validating an effective DeePC framework on a 3D, cable-driven soft arm. Specifically, we design and fabricate a soft robotic arm with a thick tubing backbone for stability, a dense silicone body with large cavities for strength and flexibility, and rigid endcaps for secure termination. Using this platform, we implement DeePC with singular value decomposition (SVD)-based dimension reduction for two key control tasks: fixed-point regulation and trajectory tracking in 3D space. Comparative experiments with a baseline model-based controller demonstrate DeePC's superior accuracy, robustness, and adaptability, highlighting its potential as a practical solution for dynamic control of soft robots.

Presenter: Chibuike Onyeogulu

Presentation Session: MO3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Professor Amanda Patrick, Chemistry

Title: Temperature Dependence of Ionic Liquid Pyrolysis Products

Abstract: Ionic liquids (ILs) are salts with a melting point below 100°C that are characterized by bulky organic cations paired with an anion, which can either be organic or inorganic. Their typically high thermal stability and low volatility make them attractive for a range of applications. However, certain applications may be carried out at or result in exposure of the ILs to very high temperatures, testing the limits of ILs' thermal stability. Likewise, waste disposal through incineration may lead to (potentially hazardous) intermediate products if not accomplished completely. Both of these are motivators for understanding the molecular nature of high-temperature decomposition of ILs. Such a molecular understanding will provide important insights into the practical use and life cycle management of ILs.

This study focuses on the detection of pyrolysis products of ILs using gas chromatography–mass spectrometry. Specifically, the impact of the nature of the anion, the substituents on the imidazolium cation, and the pyrolysis temperature were investigated. Four ILs (1-(2-methoxyethyl)-3-methyl-imidazolium bis(trifluoromethylsulfonyl)imide, 1-(2-methoxyethyl)-3-methyl-imidazolium chloride, 1-butyl-3-vinylimidazolium bis(trifluoromethylsulfonyl)imide, and 1-butyl-3-vinylimidazolium chloride), were subjected to pyrolysis at varying temperatures (200-1000 °C in increments of 50 °C). Results showed that ILs containing bis(trifluoromethylsulfonyl)imide anion exhibited higher thermal stability (consistent with previous reports in the literature), showing little to no detectable decomposition until temperature exceeded 400 °C. Chloride paired ILs decomposed at significantly lower temperatures starting from 250 °C. Assignments of the chemical nature of the decomposition species are ongoing and a status update will be included in the talk.

Presenter: Cooper Little

Presentation Session: MO2

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Agriculture and Life Sciences

Advisor: Dr. Mary Love Tagert, Ag. and Bio Engineering

Title: Relation of Soil Moisture to Iron Deficiency Chlorosis in Soybean

Abstract: Iron deficiency chlorosis (IDC) is a common problem throughout the Midwest as well as the Black Prairie region of Mississippi. Soybeans are valued at over 1.5 billion dollars annually in the state of Mississippi and is most planted row crop in the Black Prairie region. IDC can cause substantial yield loss in affected areas of the field. Symptoms of IDC include interveinal chlorosis of newly developed leaves, stunted growth, poor root-nodule formation, tissue death near leaf edges, and even plant death in severe cases. IDC occurs when soybeans are grown in soils with a high $CaCO_3$ content. Other factors that influence IDC severity are high soil pH, soil nitrate content and soil moisture. The effect of soil moisture on IDC symptomology has been researched in a temperate, humid continental climate, but research is lacking in a humid subtropical climate where soybeans endure higher temperatures. IDC symptoms are known to be worse in saturated conditions, but IDC is also exacerbated in hotter-drier conditions in the south due to the amount of stress plants experience from higher temperatures. This study evaluates the effects of soil moisture on IDC symptoms. Two Watermark model 200SS granular matrix sensors were installed in 64 plots for a total of 128 sensors. Sensors were installed at 30 and 60 cm depths – two Pioneer varieties were used (one more tolerant and one susceptible to IDC) in eight different cropping systems. These sensors are connected to a Watermark 900M datalogger that is set to record soil water tension at one-hour intervals. Sensors will be used to measure soil water tension and weekly visual ratings to access IDC symptoms.

Presenter: Courtney Wynn

Presentation Session: AO5

Level of Study: PhD

Department: Biochemistry, Nutrition, and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr. Seung-Joon Ahn, Associate Professor, Biochemistry, Nutrition, and Health Promotion

Title: Molecular and behavioral analysis of the Pheromone Biosynthesis Activating Neuropeptide (PBAN) and its receptor (PBANR) in the Soybean Looper (*Chrysodeixis includens*)

Abstract: The soybean looper (*Chrysodeixis includens*) is a destructive lepidopteran pest of soybean and other economically important crops in the southern United States. Intensive reliance on insecticides has led to widespread resistance, highlighting the need for alternative management strategies. Pheromone-based methods, such as trapping and mating disruption, provide sustainable options, yet the molecular regulation of pheromone production in C. includens remains poorly characterized. In moths, the Pheromone Biosynthesis Activating Neuropeptide (PBAN) and its receptor (PBANR) are central regulators of sex pheromone production and release. In this study, we analyzed the expression of PBAN and PBANR across developmental stages of C. includens, including egg, larva, pupa, and adult, and within distinct regions of the larval central nervous system (brain, thoracic, and abdominal ganglia). Female pheromone release behavior was assessed over five days post-emergence, and pheromone gland samples were collected every two hours for 24 hours following the first dark period after emergence to capture temporal dynamics of pheromone production. Functional significance was further evaluated through RNA interference (RNAi) knockdown of PBAN and PBANR, followed by field assays in which treated females were released into pheromone traps. Females with silenced PBAN or PBANR attracted significantly fewer males compared to controls, confirming the importance of these genes in pheromone-mediated communication. This study provides the first comprehensive characterization of PBAN signaling in the soybean looper. By linking gene expression, behavioral assays, and RNAi field trials, our findings highlight the critical role of PBAN and PBANR in regulating pheromone production and demonstrate their potential as targets for gene-based approaches to pest management.

Presenter: Cristian Suarez Barazeta

Presentation Session: AP1

Level of Study: PhD

Department: Wildlife, fisheries and aquaculture

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Fernando Y. Yamamoto, Assistance Research Professor, Wildlife, Fisheries and Aquaculture

Co-Advisor: Dr. Heather R. Jordan, Professor, Department of Biology

Title: Evaluation of the Antimicrobial Activity of Phytocompounds Against Fish Bacterial Pathogens

Abstract: The rapid expansion of aquaculture has raised growing concerns about the emergence of antibiotic-resistant bacteria—a challenge exacerbated by the limited availability of FDA-approved chemotherapeutic agents to treat diseased fish. A promising alternative is the use of plant-derived products, which have demonstrated antibacterial, immunostimulatory, antioxidant, and anti-stress properties. These phytocompounds can interact with the host's immune system and physiology, potentially enhancing disease resistance and promoting growth. This study evaluated the antimicrobial activity of key active compounds—carvacrol, thymol, citral, and cassia oil against major fish pathogens: Aeromonas hydrophila (S14-452), Edwardsiella ictaluri (S97-773), and Streptococcus iniae (LSU 01-105). Methods included the Kirby-Bauer disk diffusion test, broth microdilution to determine the minimum inhibitory and bactericidal concentrations, biofilm inhibition, and hemolytic activity. Cassia oil, carvacrol, and thymol showed significant inhibition across all strains, with E. ictaluri exhibiting the largest zones of inhibition. Serial dilution assays demonstrated significant reductions in bacterial growth, with certain dilutions also effectively inhibiting the biofilm formation by A. hydrophila. These findings suggest that the tested phytocompounds exhibit strong antibacterial activity, supporting further research into their potential to reduce or even replace the use of antibiotics in aquaculture.

Presenter: Cristian Suarez Barazeta

Presentation Session: MO5

Level of Study: PhD

Department: Wildlife, Fisheries, and Aquaculture

Category: Agriculture and Life Sciences

Advisor: Dr. Fernando Yamamoto, Assistant Research Professor, Department of Wildlife, Fisheries, and Aquaculture

Co-Advisor: Dr. Heather R. Jordan, Professor, Department of Biological Sciences

Title: Optimizing Carbohydrate and Lipid Ratios in Channel Catfish Feeds to Enhance Physiological and Immunological Responses, and Resistance Against Edwardsiella Ictaluri

Abstract: Optimizing macronutrient ratios in aquafeeds is essential for enhancing growth and disease resistance in cultured fish. However, limited research has explored how carbohydrate-to-lipid ratios influence physiological and immunological responses in channel catfish (Ictalurus punctatus). Five isoenergetic diets with decreasing levels of digestible carbohydrates (CHO) and increasing levels of dietary lipid (% CHO:lipid; Diet 1: 30:3.7; Diet 2: 26.3:5.3; Diet 3: 22.5:7; Diet 4: 18.75:8.7; Diet 5: 15:10) over a 10-week feeding trial. Fish were fed twice daily to apparent satiation. At the end of the feeding trial, production performance, condition indices, and survival were assessed, followed by a bacterial challenge with Edwardsiella ictaluri. No significant differences were found in weight gain, survival, feed intake, feed efficiency, hepatosomatic index, or hematological parameters (MCV, MCHC, MCH). However, Diet 5 showed a higher intraperitoneal fat index than Diet 1, and Diets 3–5 were higher than Diet 2. Viscerosomatic index was also elevated in Diet 5 compared to Diet 1, and in Diets 4 and 5 versus Diet 2, suggesting increased visceral fat accumulation in lipid-rich diets, which may influence immune function. After the exposure to Edwardsiella ictaluri, the causative agent of enteric septicemia of catfish, Diet 4 showed the highest survival rate (71.6%), followed by Diet 5 (65.6%), Diet 2 (64.1%), Diet 3 (54.0%), and Diet 1 (48.6%). The findings suggest that a well-balanced lipid-rich diet, particularly Diet 4, may enhance disease resistance without compromising growth. This study highlights the need for further research into macronutrient-driven immunonutrition strategies in catfish aquaculture.

Presenter: Dakota Hester

Presentation Session: MO9

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Vitor S Martins, Assistant Professor, Agricultural and Biological Engineering

Title: Learning with less: label-efficient land cover classification at very high spatial resolution using self-supervised deep learning

Abstract: Deep learning methods for land cover classification are highly performant, particularly at high spatial resolutions where traditional pixel-wise or object-based approaches face limitations. However, the wide parameter space of deep neural networks typically requires several thousand densely annotated imagery tiles to achieve reliable performance. We demonstrate that applying Bootstrap Your Own Latent (BYOL) self-supervised learning to an ImageNet pre-trained ResNet-101 encoder using unannotated aerial imagery enhances the performance of a semantic segmentation network on a downstream land cover classification task, particularly when few samples are supplied during training. When applied to a 1 m resolution land cover task using linear probing, our BYOL model demonstrates average increases of 15.44% and 14.87% in macro F1 score and overall accuracy over a similar model pre-trained on ImageNet alone, illustrating the extent of the domain gap between general-purpose imagery often used for pre-training and high resolution remote sensing data. Fine-tuning the BYOL pre-trained encoder in a U-Net framework using 750 labeled samples achieves 86.43% overall accuracy and 74.04% macro F1 score for comprehensive 8-class land cover mapping across Mississippi, improvements of 0.32% and 1.47% over ImageNet pre-training. We apply an ensemble of the best-performing models to produce the first publicly-available meter-scale land cover product for the state of Mississippi, USA using only 1,000 labeled training samples in total. These results demonstrate that self-supervised learning is an effective strategy for reducing the need for large volumes of human-annotated data, directly addressing a major hurdle to high spatial resolution land cover mapping at scale.

Presenter: Daniel Egerson

Presentation Session: AP1

Level of Study: PhD

Department: Wildlife, Fisheries, and Aquaculture

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Kristine O. Evans, Professor, Wildlife, Fisheries, and Aquaculture

Co-Advisor: Dr. Mark D. McConnell, Professor, Wildlife, Fisheries, and Aquaculture

Title: Addressing Knowledge Gaps in the U.S. Conservation Reserve Program: Developing the CRP Menu Tool for Enhanced Decision-Making

Abstract: The Conservation Reserve Program (CRP) incentivizes farmers to convert highly erodible or environmentally sensitive lands into conservation vegetation through annual rental payments and cost-share assistance. Although the program supports soil conservation, water quality improvement, and wildlife habitat restoration, its effectiveness is often constrained by informational barriers. Knowledge gaps and uncertainty in decision-making frequently lead landowners to adopt practices poorly suited to local ecological conditions, limiting conservation outcomes. To address these challenges, we conducted workshop-based research with 91 landowners and 145 practitioners across Mississippi, Missouri, and Illinois. Findings revealed persistent gaps in understanding, stemming from technical jargon, inconsistent guidance, and unclear eligibility and contract terms. Participants emphasized the need for clearer communication, culturally responsive outreach, practitioner training, and decision-support resources. In response, we developed the CRP Menu Tool, an interactive platform that allows users to explore conservation practices, payment rates, management requirements, and land eligibility scenarios. The tool enhances transparency, aligns options with both landowner priorities and ecological goals, and supports more informed and equitable participation in the CRP.

Presenter: Daniel Egerson

Presentation Session: MO5

Level of Study: PhD

Department: Wildlife, Fisheries and Aquaculture

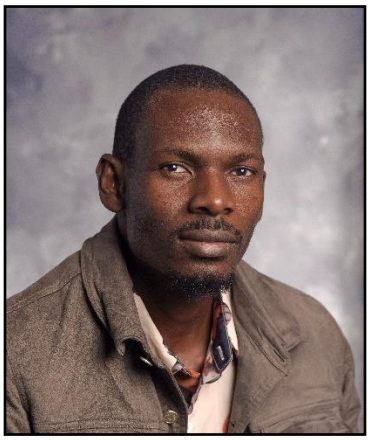
Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Kristine O. Evans, Professor, Wildlife, Fisheries, and Aquaculture

Co-Advisor: Dr. Mark D. McConnell, Professor, Wildlife, Fisheries and Aquaculture

Title: From Knowledge Gaps to Informed Choices: Addressing Barriers to Landowner Decision-Making in the U.S. Conservation Reserve Program

Abstract: The Conservation Reserve Program (CRP) incentivizes farmers to convert environmentally sensitive lands into conservation vegetation through rental payments and cost-share assistance. Despite its environmental benefits, such as soil conservation, water quality improvement, and wildlife habitat restoration, CRP effectiveness is often limited by informational barriers. Knowledge gaps and unclear guidance can lead landowners to select practices misaligned with local ecological conditions or expected outcomes. This study examined the factors driving these knowledge gaps, assessed landowner information needs, and explored stakeholder expectations for decision support tools. Findings highlighted challenges including technical jargon, inconsistent guidance, and limited clarity on eligibility and contract terms. Based on stakeholder input, we developed a user-centered CRP Menu Tool that allows landowners to explore practices, simulate scenarios, and make informed, ecologically aligned decisions



Presenter: Dingiswayo Mwanza

Presentation Session: MO1

Level of Study: Master's

Department: Plant and Soil Sciences

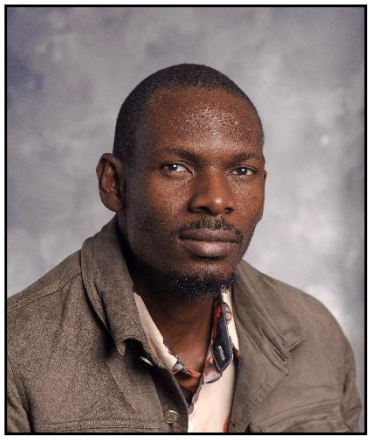
Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli

Title: Physiological and Morphological Responses of Maize to Early-Season Waterlogging

Abstract: Dingiswayo Mwanza, Chami Rampati Dewage, Mohan K Bista, Renganathan Vellaichamy Gandhimeyyan, Raju Bheemanahalli

Corn is the top crop worldwide in terms of total production. During early crop establishment, an extended period of soil saturation (waterlogging) can severely reduce plant vigor. This condition deprives the root system of essential oxygen, which can lead to stunted growth, decreased leaf area, and even plant death, ultimately impacting final yield. Climate models indicate that waterlogging events often occur during the early growing season. The objectives of this study were to quantify the effects of increasing waterlogging durations and identify waterlogging-tolerant genotypes at an early vegetative growth stage. In this study, two corn genotypes, D58VC74 and B73, were evaluated to investigate genotype-specific responses and determine the optimal screening duration for waterlogging stress in corn. Progressive waterlogging treatments were applied for different periods (0 to 7 days) at the V3 seedling stage. Physiological, pigment, and morphological (shoot and root) data were collected 7 days after treatment. Increased waterlogging duration resulted in a decrease in the chlorophyll index and an increase in the anthocyanin index. Nearly all shoot and root parameters were inversely related to waterlogging duration, with more noticeable adverse effects in D58VC74 than in B73. Comparing the two, B73 consistently outperformed D58VC74. A linear regression model was used to fit biomass and stress duration, identifying a threshold. The point at which biomass declined by 50% compared to the control was considered the critical threshold, providing a quantitative basis for distinguishing between tolerant and susceptible genotypes. The results showed that 5 days of waterlogging clearly distinguished the two genotypes, while longer exposures caused severe root damage and delayed recovery. Based on these findings, the study recommends using more than 5 days of waterlogging as an optimal threshold for screening larger numbers of corn genotypes for waterlogging resilience



Presenter: Dingiswayo Mwanza

Presentation Session: MP4

Level of Study: Master's

Department: Plant and Soil Sciences

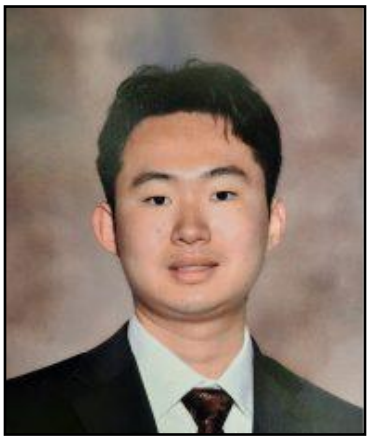
Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli

Title: Evaluating High-Yielding Corn Hybrids for Waterlogging Tolerance

Abstract: Dingiswayo Mwanza, Chami Rampati Dewage, Renganathan Vellaichamy Gandhimeyyan, Mohan K Bista, Raju Bheemanahalli

Waterlogging (WL) poses a significant threat to agricultural productivity and food security worldwide. In the Southern U.S., prolonged rainfall adversely affects seedling establishment and the potential of high-yielding corn hybrids. This hypoxic condition triggers morphological and metabolic changes that limit the genetic potential of plants. Identifying tolerant corn hybrids is crucial for sustainable agriculture in the face of unpredictable climates. We hypothesized that some high-yielding corn hybrids may possess inherent tolerance to WL, thereby enabling them to survive under suboptimal conditions. To test this hypothesis, we evaluated 22 corn hybrids under control and WL conditions to investigate the variations in physiological, pigmentation, and morphological traits. Our findings demonstrated that WL markedly diminished the chlorophyll index by 42% during the early vegetative phase. Concurrently, an increase in flavonoid concentrations was observed in several genotypes. A brief period of WL exposure resulted in a substantial reduction in plant height (36%) and leaf area (67%). Furthermore, WL conditions led to significant decreases in shoot biomass (42.1%) and root biomass (28%), indicating a more pronounced impact on root mass, which decreased 14% more than shoot biomass. Correlation analysis revealed positive correlations under WL conditions: the chlorophyll index was significantly correlated with leaf area ($r = 0.66$, $p < 0.01$), shoot biomass ($r = 0.49$, $p < 0.01$), and root biomass ($r = 0.58$, $p < 0.01$). This suggests that genotypes maintaining higher chlorophyll levels may have enhanced growth potential. However, a weak relationship was observed between treatments for the same traits, highlighting the need for careful selection of genotypes that exhibit both high growth rates and WL tolerance. Preliminary multi-trait stress tolerance indices analysis led to the selection of diverse corn genotypes with varying morpho-physiological responses under WL stress.



Presenter: Dongmin (Ethan) Kang

Presentation Session: MO9

Level of Study: PhD

Department: Industrial and Systems Engineering

Category: Engineering

Advisor: Dr. Haifeng Wang, Associate Professor, Industrial and Systems Engineering

Title: Saving Storage Space with Principal Component Analysis Methods for Thermal Images in Additive Manufacturing

Abstract: Analysis of melt pool behaviors from thermal images are critical to improving product and process quality control in additive manufacturing (AM) processes. As more advanced sensors collect better quality thermal images at higher speeds and resolutions, the volume of this data will only accelerate. Many studies have utilized data compression techniques to save storage space and reduce transmission loads for overwhelmingly large datasets in scientific applications. Principal Component Analysis (PCA) methods were applied to minimize reconstruction errors from compressed data at fixed numbers of latent dimensions. However, not much is known about their reconstruction accuracies when using optimized numbers of latent dimensions derived from their percentages of variance explained (POVE). In this work, we benchmark several PCA variants at different POVE levels. Leveraging these values preserve the most statistically significant melt pool features contained in the thermal images while minimizing reconstruction errors. We also propose a novel compression framework inspired from POVE, which result in images that solely retain melt pool features and eliminates non-essential background information. All PCA variants and the proposed framework were evaluated on two publicly available laser powder bed fusion (L-PBF) datasets for space savings and reconstruction accuracy. These methods make it possible to compress thermal images to latent tensors with at least a 90% reduction in raw bytes based on 99% POVE. From the analyses of our methodology, we demonstrate that it can be applied to other AM processes and other spatiotemporal data that are essential for quality control decisions.

Presenter: Elizabeth A. Esser

Presentation Session: MO8

Level of Study: PhD

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Ashley Schulz, Assistant Professor, Forestry

Title: Impact of soil type on autotoxicity of cogongrass (Imperata cylindrica) leachates

Abstract: Cogongrass (Imperata cylindrica) is an invasive plant that threatens the health of many important ecosystems in the southeastern United States. Current cogongrass control methods are ineffective at achieving large-scale control, and research is ongoing to determine whether autotoxicity, or toxicity from compounds produced by cogongrass itself, can be harnessed as an alternative control method. Though research has suggested that many plants contain autotoxic compounds, thus far cogongrass leachates have not demonstrated autotoxicity. As different soil types may bind leachate compounds more tightly, this research seeks to determine whether soil type has an impact on the autotoxicity of cogongrass leachates. To test this, cogongrass was planted in four different soil types: clay, loam, a mixture of sand and loam, and a mixture of peat moss and perlite. To create cogongrass leachates, cogongrass rhizomes were soaked in water or ethanol for 24 hours. These leachates or a water-only control were applied as a soil drench to cogongrass plants growing in the different soil types, and plant growth was monitored for fourteen days after application. We measured the growth of each plant using daily measurements of plant length and the number of leaves, and we imaged plants every other day. After fourteen days, we measured the aboveground and belowground biomass of each plant. The results of this study will show how soil type affects the toxicity of cogongrass leachates, which will inform future autotoxicity trials and provide insight into the viability of using autotoxicity to manage cogongrass across different landscapes.

Presenter: Elizabeth Fox

Presentation Session: AP4

Level of Study: Master's

Department: Anthropology and Middle Eastern Cultures

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Anna Osterholtz, Associate Professor, Department of Anthropology and Middle Eastern Cultures

Title: Buried in a well: An osteobiographical study of two non-adult individuals from Roman period Mursa (Osijek, Croatia)

Abstract: The skeletal remains of two individuals were recovered during the 2011 archaeological excavations of the region once known as Colonia Aelia Mursa, a Roman era colony in modern-day Osijek, Croatia. Both sets of remains were discovered in a colony water well in which they were presumably buried in the mid-3rd century CE. In this study, an osteobiographical analysis offers insight into the lives and deaths of the individuals through the illumination of their health and demographic. Osteological and chemical analyses suggest that both individuals represent non-adult males between the ages of 7.5 and 8.5 years at death. The presence of active skeletal lesions indicate they were suffering from an infectious disease, likely tuberculosis, at the time of their deaths. In addition, through chemical testing, traces of led were detected in the remains, a detail which may shed further light on the individuals' health. Future studies will attempt to connect the broader historical and archaeological context, including the nature of the burial, to the osteological and chemical data. The combination of these insights may further our understanding of how the individuals were perceived and treated within their community, both in life and in death, in turn illuminating how similar individuals may have experienced life in Roman provincial society.

Presenter: Emily Creel

Presentation Session: MO7

Level of Study: PhD

Department: Psychology

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Jarrod Moss, Professor and Interim Department Head, Psychology

Title: Insights from the Past: Does access to unsuccessful problem attempts facilitate restructuring in insight problems?

Abstract: Insight problems are often comprised of a period of impasse during which no new attempts are generated followed by an abrupt realization of the solution arising from the restructuring of an initial flawed problem representation. However, the precise mechanisms precipitating these processes are still being investigated. One hypothesis is that analyzing the unchanging elements of previous attempts may facilitate restructuring. We investigated this hypothesis by using three classic insight problems and providing some participants with access to their own unsuccessful problem attempts. The prior attempts condition eliminates the need to rely on memory to access previous unsuccessful attempts so this mechanism could be investigated. Individual differences in working memory capacity and cognitive reflection were also collected. While there was no overall effect of the prior attempts conditions, both working memory and cognitive reflection were identified as significant predictors of restructuring and solving across problems and conditions.

Presenter: Emma Farnlacher

Presentation Session: MP6

Level of Study: Master's

Department: Animal and Dairy Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Molly Nicodemus, Animal and Dairy Sciences

Co-Advisor: Dr. Clay Cavinder, Animal and Dairy Sciences

Title: Relationship between Stress and Salivary Serotonin and Dopamine Concentrations within College Students participating in a Campus-Based Equine-Assisted Intervention Program

Abstract: Due to the mental health crisis that college students face, campuses are exploring alternative solutions to promote student mental health, including the use of horses. While equine-assisted intervention (EAI) has proven to be a useful tool in supporting student mental health, most impacts of EAI have been measured using self-reporting assessments, neglecting the potential physiological impact of EAI. Therefore, the objectives of this study are to investigate the physiological impacts of campus-based EAI on dopamine (DA) and serotonin (5-HT) levels within college students and to determine how these levels impact stress as reflected within heart rate and self-reporting measures. College students (n = 14) participated in a one-hour on-campus EAI session consisting of ground-based activities. Pre- and post-session self-reporting surveys were collected along with saliva samples for measuring DA and 5-HT concentrations. Wearable heart rate monitors measured heart rate throughout the session. Results show that perceived stress and emotions were improved post-session ($P = 0.0001$ and $P = 0.003$, respectively). Although maximum heart rate reached aerobic threshold and there was a significant increase in heart rate post-session ($P = 0.007$), DA and 5-HT concentrations were not significantly impacted ($P = 0.23$ and $P = 0.27$, respectively). As such, the physical activity associated with EAI did not negatively impact neurotransmitter response as seen in DA and 5-HT concentrations; however, it did positively impact perceived student mental health.

Presenter: Emmanuel Ankomah

Presentation Session: MO3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Colleen N. Scott, Chemistry

Title: Design and synthesis of NIR/SWIR probes for Biological Imaging

Abstract: Near Infrared (NIR) / Short Wave Infrared (SWIR) emissive probes offer advantages in biological sensing and imaging due to their long absorption and emission wavelengths. Developing NIR/SWIR gives deeper penetration and less cellular damage as well as better resolution for imaging due to the avoidance of autofluorescence from biomolecules.

The Scott's group research centers on creating novel NIR/SWIR xanthene-based dyes for biological sensing and imaging. A critical aspect of our work involves modifying the acceptor xanthene core by incorporating conjugated donor molecules to lower the dye's bandgap. These dyes demonstrate significant potential in bioimaging and possess strong photoacoustic signals, making them ideal for long-term imaging and sensing applications.

This study present the synthesis of xanthene-based fluorophore. The target compounds were obtained via a concise three- to four-step synthetic route starting from commercially available precursors. The synthetic strategy was designed to maximize yield and minimize purification steps, affording the fluorophore in high overall yield. Spectroscopic analysis revealed a high absorptivity, high quantum yield, and strong solubility in both water and other biological media, making it suitable for bioimaging and sensing applications.

Presenter: Etseoghena Oladejo

Presentation Session: AP1

Level of Study: PhD

Department: School of Human Sciences/Human Development and Family Science

Category: Agriculture and Life Sciences

Advisor: Dr. Lori Elmore-Staton, Professor, School of Human Sciences

Title: Buffering the effects of family adversity: The role of parental monitoring and supportive relationships on academic performance among Black/African American Students

Abstract: Family adversity can elevate the risk for poor academic outcomes (Wadman et al., 2020), which can be more pronounced among Black/African American children because of disproportionate exposure to adversity and the compounding effects of systemic racism (Assari & Zare, 2025; Matthew et al., 2016). However, studies indicate that protective factors, such as parental monitoring and supportive relationships, may buffer these risks (Crouch et al., 2023). Using nationally representative data from the 2023 Centers for Disease Control (CDC) Youth Risk Behavior Survey (YBRS; N = 20,103), we conducted a stratified analysis of Black/African American high school students (n = 1,185). Key variables included family adversity (i.e., parental substance use, mental illness, and incarceration), academic performance (i.e., self-reported grades), parental monitoring, and supportive family relationships. An ordinal logistic regression showed that family adversity significantly predicted poorer academic outcomes ($\beta = 0.31$, $p = .048$). In the regression examining supportive relationships, marginal main effects were found ($\beta = -0.33$, $p = .067$). The interaction with adversity suggests that supportive relationships may not be as protective at higher levels of adversity. For the regression, including parental monitoring, no main or significant effects were found. Interaction models indicated that buffering effects did not differ by age (early vs. late adolescence) or by gender (all $p > .05$). Overall, findings emphasize that in the context of high levels of family adversity, having a supportive parental relationship may not protect adolescents from poor academic outcomes. Findings will be discussed in the context of the greater literature.

Presenter: Faria Noshin

Presentation Session: MO2

Level of Study: PhD

Department: Agricultural Science and Plant Protection

Category: Agriculture and Life Sciences

Advisor: Dr. Chang Liu, Assistant Professor, Agricultural Science and Plant Protection

Title: Management of Rotylenchulus reniformis on Sweetpotato using Non-fumigant Nematicides and Bio-Nematicides

Abstract: Sweetpotato is an economically and nutritionally important crop vulnerable to significant yield and quality losses from plant-parasitic nematodes, particularly Rotylenchulus reniformis. These nematodes are widespread, persistent in soil, and difficult to control due to their broad host ranges and limited host resistance. Traditionally, nematode suppression in sweetpotato has relied on chemical fumigants such as 1,3-dichloropropene, metam sodium, and dazomet. In the past decade, several non-fumigant nematicides have become available, though they have been rarely tested against reniform nematode. However, increasing regulatory restrictions and environmental concerns have stimulated interest in reduced-risk products and integrated approaches. Bio-nematicides offer environmentally compatible alternatives, though efficacy varies and is generally lower than synthetic standards. This greenhouse study compared the effectiveness of selected non-fumigant synthetic nematicides and bio-nematicides for reniform nematode management in sweetpotato. Treatments included Ecozin, Majestene, fluopyram, fluazaindolizine, fluensulfone, and oxamyl, Azaguard, Monterey, NemaClean, and an untreated control. Reniform nematode counts were recorded two months after treatment application. Ecozin, Majestene, and fluopyram achieved the greatest reductions, producing the lowest nematode counts. Moderate suppression was observed with oxamyl, fluensulfone, fluazaindolizine, and Azaguard, whereas Monterey and NemaClean were the least effective. Untreated controls had the highest population levels. All treatments significantly reduced nematode numbers compared to the control, and notably, Ecozin and Majestene outperformed some synthetic nematicides in suppressing reniform nematode populations. Results indicate that certain bio-nematicides can provide effective nematode suppression comparable to conventional chemical nematicides in greenhouse conditions. The superior performance of Ecozin and Majestene highlights their potential as components of integrated nematode management strategies, contributing to reduced chemical reliance and more sustainable sweetpotato production systems.

Presenter: Fasiha Zainab

Presentation Session: MP5

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. Yong Fu, Professor, Electrical and Computer Engineering

Title: Uncertainty-aware Wildfire Risk Mitigation Approach in Power System

Abstract: This study presents a new wildfire risk management approach to address the growing challenges introduced by power system-induced wildfires. First, the proposed work introduces a model where the probability of ignition is influenced by both deterministic failure data of transmission lines and uncertain wind speed conditions. To characterize the impact of wind speed on the probability of ignition, a Wasserstein distance-based ambiguity set is established to describe the uncertain probability distribution. Then, an adjustable distributionally robust chance-constrained based power shutoff (ADRCC-BPS) problem is formulated in which the wildfire risk mitigation (WRM) is modeled as a chance constraint, and the risk tolerance associated with the WRM constraint is treated as a variable. The proposed ADRCC-BPS problem seeks to balance the load shedding cost and the cost of violating the WRM constraint. It is reformulated and solved as a mixed-integer second-order conic programming (MISOCP) problem. Case studies on the RTS-GMLC 73-bus system demonstrate the effectiveness of the proposed strategy in mitigating wildfire risk, reducing load shedding, and maintaining safe system operation under adverse weather conditions.

Presenter: Frances A Podrebarac

Presentation Session: MO5

Level of Study: PhD

Department: Wildlife, Fisheries & Aquaculture

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Beth H. Baker, Associate Extension Professor, Department of Wildlife, Fisheries & Aquaculture, Assistant Director of Environmental Stewardship, MSU Extension Service

Co-Advisor: Dr. Dana M. Miles, Research Chemical Engineer, USDA-ARS Mississippi State, MS

Title: Impact of cover crop residue on soil CO_2 and N_2O fluxes and microbial communities

Abstract: Planting cover crops is a sustainable practice that can improve soil conservation by adding post-season biomass. Using a semi-controlled field design, we investigated how varying levels of Elbon rye (Secale cereale L.) cover crop residue influence the flux of CO_2 and N_2O and alter soil properties in a non-irrigated cotton (Gossypium hirsutum L.) cropping system with no prior cover-cropping history in Mississippi. We evaluated three cover crop residue treatments, with 0%, 40%, and 80% area coverage, measuring soil fluxes (CO_2 and N_2O), chemical properties (soil pH, soil electrical conductivity, and estimated water-filled pore space), and the microbiome in response to sampling dates. The 80% residue treatment increased CO_2 flux by 39.7% and decreased N_2O flux by 65% relative to the 0% treatment. Sampling date had a significant effect on both CO_2 flux ($p<0.001$) and N_2O flux ($p=0.006$). Principal component analysis revealed that temporal and environmental patterns explained the majority of variance (PC1: 30.6%, PC2: 22.0%), while treatment effects were captured in PC3 (15.5% variance, $p=0.043$). PC1 tracked seasonal shifts from an early labile-substrate to a later moisture-driven microbial phase. PC2 represented moisture-gas-flux covariance and seasonal structure. PC3 differentiated residue treatments through pH-driven responses, with control samples (higher pH) separating from higher residue treatments (lower pH). These findings demonstrate that cover crop residue treatments significantly affected soil CO_2 and N_2O fluxes, with effects modulated by seasonal biogeochemical patterns and pH-driven microbial responses.

Presenter: Gbenga I. Elufisan

Presentation Session: AO2

Level of Study: PhD

Department: Sociology

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Diego Thompson, Associate Professor, Sociology

Title: Farming challenges in Mississippi: cooperative, black farmers' haven

Abstract: The decline in the population of Black farmers in the United States is alarming. While this problem applies to both white and Black famers, the impact is higher among Black farmers, as only two percent of farmers in the US identify as Black. Some of reasons attributed to the reduction are historical institutional discrimination, land dispossession, heirs' property, and youth lack of interest in farming. Membership of farmers' cooperative is a major coping strategy for Black farmers in navigating farming challenges, leading to the need to study role of cooperatives in Black farmers struggles. This study utilized qualitative data from 20 Black farmers, who were drawn from dominant cooperatives, and ethnographic observation cooperative meetings and farmers' field days in Mississippi to understand the role cooperative in helping Black farmers deal with farming challenges. Findings from the thematic analysis of the in-depth interviews show consistent pattern of challenges with extant studies, with emphasis on "eligibility requirement" as the contemporary challenge among Black farmers. The study, which is theoretically informed by the concept of resilience and community capital framework reveals that Black farmers' cooperatives provide members and other alike with multiple "community capitals" that help in coping with farming challenges.

Presenter: Getrude Aturu

Presentation Session: MO8

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Adam Polinko, Professor, Forestry

Title: The Influence of Genetics and Foliar Nutrients on Conelet Survival in Three Lodgepole Pine Orchards

Abstract: The primary objective of conifer seed orchards is to efficiently produce genetically improved seeds while maintaining a balance between genetic gain and diversity. Globally, seed orchards and breeding have significantly improved seed quality, helping meet the rising demand for forest products while reducing pressure on natural forests. When a seed orchard does not produce high-quality seeds in large quantities due to low cone production or survival, it delays breeding goals, increases production cost, and stalls restoration, reforestation, and conservation efforts. This research contributes to the understanding of reproduction in conifer seed orchards by evaluating orchard-specific genetics, year-to-year variations, and foliar nutrients influencing conelet mortality in three lodgepole pine orchards across three years. Using a generalized additive model for location, scale, and shape (GAMLSS), this research revealed that genetics sets the baseline reproductive potential. Genetics drove conelet survival and was modulated by their interactions with foliar nutrients and year-to-year variations like weather, pollen availability, etc. A key finding is that families or genotypes with high conelet survival did not always correspond with low mortality severity. This suggests that these traits are decoupled from each other, and estimating separate breeding values will be a more efficient method for genetic selection compared to selecting based on a single, aggregated prediction.

Presenter: Grace Olaitan

Presentation Session: MP3

Level of Study: PhD

Department: Industrial Technology, Instructional Design and Community College Leadership

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Ryan Walker, Associate Professor, College of Professional and Continuing Education

Title: Revolutionizing Weather and Climate Instruction: The Impact of VR Immersive Learning Labs

Abstract: Virtual Reality (VR) is increasingly recognized as a valuable tool for enhancing student engagement and learning in STEM education. This study evaluates the effectiveness of VR-based immersive labs in a college-level Weather and Climate course, comparing them to traditional workbook-based instruction. The research examines student engagement, perceived learning outcomes, usability, and technical challenges. Data was collected through a quantitative survey featuring Likert-scale and multiple-choice questions, supplemented by open-ended responses for deeper insights. Results indicate that students preferred VR labs, citing higher engagement, increased motivation, and improved comprehension of meteorological concepts. However, challenges such as motion sickness and technical issues were reported. Qualitative feedback highlights student appreciation for interactivity and immersion while identifying areas for instructional improvements. This study contributes to the growing research on VR in geoscience education, offering insights into optimizing VR instructional design to improve learning experiences and address student needs effectively.

Presenter: Guyue Tang

Presentation Session: MP6

Level of Study: PhD

Department: Animal and Dairy Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Xue Zhang, Assistant Professor, Animal and Dairy Sciences

Title: Effects of ammonia stress on the growth performance, fillet quality, and gut microbiota of channel and hybrid catfish

Abstract: Catfish aquaculture is the largest aquaculture sector in the United States, with Mississippi leading production. Channel (Ictalurus punctatus) and hybrid catfish (♂ Ictalurus furcatus × ♀ Ictalurus punctatus) are the most used two species, their microbiota and responses to environmental stressors remain underexplored. This study aimed to investigate the effects of ammonia stress on the growth performance, gut microbiota, and fillet quality of channel and hybrid catfish.

Fish (channel and hybrid, n = 120 each) were assigned to water conditions (control and high ammonia) and raised in 200-L tanks for 5 weeks. A split-plot arrangement in a randomized complete block design, with two replications (occasions), was conducted to determine the growth performance, fillet pH, sensory characteristics, and gut microbiota.

Ammonia stress reduced weight gain in both species ($P < 0.05$), with channel catfish outperforming hybrid catfish in both length and weight gain. Sensory analysis on fillets revealed minimal sensory differences among four treatments. Microbiota analysis showed species richness was higher in hybrid catfish (Chao1, $P < 0.05$), but evenness remained consistent ($P > 0.05$). Beta diversity differed between fish species ($P < 0.05$) but not ($P > 0.05$) ammonia stress. Channel catfish harbored more balanced microbial communities, while hybrid catfish microbiota were dominated by Lactococcus lactis, especially under ammonia stress. Results suggest that host species has a stronger influence on gut microbiota than ammonia stress. These findings have implications for optimizing production strategies tailored to specific environments, improving production efficiency and product quality in the catfish industry.

Presenter: Hannah Lawson

Presentation Session: AO6

Level of Study: Master's

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. A. Patrick, Associate Professor, Chemistry

Title: Toward Separation and Detection of Ionic Liquid Cations by Ultra High-Performance Liquid Chromatography (UHPLC) using a Pentafluorophenylpropyl (PFPP) Column with Mass Spectrometric Detection

Abstract: Ionic Liquids (ILs) are salts, usually with a bulky asymmetric organic cation, that are liquid at room temperature. They have found use in many fields and with increased use comes increased concern about potential issues including environmental release and accumulation, toxicity, and structural fidelity during recycling and reuse. To fully understand the validity of such concerns, reliable analytical methods are needed that can (1) separate ILs from complex matrices, (2) differentiate between similarly structured IL cations and/or related products, and (3) quantify target ILs and related analytes. Current methods available in the literature use chromatographic stationary phases ill-suited for the scope of common IL cation structures or use only UV detection—severely hindering the achievable limit of detection.

In this talk, first ionic liquids and methods available in the literature for IL cations analysis will be briefly reviewed, highlighting the gaps and open questions that remain. Then, a rationalization for the use of the pentafluorophenylpropyl (PFPP) stationary phase, UHPLC, and mass spectrometric detection will be provided. Next, a status update on initial experiments using these approaches for the analysis of 1-methyl-3-(2-methoxyethyl) imidazolium, 1-butyl-3-methylimidazolium, 1-benzyl-3-methylimidazolium, and 1-butyl-3-vinylimidazolium cations will be provided. In these initial experiments, elution ordering of the varying cations and linear response of UV and MS detectors were explored. Finally, the outlook of this work will be discussed.

Presenter: Haomiao Li

Presentation Session: AO2

Level of Study: PhD

Department: Psychology

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Michael S Pratte, Associate Professor and Associate Department Head, Psychology

Title: The effect of information entropy on recognition memory for words

Abstract: Predictive processing plays a central role in language comprehension, but its influence on subsequent memory formation remains unclear. In the extant Psycholinguistics literature, lexical predictability is often measured for individual words, and it is not clear how the distribution of words that fit a sentential context, i.e., conditional entropy, would facilitate or interfere with recognition memory. The present study aims to investigate how lexical prediction uncertainty (entropy) during language comprehension affects subsequent recognition memory. Participants (N = 60) first completed a cloze task, generating 1–8 plausible continuations for 648 sentence fragments missing a final, target word (e.g., The hungry monkey was trying to peel the ____.) along with subjective probability estimates. Trial-level entropy values were calculated based on the number and probabilities of these responses, with a normalization procedure applied to account for cases where assigned probabilities did not sum or exceeded 100%. This normalization preserved the relative differences among probabilities while ensuring comparability across trials. Additionally, we calculated the semantic similarity between each target word (e.g., banana) and all other responses generated by each participant for each experimental sentence (e.g., mango, coconut, orange etc.), as an index of the degree of semantic pre-activation. Subsequently, participants read the same sentences while their eye movements were tracked, followed by a surprise recognition memory test. Trial-level entropy and semantic similarity were computed for each item, and their potential effects on target recognition accuracy and response times were analyzed. Results showed that semantic similarity was a significant positive predictor of recognition accuracy ($\beta = 0.180$, $p < .001$). In contrast, entropy had no significant main effect, and its interactions with cloze probability, sentence constraint, and target predictability were nonsignificant. Eye-tracking data revealed that low-predictability targets elicited significantly longer gaze durations ($p < .001$), but total reading time did not significantly predict recognition accuracy. These findings support the view that the activation of upcoming semantic features enhances memory encoding and facilitates subsequent retrieval, suggesting that semantic processing is a key mechanism underlying prediction-driven memory enhancement.

Presenter: Hemraj Kathayat

Presentation Session: MO10

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Attila Karsi, Professor, Department of Comparative Biomedical Sciences

Co-Advisor: Dr. Hasan C. Tekedar, Assistant Professor, Department of Comparative Biomedical Sciences

Title: TolC Efflux Channel Contributes to Efflux Activity and Biofilm Formation in Edwardsiella ictaluri

Abstract: Edwardsiella ictaluri poses a persistent challenge in U.S. aquaculture and contributes to major economic losses. Antimicrobial resistance complicates treatment efforts, and efflux pumps play a crucial role in this process. However, the functional roles of these systems in E. ictaluri are not yet fully understood. Our previous transcriptomic and comparative genomic analyses identified efflux pump genes of potential importance, including channel proteins such as TolC. To investigate its role, we constructed an in-frame deletion mutant targeting the TolC channel protein (EiΔtolC) and performed growth kinetics, biofilm formation, and ethidium bromide (EtBr) accumulation assays. Growth kinetic assays showed that wild type (WT) and EiΔtolC exhibited comparable early growth, but the mutant displayed reduced growth during the stationary phase, which was not significant, indicating no fitness defect associated with TolC loss. In the presence of colistin, both strains showed similar growth inhibition, suggesting that TolC does not significantly contribute to colistin resistance. Biofilm formation was significantly reduced in the EiΔtolC mutant compared to the WT strain, suggesting that TolC contributes to surface-associated community structure. EtBr accumulation and fluorescence assays revealed that WT cells with glucose efficiently expelled EtBr. In contrast, CCCP-treated WT and EiΔtolC mutants retained significantly higher levels of EtBr, consistent with impaired efflux capacity. These results indicate that TolC does not affect growth, but it contributes to efflux activity and biofilm formation in E. ictaluri. While additional studies are needed, our findings highlight TolC as a key component of the efflux system and a potential target for strategies aimed at reducing E. ictaluri survival in the host environment.

Presenter: Himani Joshi

Presentation Session: MO2

Level of Study: PhD

Department: Animal and Dairy Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Peixin Fan, Assistant Professor, Department of Animal and Dairy Sciences

Title: Identification of rumen microbial genes and their hosts involved in neurotransmitter production

Abstract: Our previous study detected several neurotransmitters, including glutamate, γ-aminobutyric acid (GABA), and acetylcholine, in rumen fluid during in vitro culture, suggesting that the rumen microbiota may play a role in nervous system regulation. To investigate primary rumen microbial genes and their hosts involved in neurotransmitter synthesis, we conducted long-read metagenomic sequencing of rumen fluid samples collected at 0 h, 4 h, 12 h, 24 h, and 48 h. The relative abundance of genes (hits per gigabases) responsible for glutamate synthesis and catabolism (glutamate synthase, glutamate dehydrogenase, etc.) was the highest and remained stable (1409.6 to 1641.7). In contrast, genes for GABA synthesis (e.g., glutamate decarboxylase, aldehyde dehydrogenase) increased nearly 2-fold at 24 h (336.0) and 48 h (302.5) compared to 0 h (108.7). Genes involved in GABA catabolism exhibited a twofold increase at 24 h (33.6) and a sevenfold increase at 48 h (95.9) relative to 0 h (13.2). We also detected a few reads for genes responsible for acetylcholine, serotonin, or dopamine synthesis. These findings are consistent with metabolomics data, which showed significantly higher glutamate and GABA concentrations compared with other neurotransmitters in rumen fluid, and well explained increase in GABA levels from 0 h to 24 h, followed by decline at 48 h. We also identified the bacterial taxa harboring neurotransmitter synthesis genes (e.g., Prevotella and Comamonas kerstersii for GABA). Overall, this study demonstrates the genetic potential of rumen microbes in neurotransmitter production and highlights the need for further research into how these microbes influence ruminant behavior.

Presenter: Honor Elchos

Presentation Session: AO3

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Lauren B. Priddy, Associate Professor, Ag. & Bio. Engineering

Co-Advisor: Dr. Matthew W. Priddy, Assistant Professor, Michael W. Hall School of Mechanical Engineering

Title: Cell seeding efficiency is enhanced with an oscillatory perfusion method and with nanohydroxyapatite coating

Abstract: With the need for intermediate models between static cultures and in vivo systems, optimizing cell seeding efficiency on biomaterial scaffolds is critical for enhancing the relevance of experimental results. Static seeding is commonly employed due to its simplicity and repeatability, but it has low seeding efficiencies (10 to 25%). In contrast, dynamic seeding, specifically oscillation seeding, which involves the passage of cell-laden media in an oscillatory manner at regular intervals, can achieve seeding efficiencies between 70 and 80%. We have previously demonstrated a hybrid polydopamine + nanohydroxyapatite (nHA) coating enhanced cell attachment on polylactic acid (PLA) scaffolds seeded statically. We hypothesized that both oscillation seeding and nHA coating would enhance cell attachment compared to static seeding and noncoated scaffolds. To facilitate oscillation seeding, a three-chamber system was designed for perfusing 50,000 cells/mL of MC3T3-E1 preosteoblasts at 0.2 mL/min through two 3D-printed PLA scaffolds simultaneously in each chamber. The suspension was oscillated 6 times, 40 minutes each, for a total duration of 4 hours. Alternatively, scaffolds were seeded statically (dropwise) and cultured for 4 hours. Noncoated and nHA-coated scaffolds were seeded statically and via oscillation. Seeding efficiency was quantified using a CCK-8 assay at 24 hours. Both oscillation seeding and nHA coating significantly enhanced cell seeding, with nHA coating having a greater effect. This custom seeding device serves as an easy-to-use, cost-effective system for facilitating dynamic cell seeding and increa sing seeding efficiency on biomaterial scaffolds. Currently, ceramic scaffolds with novel geometries are being investigated for their effects on seeding efficiency.

Presenter: Hossein Mohammadi

Presentation Session: MP5

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. Vuk Marojevic, Professor, Electrical and Engineering

Title: Deep Reinforcement Learning for Spectrum Coexistence: RFI-Resilient Passive Sensing in Shared 5G Environments

Abstract: The rapid growth of next-generation wireless communication and satellite services has intensified spectrum congestion, creating severe interference risks for passive radiometer sensors that are vital for Earth observation, climate monitoring, and national security. The NSF SWIFT-SAT "INTERACT" project addresses this challenge by developing the first large-scale experimental dataset for active-passive RF coexistence, building a UAV-based agile microwave radiometer system, and advancing machine learning-driven interference detection and mitigation methods. Leveraging the AERPAW testbed, we design and evaluate controlled interference scenarios, coupled with digital twins, to generate labeled datasets that capture realistic co-channel and adjacent-channel interference. Our poster highlights the project's holistic contributions, with emphasis on deep reinforcement learning (DRL)-based spectrum management and 5G NR signal generation for controlled interference experiments. Specifically, we investigate DRL techniques including Double Deep Q-Networks for— dynamic spectrum allocation and interference-aware waveform designs that balance communication performance with the protection of passive sensors. Furthermore, we implement and simulate 5G NR signal generation and propagation under standardized 3GPP channel models to study interference impacts on radiometry. The integration of experimental testbeds, digital twin modeling, and DRL-driven spectrum management establish a foundation for resilient coexistence frameworks that can inform spectrum policy, enable AI-enhanced wireless systems, and ensure reliable scientific observations in congested spectral environments.

Presenter: Iffat Ara Ebu

Presentation Session: AO3

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. Robert Moorhead, Professor, Electrical and Computer Engineering

Co-Advisor: Dr. John Ball, Professor, Electrical and Computer Engineering

Title: Large-Scale Underwater Multi-Fish Tracking Using the ByteTrack Algorithm

Abstract: Tracking underwater fish species is crucial for stock assessments, production management, maintaining a balanced ecosystem, and protecting endangered species. Image processing and computer vision techniques have been widely applied for the detection, classification, and tracking of fish species. Although numerous methods have been developed for detection and classification, relatively few algorithms address the challenge of tracking underwater fish species. In computer vision, this task is typically framed as an object detection problem followed by data association for tracking. In this study, the You Only Look Once Extended (YOLOX) detector was used, and the ByteTrack algorithm was adapted for tracking due to its real-time multiple-object tracking capabilities. This was applied to a large-scale and diverse dataset extracted from the Gulf Fishery-Independent Survey of Habitat and Ecosystem Resources Dataset 2024 (GFISHERD24), which captures fish in their natural underwater habitats. The underwater environment poses significant challenges, one of the most difficult being the visual similarity between fish and background elements. The ByteTrack algorithm addresses this by integrating data association accuracy through the use of both high-confidence and low-confidence detection results. This approach significantly improves tracking robustness and identity preservation while maintaining high efficiency, making ByteTrack highly suitable for real-time and large-scale tracking applications. The tracking performance was evaluated on 45 test videos. A Multiple Object Tracking Accuracy (MOTA) of 60.6\% and a Multiple Object Tracking Precision (MOTP) of 0.303 were achieved on 983 ground truth tracked objects.

Presenter: J. Christopher Jacobson

Presentation Session: MP1

Level of Study: PhD

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Adam D. Polinko, Assistant Professor, Department of Forestry

Co-Advisor: Dr. Ashley N. Schulz, Assistant Professor, Department of Forestry

Title: Loblolly Pine Secondary Growth Responses to Fire and Herbicide: a Dendrochronological Analysis

Abstract: Prescribed fire is a common management tool utilized in loblolly pine (Pinus taeda) forests across the southeastern United States. Despite its widespread use, its effects on loblolly pine growth and vigor remain uncertain, particularly in production settings. Previous studies suggest that prescribed fire responses vary globally in the genus Pinus, with many North American species benefiting from low-intensity burns. While limited literature examines prescribed fire effects on loblolly pine, many studies have investigated herbicide applications in mid-rotation stands, which can result in increased secondary increment. This study examines loblolly growth response to prescribed fire and herbicide treatments using dendrochronological methods. Three loblolly pine-dominated (≥90% basal area) stands near Starkville, Mississippi were thinned to the same residual basal area and assigned to one of three treatments: prescribed fire only, herbicide plus fire, or control. Six dominant or co-dominant trees were haphazardly selected from each treatment, and increment cores were extracted from the north and east sides of each tree. Cores were dried, mounted, scanned, and dated following standard dendrochronological procedures. Ring dating used CooRecorder imaging software, and cross-dating was verified in R with the dplR package. The relationship between annual and interannual growth variation was assessed with a linear mixed-effects model. Growth rates were then compared across different treatment types by subtracting the detrended growth rate of the control stand from the growth rate of the treated stands. Preliminary results will be discussed. Results will help inform management practices to promote loblolly pine growth and vigor in the southeastern United States.

Presenter: Jessie Hassan

Presentation Session: AP4

Level of Study: Master's

Department: Anthropology and Middle Eastern Cultures

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Jesse Goliath

Title: We The People: Tracing Marginalization in Forensic Anthropology

Abstract: Forensic Anthropology is often described as a discipline of objectivity; however, its academic and professional structures show that it is, in fact, entrenched like any STEM field in power and inequality. Examining diversity solely through the lens of elite institutions creates a vacuum that obscures the structural limitations faced by students and scholars who come from marginalized backgrounds. Identifying this also faces critical analysis of the missing and unidentified in relation to their social status in the US. Additionally, it does not stop with missingness; there is a violence to being an individual of color who disappears that cannot be expressed solely in academia. By examining the disparity of individuals who are missing from institutional exclusionary practices, we can see a comparative ratio that speaks volumes. As a discipline, we seek accountability, transparency, and equity in both pedagogy and practice.

Presenter: Jesus Ortiz

Presentation Session: MO4

Level of Study: Master's

Department: Civil and Environmental Engineering

Category: Engineering

Advisor: Dr. Ramirez-Avila Jhon, Professor, Civil and Environmental Engineering

Title: Determination of statistical parameters in Curve Number Adjustments

Abstract: The Soil Conservation Service Curve Number (SCS-CN) method is widely used for rainfall-runoff estimation, yet its reliability depends critically on how the curve number (CN) values are calibrated. Traditional performance metrics used in calibrations such as PBIAS, KGE, NSE, and RSE each carry methodological limitations when used in isolation. This study introduces a new composite metric, OF-KGE, designed to address these weaknesses by combining the robustness of the Kling-Gupta Efficiency with a penalty for systematic bias .The approach was tested across 1,358 watersheds in the contiguous U.S. using event data from 1950 to 2023. Two calibration methods—least-squares estimation (LSE) and asymptotic (ASY)—were applied to both natural and frequency-matched rainfall-runoff events under two λ values (0.05 and 0.20) and two precipitation thresholds ($P > 0$ mm and $P > 25.4$ mm).

Results revealed that single-objective metrics frequently misrepresented model performance: RSE and NSE were overly sensitive to outliers, KGE fails to penalize models that align well in timing and variability but exhibit substantial systematic volume errors, and PBIAS ignores timing discrepancies. In contrast, the OF-KGE metric effectively mitigated the impact of single-event outliers, successfully rectified over 70% of bias-masked calibrations that were considered acceptable using KGE alone, and addressed the timing discrepancies identified by the PBIAS.

By integrating both efficiency and bias considerations, OF-KGE offers a more comprehensive and hydrologically realistic performance assessment, advocating for replacing single-metric approaches with composite objectives to improve calibration defensibility and predictive reliability across varied hydrologic conditions.

Presenter: Jing Huang

Presentation Session: MO5

Level of Study: PhD

Department: Wildlife, Fisheries, and Aquaculture

Category: Agriculture and Life Sciences

Advisor: Fernando Y. Yamamoto, Assistant Research Professor, Department of Wildlife, Fisheries, and Aquaculture

Co-Advisor: Heather R. Jordan, Professor, Department of Biological Sciences

Title: Exploring Carbohydrate Ingredients for Potential Synbiotic Interaction with Autochthonous Lactococcus lactis MA5 in Diets for Hybrid Catfish (Ictalurus punctatus × I. furcatus)

Abstract: Carbohydrate ingredients are primarily used in catfish feeds as cost-effective energy sources. Beyond this role, they also serve as nutrients for commensal intestinal bacteria, which are associated with intestinal health and disease resistance in farmed fish. The host-associated bacterium strain Lactococcus lactis MA5 was previously identified as a potential probiotic for hybrid catfish, showing benefits in production performance and resistance against bacterial pathogens. However, probiotics as feed additives have relatively short shelf-life, limiting practical applications. To address this issue, the supplementation of ingredients with prebiotic-like properties was investigated to assess the colonization of MA5 in the intestine. In this study, four carbohydrate ingredients (corn meal, corn germ, wheat-middlings, and yellow field peas) and the prebiotic inulin were evaluated for their synbiotic properties with MA5. MA5 proliferation and fermentation capacity with prebiotic candidates were assessed in vitro after 24h incubation in carbohydrate-free modified de Man-Rogosa-Sharpe medium. MA5 preferentially utilized yellow field peas and wheat-middlings, demonstrating higher proliferation rate and fermentation capacity. To further assess synbiotic-pathogen interactions, the catfish pathogen Edwardsiella ictaluri, exhibited poor growth in vitro when incubated with wheat-middlings compared to other candidates. In addition, MA5 metabolites produced after 24h fermentation of yellow field peas was co-cultured with E. ictaluri for 3h. Virulence-related genes (eihA, eihB, and luxS) were downregulated, suggesting that this combination may attenuate E. ictaluri. Next, a 21-day feeding trial with diets formulated with the carbohydrate ingredients was conducted to investigate the colonization of MA5 in the intestine, and the 16S rRNA sequencing data is pending.

Presenter: Juliana Araujo

Presentation Session: MP5

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Vitor Souza Martins, Assistant Professor, Department of Agricultural & Biological Engineering

Co-Advisor: Dr. Lucas Borges Ferreira, Assistant Professor, Department of Agricultural & Biological Engineering

Title: The First Global 10 m Agricultural Mask from Satellite Imagery and AI-Based Segmentation for Digital Agriculture Applications

Abstract: Timely and high-resolution information on the spatial distribution of cropland is fundamental for advancing global food security, agricultural sustainability, and climate adaptation. In this context, crop masks serve as a critical geospatial layer that supports diverse applications, including yield modeling, crop monitoring, growth forecasting, land-use change detection, and climate–agriculture interaction analysis. Their importance continues to grow as they become indispensable for decision-making across local, regional, and global scales. However, existing global cropland products are typically limited by their coarse spatial resolution, low update frequency, and inability to capture field-scale spatial patterns that are essential for precision agriculture and downstream applications. To address these challenges, we present the first global 10 m resolution cropland extent from annual Sentinel-2 temporal composites and designed to map agricultural areas across multiple countries. Our approach utilizes deep learning semantic segmentation (ResUnet) to delineate cropland with high spatial detail, overcoming limitations of pixel-based classification products that tend to introduce salt-and-pepper effects. The workflow is scalable and temporally flexible, enabling the generation of annual masks across diverse agricultural landscapes. The resulting dataset will be openly accessible through an interactive dashboard and serve as a foundational layer for downstream applications. By closing critical data gaps in global cropland monitoring, this work supports the advancement of digital agriculture and more informed decision-making from the field to global scales.

Presenter: Katy Kemalyan

Presentation Session: MO7

Level of Study: Master's

Department: Historic Preservation

Category: Education, Arts and Sciences, and Business

Advisor: Beth Miller, Department Head, Historic Preservation

Co-Advisor: Critz Campbell, Professor, Department of Art

Title: Responding to the urban canvas: Murals, placemaking, and preservation in Meridian, MS

Abstract: Public murals that depict elements of local culture and history are an effective creative placemaking tool used by preservationists and other entities invested in the revitalization of their historic districts. Tourism bureaus often market a town's mural collection as an attraction for visitors hoping to learn about a place. For residents, murals increase the visibility of areas in need of revitalization, thus catalyzing further development. Research on public murals largely focuses on dense urban areas and excludes considerations of placemaking value added by historic architecture used as a mural substrate.

Rectifying this omission, this study seeks to expand which genres of murals extant in Meridian, MS are considered for their placemaking value and as potential areas for future restoration and investment. Through geographic survey and stakeholder interviews, faded twentieth century advertisements and graffiti were found to exhibit placemaking content in addition to officially sponsored murals and determined Meridian's current position as ideal for the establishment of a mural management system.

Presenter: Kendall N. McKinnon

Presentation Session: MP2

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Russell Carr, Professor, Comparative Biomedical Sciences

Title: Dose-Dependent Effects of the Organophosphorus Insecticide Metabolite Chlorpyrifos-oxon on Cholinesterase Activity in Juvenile Rats Following Acute Exposure

Abstract: Chlorpyrifos (CPF), an organophosphorus insecticide, targets animal and human nervous systems and is hypothesized to cause developmental neurotoxicity. At higher levels, CPF is converted to the toxic metabolite chlorpyrifos-oxon (CPO), which irreversibly binds acetylcholinesterase (AChE) and causes acetylcholine accumulation. This induces hyperactivity in the cholinergic system, possibly leading to death via respiratory function loss. Typically, environmental exposure to CPF occurs at lower levels, targeting the enzyme fatty acid amide hydrolase (FAAH). This prevents degradation of the endocannabinoid anandamide, causing changes that may disrupt normal development and function. Children exposed to low CPF levels have been associated with persistent behavioral problems (ADHD and decreased cognitive abilities). In this study, the objective was to establish a dose-response relationship between CPO and AChE to measure the drug's inhibitory effects at increasing dosages. At 21 days old, male and female rat pups were subcutaneously administered either the vehicle multisol or CPO (0.5, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0 mg/kg). Pups were sacrificed 3 hours post-exposure with brain and serum collected to determine AChE and ChE activities. For brainstem AChE activity, little to no inhibition was observed at 0.5 and 0.75 mg/kg. Both 1.0 and 1.25 mg/kg inhibited approximately 33% of activity, and dosages of 1.5 (45%), 1.75 (41%), and 2.0 mg/kg (49%) showed moderate inhibition. Serum ChE activity demonstrated low to moderate inhibition: 0.5 (21%), 0.75 (32%), 1.0 (38%), 1.25 (40%), 1.5 (46%), 1.75 (41%), and 2.0 (50%). Future studies will explore CPO's effects on FAAH activity and gene expression at different inhibition levels.

Presenter: Khadija Ferdous

Presentation Session: MP2

Level of Study: PhD

Department: Clinical Sciences, College of Veterinary Medicine

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Cooper Brookshire, Associate Clinical Professor, Department of Clinical Sciences

Co-Advisor: Dr. Keun Seok Seo, Associate Professor, Department of Comparative Biomedical Sciences

Title: Effects of amoxicillin/clavulanic acid and enrofloxacin on fecal microbiota composition and ESBL-producing E. coli carriage in healthy dogs

Abstract: Antibiotics are essential for treating bacterial infections, but their broad-spectrum activity can disrupt the gut microbiome and promote the emergence of antimicrobial resistance. This study investigated the short- and intermediate-term effects of antibiotic administration on gut microbiota composition and the carriage of extended-spectrum β-lactamase (ESBL)-producing Escherichia coli in healthy dogs. Ten healthy research beagles were orally administered amoxicillin/clavulanic acid and enrofloxacin at typical dosages, with fecal samples collected biweekly over five weeks: two pre-treatments, two during treatment, and six post-treatment timepoints. Selective culture for resistant Enterobacterales and 16S rRNA sequencing analyses were performed on each sample to assess microbial shifts and diversity. Before antibiotic administration, only 1 of 10 dogs carried ESBL-producing Escherichia coli. However, all 10 dogs tested positive for ESBL-producing isolates during and after treatment, representing a 900% relative increase in carriage. Microbiome analysis revealed a marked reduction in alpha diversity and significant increases in the relative abundance of E. coli, Enterococcus spp., and Clostridium celatum during antibiotic administration, followed by a continued post-treatment decline in alpha diversity and an increase in Clostridium perfringens. These findings demonstrate substantial and sustained alterations to the fecal microbiota and increased colonization by antibiotic-resistant organisms following treatment. This pilot study underscores the need for strategies to preserve microbiome resilience during antimicrobial therapy and to mitigate resistance transmission in veterinary and One Health contexts.

Presenter: Kodai Watanabe

Presentation Session: MO9

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Alex Thomasson, Director of AAI Department Head, Professor, and Berry Endowed Chair of ABE, Agricultural and Biological Engineering Department, Mississippi State University

Co-Advisor: Dr. Xin Zhang, Assistant Professor, School of Environmental, Civil, Agricultural and Mechanical Engineering, University of Georgia

Title: Generation of Synthetic Image Data in a Simulated Agricultural Environment Using MAVS: A Case Study and Evaluation on Deep Learning-Based Cotton Boll Detection

Abstract: Cotton boll detection is essential in autonomous cotton boll picking and phenotyping tasks. Robust deep learning-based cotton boll detection models require extensive imagery data taken under different times and weather conditions in a field to ensure diversity in the data. However, collecting such data is time-consuming and labor-intensive because researchers must visit the field under each condition. Using a simulation solves this problem because it allows control of the environmental conditions and allows researchers to acquire as much data as needed for training the models. However, research on the use of simulation in agricultural scenarios is highly limited. Therefore, this research aims to reduce the burden of in-field data collection for the deep learning-based cotton boll detection model development by enabling synthetic data collection in the simulation environment. The MSU Autonomous Vehicle Simulator (MAVS) is used to programmatically collect images within the simulation environment. In this research, the performances of cotton boll detection models trained on simulation data, in-field data, and a mix of the two are compared and analyzed. This research also suggests that a strategic use of training data, known as curriculum learning, is crucial for enhancing the performance of simulation-image-based cotton boll detection models.

Presenter: Laith Odeh Bani Khaled

Presentation Session: AP3

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. John E. Ball, Professor, Department of Electrical and Computer Engineering

Title: FlashLightNet: An End-to-End Deep Learning Framework for Real-Time Detection and Classification of Static and Flashing Traffic Light States

Abstract: Accurate traffic light detection and classification are fundamental for autonomous vehicle navigation and real-time traffic management in complex urban environments. Existing systems often fall short of reliably identifying and classifying traffic light states in real-time, including their flashing modes. This study introduces FlashLightNet, a novel end-to-end deep learning framework that integrates YOLOv10 for traffic light detection, ResNet-18 for feature extraction, and a Long Short-Term Memory (LSTM) network for temporal state classification. The proposed framework is designed to robustly detect and classify traffic light states, including conventional signals (green, yellow, red) and flashing signals (flashing red, flashing yellow), under diverse and challenging conditions such as varying lighting, occlusions, and environmental noise. The framework has been trained and evaluated on a comprehensive custom dataset of traffic light scenarios organized into temporal sequences to capture spatiotemporal dynamics. The dataset has been prepared by taking videos of traffic lights at different intersections of Starkville, Mississippi, and Mississippi State University, consisting of green, yellow, red, flashing yellow, and flashing red. In addition, simulation-based video datasets with different flashing rates — 2, 3, and 4 seconds — for traffic light states at several intersections were created using RoadRunner, further enhancing the diversity and robustness of the dataset. The YOLOv10 model achieved a mean average precision (mAP) of 99.2% in traffic light detection, while the ResNet-18 and LSTM combination classified traffic light states (green, red, yellow, flashing red, and flashing yellow) with an F1-score of 96%.

Presenter: Leila Kargaripadar

Presentation Session: AP4

Level of Study: PhD

Department: Counseling, Higher Education Leadership, Educational Psychology, and Foundations

Category: Education, Arts and Sciences, and Business

Advisor: Dr. M. Garemani, Assistant Professor, Educational Psychology

Title: Mapping courage: A cross-disciplinary Systematic Literature Review

Abstract: Courage—the capacity to act despite fear or risk—is examined across psychology, health, education, and organizational science, yet definitions, measures, and reported effects remain heterogeneous. This cross-disciplinary systematic review maps the field by (a) integrating conceptualizations and typologies of courage (e.g., moral, psychological, and social/organizational courage), (b) cataloging instruments and their psychometric properties, and (c) synthesizing effects and moderators across contexts. Following PRISMA 2020 and PRISMA-S guidance, comprehensive searches will be conducted in APA PsycINFO, PubMed/MEDLINE, Web of Science, Scopus, CINAHL, ERIC, and Business Source Complete for peer-reviewed records published from 2000 to 2025 in English. Eligible studies include empirical (quantitative, qualitative, mixed-methods), instrument development/validation, and theory/model papers directly addressing courage or close variants (e.g., bravery, moral courage). Two reviewers will independently screen, extract, and appraise quality using the Mixed Methods Appraisal Tool for empirical designs, COSMIN criteria for measurement studies, AMSTAR 2 for any included reviews, and Joanna Briggs Institute tools for qualitative research. Data will be synthesized thematically across domains; where three or more comparable studies report common outcomes, random-effects meta-analysis will be performed with heterogeneity and small-study bias checks. The review will deliver (1) a coherent taxonomy of courage concepts, (2) an overview of instruments with reliability/validity evidence and usage contexts, and (3) an aggregate of effects (e.g., ethical action, well-being, performance, coping with fear, resilience), informing theory, assessment, and intervention.

Presenter: Luis Caballero Choy

Presentation Session: AP4

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. J. P. Emerson, Professor, Chemistry

Co-Advisor: Dr. S. Stokes, Professor, Chemistry

Title: Zinc(II) binding of a γ-CA-like protein from a hyperthermophilic archaeon

Abstract: We report the initial characterization of PaaY, a protein in the phenylacetic acid degradation operon of Pyrococcus furiosus, with structural similarity to the γ-class carbonic anhydrases (γ-CAs), suggesting a potential role as a metal-dependent hydrolytic protein. PaaY was successfully overexpressed in E. coli and purified by heat treatment followed by His-tag affinity chromatography. Initial studies indicate the protein yield of this method is around 25 mg/L of culture. The isolated protein was probed by CD and showed only minor changes in the CD over a wide range of temperatures, a remarkable thermostability, consistent with its hyperthermophilic origins. The zinc(II) titrations measured in an ITC confirm a high-affinity zinc(II) binding site per monomer unit. SEC data supports a dimeric structure of the protein, contrary to the most common trimeric form of γ-CAs. The interest in abiotic enantioselective catalysis of organic reactions using the chiral environment surrounding the Lewis acid cofactor in metalloproteins has led us to study PaaY's stability in organic solvents. The stability of PaaY was screened in a range of solvent mixtures, showing good solvent stability up to 30% in acetonitrile, isopropanol, tetrahydrofuran and 1,4-dioxane. At higher organic solvent proportion, the protein showed some insolubility but appears to reversibly dissolve when diluted back with buffer to 30% organic solvent.

Presenter: Luke Ferguson

Presentation Session: AO1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. K. P. Poudel, Associate Professor, Forestry

Co-Advisor: Dr. C. M. Siegert, Associate Professor, Forestry, Dr. H. J. Renninger, Associate Professor, Forestry

Title: Generalized aboveground biomass equations for eastern cottonwood and black willow

Abstract: Alternative sources of energy are becoming increasingly important to mitigate the adverse effects of climate change exacerbated by both fossil fuel extraction and use. One such alternative is the use of short rotation woody crops (SRWCs) for woody biomass for energy generation. Eastern cottonwood (Populus deltoides) and black willow (Salix nigra) are two such SRWCs that have been extensively studied. Eastern cottonwood and black willow have short rotation periods and can coppice regenerate, cutting down on potential replanting costs. For large-scale bioenergy production using SRWCs, it is important that tools are produced that allow for accurate estimation of aboveground biomass and therefore, prediction of yields. While aboveground biomass equations have been developed for cottonwood and willow, most of them are localized and can only be applied to cottonwoods and willows grown in the location for which the equation was developed. To this end, this study aimed at developing generalized aboveground biomass equations for eastern cottonwood and black willow that can be used across multiple regions. A modified meta-analysis was used by compiling existing aboveground biomass equations for eastern cottonwood and black willow from multiple studies to generate aboveground biomass pseudodata and finally, deriving a final biomass equation by fitting models to the pseudodata using regression analysis. Model validation involved using criteria such as bias and root mean square error. New models will simplify the process of producing accurate estimates of aboveground biomass for eastern cottonwood and black willow and expand the pool of SRWC aboveground biomass equations.

Presenter: Lydia Bailey

Presentation Session: MO7

Level of Study: Master's

Department: Anthropology and Middle Eastern Cultures

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Molly K. Zuckerman, Full Professor, Anthropology and Middle Eastern Cultures

Title: Assessing impacts of the Great Depression on childhood health using bioarchaeological perspectives

Abstract: Economic downturns pose cyclic challenges that often correlate with worsened childhood health outcomes due to food insecurity, psychological distress, and family financial pressures. This research investigates the ways in which the Great Depression (1929-1939) impacted childhood health outcomes for a group of low SES individuals in Cleveland, Ohio. The primary research question asks: what relationships exist between childhood morbidity and mortality and the social, economic, and physical environments produced by government expenditures during past economic downturns? Analyses draw on skeletal evidence of stress and nutritional deficiency (i.e., cribra orbitalia, porotic hyperostosis, rickets, and scurvy) in juveniles in the Hamann-Todd Osteological Collection (Cleveland, OH), supported by archival death certificates, maps, and census data from early 20th-century Cleveland. Findings reveal meaningful health patterns between juveniles who died before the onset of the Great Depression and those who died during this recession. A Mann-Whitney U reveals that the Great Depression sub-group (n=18) has a significantly higher cumulative stress index (1.22 out of 4) than the pre-Depression sub-group (n=53; 0.66 out of 4; p=.014).When cause of death is considered, individuals in the pre-Great Depression sub-group have lower odds of dying from infectious and respiratory illnesses compared to the Great Depression sub-group (p = .047, OR = 0.15). These findings underscore the profound effects that recent and current economic conditions during early childhood have on health outcomes, highlighting the importance of approaching the same issue bioarchaeologically to understand their long-term impacts.

Presenter: Lydia Ogebule

Presentation Session: MP2

Level of Study: PhD

Department: Comparative Biomedical Science,
Center for Environmental Health Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr Janice E. Chambers, PhD, DABT, ATS, William L. Giles Distinguished Professor, Director, Center for Environmental Health Sciences, College of Veterinary Medicine

Title: Impact of Acute Organophosphate (NIMP) Exposure on Gene Expression and Neurodegeneration in an Atropinized Rat Model, and the Therapeutic Influence of Oxime 20 on this Expression

Abstract: Organophosphates (OP), used as insecticides and chemical nerve agents, are known for their neurotoxic effects, often causing neurodegeneration and compromising blood-brain barrier (BBB) integrity. Current treatments like 2-PAM are insufficient in providing neuroprotection across the BBB. Therefore, developing new therapeutics that can cross the BBB and protect neurons from OP toxicity is crucial. This experiment investigates the impact of the organophosphate NIMP on gene expression and neurodegeneration in atropinized rats and evaluates the therapeutic potential of Oxime 20. Specifically, it examines the expression of neurodegenerative-related genes (Cln5 and Fos), blood-brain barrier integrity gene (Ocln), cannabinoid receptor gene (Cnr1), and cholinergic receptor gene (Chrna7). Adult male Sprague-Dawley rats were divided into four groups: Control, NIMP, Oxime 20, and Therapy (NIMP+ Oxime 20 treatment). After treatment, the hippocampus region from each rat was collected, with three biological replications per group. Total RNA was extracted and mRNA analyzed using RT-qPCR to quantify gene expression levels, with normalization to the housekeeping gene Rplp1. Gene expression was assessed using the ΔCq method, and statistical comparisons were made between treatment groups. The study's findings showed that NIMP increased Cln5, Chrna7, and Fos expression, while Oxime 20 therapy reversed these effects, normalizing Chrna7, and reduced Cln5 expression.

Presenter: Madeline Ballinger

Presentation Session: AO2

Level of Study: Master's

Department: Anthropology and Middle Eastern Cultures

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Anna Osterholtz, Professor, Anthropology and Middle Eastern Cultures

Title: Extracted Coal, Extracted Health: A Geospatial Analysis of Thyroid Cancer Rates and Mountain-Top Coal Mining in Kentucky

Abstract: This study presents an epidemiological analysis of thyroid cancer incidence rates in central Appalachia. Previous research indicates that communities in central Appalachia face disproportionately high rates of negative health outcomes. These adverse health outcomes are multifactorial, but studies suggest that coal mining and lower socioeconomic status are significant components. Building from this premise, this study examines the relationship between mountain-top coal mining and thyroid cancer incidence rates in Kentucky. Using ArcGIS Pro to perform geospatial statistical methods, this analysis tests the hypothesis that thyroid cancer incidence rates are spatially correlated to areas with mountain-top coal mining. The results suggest that the presence of mountain-top coal mining is correlated with increased thyroid cancer incidence rates. These results are explored through the application of epigenetic theory and toxicology. This study brings attention to environmental justice issues in central Appalachia, calling for increased regulation of pollutants associated with mountain-top coal mining and emphasizes the need for increased research into epigenetic mechanisms.

Presenter: Maia McLin

Presentation Session: MP3

Level of Study: PhD

Department: Psychology

Category: Education, Arts and Sciences, and Business

Advisor: Danielle K. Nadorff, Professor, Psychology

Title: Resilience, Racial Identity, and Memory in Marginalized Caregiving Grandparents: The Role of Physical Activity

Abstract: Prospective memory failures in aging populations may reflect reduced engagement in protective behaviors like physical activity. Ethno-racially marginalized caregiving grandparents face intersecting stressors exacerbating memory challenges. While resilience and ethnic identity may buffer effects, their links to prospective memory remain underexplored. This study examines: 1) resilience-prospective memory links, 2) ethnic identity (resolution/exploration) moderation of resilience-physical activity pathways, and 3) physical activity's mediation. A nationwide sample of 84 Black/Hispanic/multiracial grandparents (ages 45-54) completed surveys assessing resilience (MIIRM), prospective memory (PMQ; higher scores = more failures), ethnic identity (EIS_R resolution, EIS_E exploration), and physical activity. Moderated mediation analyses revealed resilience predicted more frequent memory failures (PMQ: b=0.52, p<.001), potentially explained by cognitive load theory (heightened responsibility increasing self-reported lapses). Physical activity mediated this link inversely (b=2.86, p<.001): resilience increased activity, reducing failures among those with stronger ethnic identity resolution (B=0.04, p<.01), aligning with social identity theory. Exploration (EIS_E) showed weaker moderation (B=0.017, p=.023), with non-significant mediation, suggesting identity exploration offers fewer stabilizing benefits. Moderated mediation was significant for resolution (index=0.12, 95%CI[0.047,0.23]). Interventions fostering resilience and ethnic identity commitment may mitigate structural inequities' cognitive toll through protective behaviors.

Presenter: Manoj Kumar Reddy Allam

Presentation Session: MO6

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Professor, Plant and Soil Sciences

Title: Responsiveness Of Rice Genotypes to Elevated CO_2 Growing Conditions

Abstract: Rice (Oryza sativa L.) is a staple food for over 3.5 billion people worldwide. As a C3 crop, its growth and yield are significantly influenced by a changing environment, including increased carbon dioxide (CO_2) levels. Screening and identifying genotypes that respond positively to rising CO2 levels ensure better yields. This study evaluated a diversity panel of rice under ambient CO_2 (aCO_2; 425 ppm) and elevated CO_2 (eCO_2; 725 ppm) conditions using sunlit plant growth chambers (SPAR) with optimal water and nutrient supply. Physiological traits, growth, and development-related characteristics were measured 60 days after sowing. Except for leaf temperature, all other measured traits showed significant differences between ambient and elevated CO_2 levels. Notably, there was a reduction in stomatal conductivity (36%), electron transport rate (34%), chlorophyll content (44%), and nitrogen balance index (33%) compared to the control. There was considerable variation in leaf area among genotypes at aCO_2, ranging from 61 to 713 cm^2; at eCO_2, this range was from 60 to 712 cm^2. The genotype RU1601105 performed the best under ambient CO_2 (aCO_2), achieving growth and physiological vigor indices of 5.8 and 8.7, respectively, while INIA38 exhibited the lowest values (2.4 and 7.2). Under elevated CO_2 (eCO_2), INIA09 demonstrated the highest growth (5.04) and physiological vigor index (10.2), while RU1703132 had the lowest performance (2.9 and 5.8). INIA09 showed the strongest response to CO_2 (CO_2 response index = 1.29), whereas RU1703110 had the weakest response (0.74). These results identify promising genotypes that can serve as valuable genetic resources for breeding rice cultivars that are adapted to high-CO_2 environments in the future.

Presenter: Manoj Kumar Reddy Allam

Presentation Session: MP4

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Professor, Plant and Soil Sciences

Title: Evaluation of Rice Genotypic Variability for Drought Tolerance

Abstract: Rice (Oryza sativa L.) is the primary food source for more than half of the global population, yet its productivity is highly vulnerable to drought stress. Understanding the genotypic variability in physiological and growth responses to water limitation is the first step for identifying drought-tolerant genotypes. In this study, 192 rice genotypes were evaluated under control (CNT) and drought (DS) conditions in outdoor mini-hoop houses. The short duration of DS had a significant impact ($p<0.001$) on morphological and physiological traits. In response to DS, chlorophyll levels decreased by 12% to 20%. Leaf area ranged from 61 to 713 cm^2 under CNT and 42 to 585 cm^2 under DS, while shoot dry weight varied from 2.8 to 13.2 g in CNT and 1.2 to 6.8 g in DS. Shoot dry weight decreased by 52%, leaf area by 48%, and shoot height by 35% compared to CNT. The Based on Drought Response Index (DRI) genotypes Koshihikari and Saber had the highest tolerance, while INIA38 and Rico1 were more drought sensitive. A strong correlation ($r = 0.72–0.81$) between control and drought for traits, suggesting consistent genotype rankings under stress. This study identified genotypes suitable for breeding for early-stage drought tolerance after field validation.

Presenter: Maryam Javanpour

Presentation Session: MO2

Level of Study: Master's

Department: Biochemistry ,Nutrition ,and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr.Galen Collins , Assistant Professor , Biochemistry ,Nutrition, and Health Promotion

Title: Activation of the 26S Proteasome by the Secondary Messenger cGAMP

Abstract: Proteasomes are multi-subunit protein complexes that maintain cellular homeostasis by degrading misfolded, inactive, or unnecessary proteins. This process regulates many critical biological activities, such as cell cycle progression, signal transduction, and immune responses, ensuring proper cellular function. Inadequate proteasome activity is associated with various diseases, including cancer, neurodegenerative disorders, and viral infections, highlighting the importance of understanding proteasome regulation. Recently, 26S proteasomes have been found to be activated by secondary messenger pathways to respond to stress. The cGAS-cGAMP-STING path, a central component of cellular innate immunity, detects cytosolic DNA and initiates immune responses. The cGAS-cGAMP-STING pathway has recently been shown to increase autophagy and the level of immunoproteasomes, improving MHC class I antigen presentation and stimulating adaptive immunity. However, its ability to directly activate conventional 26S proteasomes has not been studied.

We investigated the effects of cGAMP on proteasome activity and kinetics. Using the LLVY peptidase assay, we treated cells with 50 nM cGAMP at various time points and quantified chymotrypsin-like activity by measuring fluorescence upon substrate cleavage. Results showed that cGAMP rapidly increased proteasome activity in treated samples compared to controls. Furthermore, labeling 26S proteasomes with the fluorescent covalent inhibitor MVB127 demonstrated that cGAMP increases proteasome activity without increasing proteasome abundance, unlike the later induction of immunoproteasomes observed previously. Ongoing efforts aim to elucidate cGAMP-induced proteasome activation's molecular mechanisms, including interactions with proteasome subunits or cofactors. Our findings offer valuable insights into cellular defense mechanisms and may inform therapeutic strategies for diseases characterized by proteostasis imbalance or immune dysfunction.

Presenter: Md Abdul Kium Hridoy

Presentation Session: AP3

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. Seungdeog Choi, Professor, Electrical and Computer Engineering

Title: A Compact, Single Stage, Medium-Voltage Line Impedance Stabilization Network

Abstract: Wide-bandgap semiconductor devices rated above 1 kV are transforming medium-voltage (MV) power electronics in industries such as renewable energy, electric transportation, and aerospace. Their high-speed switching enables unprecedented efficiency and power density but also generates significant conducted electromagnetic interference (EMI), creating major challenges for certification and commercialization. Line impedance stabilization networks (LISNs) are widely employed to measure and certify EMI. However, existing LISNs are primarily designed for low-voltage applications and cannot reliably support EMI measurements for MV converters, leaving a critical gap between laboratory testing and industrial certification. This work proposes a compact, single-stage LISN rated at 1.5 kV, 75 A, and 30 MHz, the first of its kind to address MV commercial applications. The design introduces parasitic mitigation strategies, including negative mutual inductance PCB trace arrangements to suppress capacitor parasitic without antiresonances, and a custom air-core inductor with optimized winding geometry to minimize parasitic capacitance while ensuring high-current capability. These innovations yield a LISN with stable 50 Ω impedance, >45 dB isolation, and <0.4 dB voltage division factor deviation across the 150 kHz–30 MHz range, fully compliant with CISPR 16-1-2 standards. Experimental validation on a 300 kVA MV EMI testbed demonstrates accurate performance above 1 kV, and reliable EMI characterization into previously unserved voltage ranges. By enabling precise EMI compliance measurements at MV levels, the proposed LISN bridges a critical technology gap and provides a practical pathway for the commercialization of next-generation WBG-based converters in grid, transport, and aerospace sectors.

Presenter: Md Mehedi Hasan Khan Shaon

Presentation Session: MO4

Level of Study: PhD

Department: Civil and Environmental Engineering

Category: Engineering

Advisor: Dr. Nazimuddin Wasiuddin, Professor, Richard A. Rula School of Civil & Environmental Engineering

Title: A Multi-Parameter Ranking Framework for Evaluating Bio-based Recycling Agents in High RAP Binder

Abstract: The stiffness and poor relaxation of RAP (Reclaimed Asphalt Pavement) typically limit its recycling to roughly 10–20% in highway asphalt pavement by the State DoTs. Recycling agent (RA), particularly newly introduced bio-based RAs—has the potential to increase RAP usage and is increasingly being used to enable higher RAP content (>30%). Selecting an effective bio-based RA and its dosage remains difficult because improvements in low-temperature relaxation can trade off against rutting resistance. Previous studies evaluated individual parameters in isolation. This work applied a multi-parameter framework, resolving conflicting metrices into clear recommendations on RA type and dosage for high-RAP binders. This study assessed three commercial bio-based RAs- Bio-1 (modified vegetable oil), Bio-2 (tall oil fatty-acid derivatives), and Bio-3 (mixture of bio-oils) in blends of PG 58-28 binder containing 35% RAP (RBR= 0.30). RA dosage was determined by two methods, NCHRP Report 927, Method 1 (restore the low-temperature grade to −28°C) and NCHRP Report 1130 Method (identify doses that keep PGH ≤ target PGH +5.9). Performance of RAs was evaluated using five metrices—effective grade span, ΔTc, Glover–Rowe (G-R) parameter, G*sinδ and Christensen–Anderson R-value. In this study, mixture of bio-oils (Bio-3) showed the most balanced performance across metrices; modified vegetable oils (Bio-1) gave strong low-temperature improvement (positive ΔTc, wider grade span) but with trade-offs in other metrices; tall-oil derivatives (Bio-2) were least favorable at low temperatures and required higher doses. This study turns differing rheological results into clear, actionable guidance for RA selection and dosing in high-RAP binders.

Presenter: Melvin L. Smith Jr.

Presentation Session: MO7

Level of Study: PhD

Department: Instructional Technology and Workforce Development

Category: Education, Arts and Sciences, and Business

Advisor: Dr. David Buys, Health Sciences

Title: Improving Patient Outcomes through Provider Continuing Education

Abstract: Rural and agricultural families face social determinant disparities such as economic volatility, occupational hazards, and mental health stigma. Despite these recognized challenges, rurality and occupational context are often overlooked in provider cultural competency training.

To address this gap, the Agriculture Family Friendly Training and Designation (AFTD) Program was developed as a continuing education initiative for healthcare providers serving rural and agricultural communities. The program consists of five self-paced, CME-accredited online modules. Topics include rural health realities, agricultural stress and mental health, economic challenges, telehealth delivery, and culturally sensitive communication. Participants receive continuing education credits and a digital designation badge to encourage adoption and visibility.

Between February and August 2025, nearly fifty individuals expressed interest, with fifteen confirmed registrants and seven completions. Partnered campaigns with provider organizations proved effective in outreach, while CME credits emerged as a primary motivator for participation. Findings highlight three key insights for innovation: (1) administrative fatigue contributed to attrition at registration and completion, (2) lack of role specificity diluted urgency among potential participants, and (3) device modality and user resources influenced engagement.

This presentation will share lessons learned and innovation considerations, emphasizing how continuing education can enhance provider preparedness to develop trust and improve outcomes for their rural and agricultural patient populations.

Presenter: Michelle Roy

Presentation Session: AO5

Level of Study: PhD

Department: Biochemistry, Nutrition, and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr. Carrie Vance, Associate Professor, Biochemistry

Co-Advisor: Dr. Andy Kouba, Professor, Wildlife Ecology and Management

Title: Targeted preservation of the mitochondrial vesicle: bovine serum albumin extends Fowler's toad sperm motility and integrity

Abstract: Bufonid sperm are characterized by elongated heads and a specialized midpiece, or mitochondrial vesicle (MV), which fuels ATP production for motility. This configuration increases susceptibility to motility loss during cold storage and cryopreservation compared with other amphibians, creating a need for targeted preservation strategies. Bovine serum albumin (BSA), widely used in cryopreservation, minimizes oxidative stress, lipid peroxidation, and may enhance sperm stability during storage. This study evaluated whether BSA enhances cellular stability during short-term cold storage of Fowler's toad (Anaxyrus fowleri) sperm by protecting the MV, as well as maintaining morphology and motility. Spermic urine collected from 19 males was divided and treated with 0.25–0.75% BSA or control, and sperm parameters monitored over 14 days. BSA-treated samples maintained significantly higher motility than the controls at days 2 ($p < 0.01$), 4 ($p < 0.0001$) and 7 ($p < 0.05$). Improved maintenance of motility in BSA-treated samples corresponded with greater preservation of MV structure. Motility and MV presence were not significantly different among groups at later timepoints (days 11 and 14), indicating a loss of BSA's protective efficiency with extended cold storage. Morphological preservation was also significantly improved by BSA at days 2 ($p < 0.008$), 4 ($p < 0.01$), and 7 ($p < 0.01$). Performance did not differ among BSA concentrations, indicating robust efficacy across doses. These results demonstrate that BSA protects bufonid sperm function and structure during short-term cold storage. Given species diversity, broader evaluation is needed, but this model highlights BSA's promise for amphibian conservation.

Presenter: Minel Guler

Presentation Session: AP1

Level of Study: PhD

Department: School of Human Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Benjamin Burke, School of Human Sciences

Title: Solo and Social Video Gaming Patterns: The Role of Motivation

Abstract: The general trend of high social gaming among families in the population (Entertainment Software Association, 2024) and the importance of evaluative perceptions of leisure activities for development (Melton et al., 2022) guided this study to explore the differences between individuals with varying patterns of gaming satisfaction in social contexts with gaming frequency and motivations. Two latent classes of individuals (N=570) were estimated based on their solo and social gaming satisfaction. Most of the sample (n=494; class 2) reported higher solo and social gaming satisfaction, whereas 76 individuals (class 1) tended to be less satisfied with gaming but with a tendency to be more satisfied with gaming with family. Individuals in class 1 reported higher diversion and competition motivations than individuals in class 2, which might imply the importance of families as safe spaces for individuals to experience diversion from their responsibilities or feel a sense of competence via video gaming.

Presenter: Moeen Ul Islam

Presentation Session: MP5

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Alex Thomasson, Department Head, Professor, Agricultural and Biological Engineering

Co-Advisor: Dr. Dong Chen, Assistant Professor, Agricultural and Biological Engineering

Title: An AI-enhanced Soft Robotic System for Selective Strawberry Harvesting

Abstract: Strawberry harvesting is labor-intensive and requires delicate, selective handling. Current robotic solutions rely mostly on rigid arms, which lack flexibility and often cause fruit damage or require complex mechanisms. To address this, we propose an intelligent soft robotic system for efficient and gentle strawberry harvesting. The system combines an AI-powered computer vision module to detect ripe strawberries, a soft silicone-based robotic arm to handle fruit without damage, and a data-driven control method for smooth, adaptive movement. An adjustable ground vehicle supports flexible field navigation. Initial results show a harvest success rate of 66.7% and an average speed of 240 strawberries per hour, demonstrating the potential of soft robotics for safer and more effective automated harvesting.

Presenter: Mohammad Abdus Shahid Rafi

Presentation Session: MO4

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. John Ball, Professor, Electrical and Computer Engineering

Co-Advisor: Dr. Volkan Senyurek, Assistant Research Professor, Geosystems Research Institute

Title: High-resolution soil moisture measurement using UAS-based GNSS-R: findings from an agricultural field campaign.

Abstract: Accurate, high-resolution soil moisture (SM) estimation is crucial for site-specific precision agriculture (PA) to optimize irrigation scheduling, improve crop yield and quality, and preserve environmental resources. Nevertheless, obtaining detailed SM measurements at the sub-field scale remains a major challenge. Unmanned Aircraft Systems (UAS) offer a practical approach by enabling efficient and spatially detailed SM monitoring at high resolution. Although satellite-based microwave remote sensing is commonly employed for large-scale soil moisture (SM) retrieval, its spatial resolution is inadequate for localized agricultural needs. This study presents a UAS-based passive Global Navigation Satellite System Reflectometry (GNSS-R) method for producing high-resolution SM maps tailored to PA. The approach leverages custom-designed UAS platforms equipped with a low-cost GNSS receiver and supporting sensor systems. Over three years, data were acquired from a 2.31-hectare corn and cotton field area utilizing GNSS-R, multispectral imaging, LiDAR (Light Detection and Ranging), and in-situ soil moisture measurements. This study examines how receiver antenna properties, surface conditions, and different GNSS constellations affect the GNSS-R observations. In addition, it investigates feature selection and normalization methods that are essential for precise soil moisture estimation. The results emphasize both the opportunities and the limitations of UAS-based GNSS-R in high-resolution SM mapping, demonstrating its promise as a highly dependable tool for site-specific precision agriculture.

Presenter: Mohammad Alizadeh Poshtiri

Presentation Session: AO6

Level of Study: PhD

Department: Physics and Astronomy

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Prabhakar Pradhan, Associate Professor, Physics And Astronomy

Title: Speckle-Free Imaging of Biological Samples using Random laser illumination

Abstract: Laser illumination is widely used in imaging but suffers from speckle noise, which reduces contrast and obscures fine details in biological samples. This limitation stems from the high spatial coherence of conventional lasers. To address this challenge, we developed a random lasing source based on Rhodamine B dye doped with polystyrene beads, which offers multiple scattering to enable optical feedback. The resulting emission combines high brightness with low spatial coherence, enabling speckle-free illumination. We utilized this source to image HeLa cells and human buccal epithelial cells, observing a significant decrease in speckle artifacts compared to traditional laser illumination methods. The enhanced image clarity and structural visibility demonstrate that random lasing is a valuable source of light for biological imaging. By combining laser-level intensity with inherently speckle-free emission, this approach opens new opportunities for high-contrast biomedical imaging of complex tissues.

Presenter: Mohan K. Bista

Presentation Session: MO1

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Professor, Plant and Soil Science

Title: Productivity vs. stability: Genotype × Environment Interaction in cotton lint yield and quality traits

Abstract: The interaction between genotype (G) and environment (E) is crucial in determining the yield and quality of cotton cultivars across various environments. Understanding G × E interaction (GEI) patterns and identifying desirable cultivars for harsh environments is crucial for sustaining productivity in the face of climate extremes. This study quantified GEI by evaluating 16 commercial upland cotton cultivars across 15 irrigated and rainfed environments in Mississippi, and selected cultivars for higher productivity and stability within a multi-trait framework. Various statistical methods, including additive main effect and multiplicative interaction (AAMI), genotype-by-environment interaction (GGE), and multi-trait select index (MTSI), were employed. Results showed differential GEI patterns across lint yield and quality traits. For example, GEI magnitude was higher for lint yield than for quality traits. The crossover GEI was dominant for quality traits, while the non-crossover GEI was dominant for lint yield. The quality traits showed higher consistency across irrigated and rainfed environments than lint yield. Although environmental variance was highest for lint yield, variance by GEI was lower compared to quality traits, indicating a narrower genetic base for lint yield than for quality traits. The selection differential for mean performance and stability across traits revealed a trade-off, underscoring the importance of combined selection for productivity and stability to improve yields and quality across diverse environments. Overall, our findings suggest that ongoing testing of cultivars for environmental stability, combined with multi-trait selection models, can help select cotton cultivars with greater productivity in both dry and irrigated conditions.

Presenter: Mohan K. Bista

Presentation Session: MP4

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Raju Bheemanahalli, Associate Professor, Plant and Soil Science

Title: Pollen-Pistil Interactions as Reproductive Barriers under Drought in Cotton

Abstract: The reproductive stage in cotton (Gossypium spp.) is highly sensitive to drought. However, the roles of drought-stressed pollen and pistils in fertilization and post-zygotic development remain largely unresolved. In this study, reciprocal crosses were made using a combination of pollen and pistil under control (C) and drought (D) conditions during sporogenesis through gametogenesis: D♀×D♂ (C1), D♀×C♂ (C2), C♀×D♂ (C3), and C♀×C♂ (C4). Results showed the highest boll retention rate in C4 (62%), followed by C3 (56%), C2 (48%), and C1 (42%), indicating that the pollen-pistil interaction is key for successful fertilization. Low germination rates of stressed pollen did not translate into fewer seeds, indicating a higher sensitivity of pistils to drought than pollen. In contrast, yield traits, including seed yield, lint yield, seed index, and lint index, were categorized by maternal growing environment. Crosses with D♀ were similar to each other and inferior to those with C♀. Drought-stressed maternal plants showed reduced chlorophyll and impaired physiology (low stomatal conductance, transpiration, and electron transport rates), compared with control plants. The results were consistent across cultivars, with no significant interaction. Our initial results reveal that drought-induced pistils affect the post-zygotic traits, such as the development of healthy embryos, seeds, and fibers. In contrast, paternal stress might be primarily crucial in determining boll retention rates without significantly altering seed or fiber traits in developing bolls. Overall, the results suggest that breeding strategies aimed at improving pistil tolerance, coupled with high boll retention, can enhance yield and quality under drought conditions.

Presenter: Muhammad Hamza

Presentation Session: AP2

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. El Barbary Hassan, Professor, Sustainable Bioproducts

Co-Advisor: Dr. Islam Elsayed, Assistant Research Professor, Sustainable Bioproducts

Title: Sustainable Nano-Cellulose Aerogel for PFAS Removal from Water

Abstract: Perfluoroalkyl substances (PFAS) are forever chemicals attributed to their stable and persistent nature. Due to these properties, they are widely used in consumer products. Once they enter the environment, they pose a significant threat to humans because they cause disruptions in the body when ingested through food and water. Recently, chemical adsorbents have been used to remove PFAS from water. However, our study focused on synthesizing green, sustainable, and cost-effective adsorbents. In this study, we synthesized a quaternary amine-functionalized cellulose nanofiber (CNF)/deacetylated chitin (DAC) composite aerogel, using epichlorohydrin as a crosslinker under mild reaction conditions. The prepared aerogel was characterized using FTIR, TGA, SEM, EDS, N2 adsorption-desorption isotherm, elemental analysis, and conductometric titrations. These analyses confirmed the successful crosslinking and amination of the aerogel by showing high amine content (0.598 mmol/g) and a high surface area (64.5 m^2/g). This aerogel was utilized as an adsorbent for the removal of PFOS and PFHxA from water through adsorption experiments, as a function of solution pH, contact time, temperature, and reusability. The maximum adsorption capacities for PFOS (255.97 mg/g) and PFHxA (83.20 mg/g) were observed at pH 6.78 and 4.1, with rapid adsorption times of 0.5 and 3 minutes, respectively. Multilayer exothermic adsorption of PFAS molecules on a heterogeneous aerogel surface was confirmed by pseudo-second-order kinetics (PSO-2) and the Freundlich model. These results demonstrate the efficiency of sustainable QA-CNF/DAC composite aerogel in removing PFAS from water over multiple cycles.

Presenter: Muhammad Hamza

Presentation Session: MO10

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Hassan El Barbary, Sustainable Bioproducts

Co-Advisor: Dr. Islam Elsayed, Sustainable Bioproducts

Title: Rapid Removal of Perfluoroalkyl Substances from Water Using Nanocellulose-Derived Aerogel

Abstract: Per- and polyfluoroalkyl substances (PFAS) are emerging contaminants, and many chemical adsorbents have recently been utilized for their removal. This study focused on developing a sustainable adsorbent from two naturally abundant polymers: cellulose nanofiber (CNF) and deacetylated chitin (DAC) for PFAS removal. The QA-CNF/DAC composite aerogel was synthesized by simultaneously crosslinking and amine quaternization of CNF and DAC. The synthesized aerogel was characterized using FTIR, TGA, SEM, EDS, N2 adsorption-desorption isotherm, elemental analysis, and conductometric titrations. The characterization results confirmed the successful crosslinking and amination of the aerogel with a high quaternized amine content (0.598 mmol/g) and a high surface area (64.5 m^2/g). The prepared aerogel was used to remove PFOS and PFHxA from water. This removal was studied further by conducting adsorption studies on the effects of solution pH, contact time, temperature, and reusability. The maximum adsorption capacities for PFOS (269.76 mg/g) and PFHxA (83.20 mg/g) were attained at pH 6.78 and 4.1, with rapid adsorption times of 0.5 and 3 minutes, respectively. Multilayer exothermic adsorption of PFAS molecules on a heterogeneous aerogel surface was confirmed by pseudo-second-order kinetics (PSO-2) and the Freundlich model. These results show that the QA-CNF/DAC composite aerogel is an environmentally friendly, sustainable, and cost-effective material for removing PFAS from water over multiple cycles.

Presenter: Muhammad Husnain Manzoor

Presentation Session: MP1

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. El Barbary Hassan, Professor, Sustainable Bioproducts

Title: Extraction of Hemicellulose Sugars from Corncobs by Hydrothermal Pretreatment

Abstract: With increasing concerns about climate change and the depletion of fossil fuels, hemicellulose sugars from lignocellulosic biomass are gaining attention as sustainable feedstocks for producing biofuels and valuable chemicals. In this study, the extraction of hemicellulose sugars from corncob biomass was performed using hydrothermal pretreatment. Response Surface Methodology (RSM) with the Box–Behnken Design (BBD) was employed to optimize different parameters. The tested parameters included the corncob-to-water ratio (0.5:10 to 1.5:10), time (30 to 90 min), and temperature (150 to 170 °C) to achieve the highest sugar yields (xylose, arabinose, and total sugars). The ANOVA results for the full quadratic polynomial model, which evaluates the effects of the three variables on xylose yield, indicate that the model is highly significant and provides a good fit to the data. This was evidenced by the minimal difference (0.003) between the predicted R2 and the adjusted R2. This study reports one of the highest recoveries of hemicellulosic sugars from corncobs and also evaluates degradation byproducts, offering a more efficient and comprehensive pretreatment approach that employs a lower temperature and a mild acid concentration (1%) compared with earlier research. The highest yields of xylose (103.49 mg/g), arabinose (26.75 mg/g), and total sugars (163.21 mg/g) were obtained at 160 ◦C and a corncob-to-water ratio of 0.5:10, after 90 min. Degradation products such as HMF and furfural in the hydrolysate were also analyzed by HPLC. The hydrolysate obtained from hydrothermal pretreatment contained oligomers that were converted into monomers through 1% H2SO4 hydrolysis. The highest yields after the acidic hydrolysis were 301.93 mg/g xylose, 46.96 mg/g arabinose, and 433.79 mg/g total sugars hydrolysis.

Presenter: Muhammad Usama

Presentation Session: MO8

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Heidi Renninger, Associate Professor, Department of forestry, Mississippi State University

Title: Physiological evaluation and screening of drought tolerant genotypes of P. deltoides

Abstract: Populus deltoides, a fast-growing and economically important species, holds significant potential for biomass production, however its productivity is adversely affected by drought stress. This species exhibits wide genotypic variation in drought tolerance, making it a valuable model for stress physiology research. To identify drought tolerant genotypes, we conducted a greenhouse experiment on six Populus deltoides genotypes with contrasting performance, and evaluated key physiological traits under control, drought, and recovery conditions. The genotypes, originating from different U.S. states were classified as either high or low biomass clones. The experiment included a 40-day drought treatment followed by a 14-day recovery phase. Principal component analysis reduced 15 trait variables into five principal components, accounting for 95% of cumulative variation. A comprehensive drought evaluation metric (D-value), growth scores and a recovery index, were used to rank genotypes across parameters. Stepwise regression identified total leaf count, diurnal transpiration rate (DTR), total dry mass (DM), and maximum rate of carboxylation (Vcmax) as the strongest indicators of drought tolerance. Hierarchical clustering further separated the six genotypes and 15 traits into two major groups. Among the tested genotypes, ST-70 and 83-2 consistently ranked highest for drought tolerance, representing promising candidates for use as elite material in breeding programs while 120-4 exhibited an overall poor performance.

Presenter: Nathaniel Bosque

Presentation Session: AP3

Level of Study: Master's

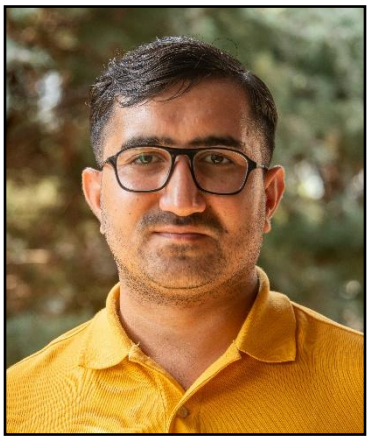
Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Lauren Priddy, Associate Professor, , Department of Agricultural and Biomedical Engineering

Title: Cytocompatibility of gold nanoparticles with protein coatings for use in photothermal therapy against bacterial biofilm

Abstract: With the rise of antibiotic resistance, adequately treating patients with infection is becoming increasingly difficult. These challenges include antibiotic resistance and bacterial biofilms, which can restrict access of antibiotics to the bacteria, requiring higher doses of antibiotics to achieve the same effects. To this end, alternatives to conventional antibiotics are needed. One alternative currently being researched is gold nanoparticles (AuNPs), which can be used for photothermal therapy (PTT). By applying a near-infrared (NIR) laser to AuNPs, they absorb the light and generate localized heat, which can destroy surrounding bacteria. Importantly, heat bypasses bacteria's mechanisms of resistance, causing denaturation of the cell membrane and its proteins. Production of gold nanospheres is easier and less toxic compared to other AuNP morphologies; however, they have the lowest photothermal conversion efficiency rate. To address this issue, spherical AuNPs were functionalized with an elastin-like polypeptide (ELP) coating. By using another protein coating, R2ab, a surface protein derived from Staphylococcus epidermis, the AuNPs are designed to specifically target proteins on Staphylococcal biofilm. To assess the cytocompatibility of these functionalized AuNPs, human embryonic kidney (HEK) 293 cells were treated with AuNPs functionalized with ELP, R2ab, or ELP+R2ab at 10 nm, 20 nm, and 40 nm concentrations. None of the AuNPs resulted in a negative effect on cell growth, which demonstrates the biocompatibility of the coatings and shows promise for their continued study in antimicrobial research.



Presenter: Nauman Ahmed

Presentation Session: AP2

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Gwendolyn Boyd-Shields, Associate Professor, Department of Sustainable Bioproducts

Co-Advisor: Dr. Yunsang Kim, Associate Professor, Department of Sustainable Bioproducts.

Title: Chitosan nanoparticles encapsulated with lemongrass essential oil as wood preservative

Abstract: The increasing demand for sustainable wood-based materials in construction and furniture highlights the urgent need for alternatives to conventional chemical preservatives, which are often limited by toxicity, poor penetration, and inadequate retention. Essential oils, such as lemongrass essential oil (LGEO), offer significant potential as natural, eco-friendly wood protectants due to their antimicrobial and antioxidant properties. However, their volatility and instability hinder long-term effectiveness. Encapsulation within chitosan nanoparticles (CSNPs) has emerged as a promising strategy to enhance the stability, controlled release, and bioactivity of essential oils, thereby overcoming these limitations. This review focuses on the development of LGEO-loaded chitosan nanoparticles (L-CSNPs) as a dual-action wood preservative against fungal and termite degradation. Key aspects of nanoparticle synthesis and characterization are discussed, including particle size, morphology, and loading efficiency, evaluated using techniques such as dynamic light scattering (DLS) and UV-Vis spectrophotometry. The antifungal activity of L-CSNPs will be assessed through inhibitory assays, while leaching tests will provide insight into their stability, retention, and environmental behavior. By combining the structural and antimicrobial benefits of chitosan with the bioactivity of LGEO, L-CSNPs demonstrate improved penetration and durability in wood. This nanobiotechnology-based approach not only addresses the challenges associated with essential oil volatility but also aligns with global efforts to advance sustainable, non-toxic, and innovative wood protection strategies.

Presenter: Nishat Shermin

Presentation Session: MP3

Level of Study: PhD

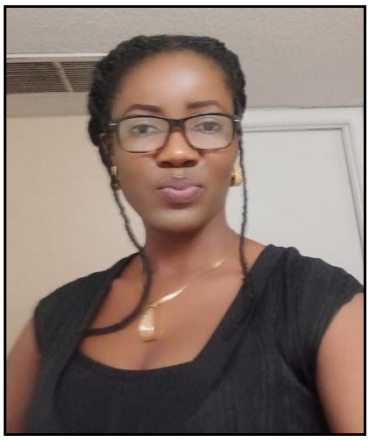
Department: Geosciences

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Narcisa Pricope

Title: From Fine-Scale UAV Observations to Regional-Scale Satellite Models: An Integrative Machine Learning Framework for Classifying Rangeland Vegetation Cover

Abstract: This study presents a scalable, multi-sensor remote sensing framework for classifying fractional vegetation cover (FVC) across rangelands by integrating UAV multispectral imagery, LiDAR structural data, and Sentinel-1/2 satellite observations. Four models were developed using machine learning algorithms—Random Forest (RF) and Extreme Gradient Boosting (XGBoost)—to test the impact of different data fusion strategies on classification performance. Conducted at Martin Ranch, Texas, the framework progresses from high-resolution UAV imagery (Model 1), to fused UAV + LiDAR data (Model 2), and finally to satellite-based upscaled models (Models 3 and 4) trained using UAV-derived labels. Model 2 (UAV + LiDAR) achieved the best performance, with overall accuracy reaching 95%, and F1-Scores of 0.92 for grasslands, 0.81 for shrubs/scrubs, and 0.71 for woody plants. Structural features, particularly canopy height, accounted for up to 32% of model importance, significantly improving classification of complex vegetation types. Model 1, using only UAV data, was fast (15 minutes processing time) but showed reduced accuracy for structurally similar classes, with F1-Scores of 0.62 for grasslands and 0.64 for shrubs. Models 3 and 4, based on Sentinel data and trained with downsampled UAV classifications, offered regional scalability but with lower accuracy (73–82%) and greater misclassification at class boundaries due to coarser resolution and limited training points. This hierarchical fusion strategy bridges local and regional scales, capturing fine-scale structure while enabling broader applications. The framework supports integration with ecological simulation tools such as PHYGROW, enhancing rangeland monitoring, biomass estimation, and hydrologic modeling. By fusing spectral and structural features across platforms, this approach advances high-resolution, ecologically meaningful FVC mapping critical for sustainable rangeland management.



Presenter: Nkolika Omoni

Presentation Session: AP2

Level of Study: PhD

Department: Sustainable Bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. F. J. Franca, Assistant Professor, Sustainable Bioproducts

Title: Non-destructive Evaluation of Wood Properties of Fire-damaged Hard Pine (Ponderosa Pine) in Plumas National Forest, Carlifornia USA.

Abstract: Wildfires cause imbalances in nature and endanger biodiversity by reducing the abundance of fauna and flora. Fire exposure results in significant alterations to wood properties, affecting its strength, stiffness, and overall structural integrity. Traditionally, forest managers rely on visual inspection to assess wood quality and estimate volume loss. Visual assessment is based on external characteristics like stem form, dimensions, and branchiness, but fails to consider internal factors such as decay, stiffness, and strength. Since decay can cause significant damage in standing trees, visual methods do not indicate the extent of internal deterioration that may compromise timber quality and value. Novel commercially available nondestructive evaluation (NDE) technologies have been developed that can determine the quality of wood in standing timber. This study assesses the impact of fire treatments on hard pine wood properties through field NDE testing of standing hard pine trees and compares it with laboratory tests of wood samples. In the first phase of field testing, non-destructive testing was carried out on 56 ponderosa pine trees in the Plumas National Forest. The sample trees tested were from 9 plots across various treatments (control, no burn, one burn, two burns, and three burns). Acoustic time-of-flight (TOF) data were collected from the sample trees in both transverse and longitudinal directions. Transverse acoustic velocity was found to consistently decrease as the fire condition changed from no burn to one, two, and three burns. There was a significant reduction in transverse acoustic velocity in 2-burn and 3-burn conditions when compared with the control. However, no significant differences were found in the longitudinal velocity measured among the different fire conditions. This indicates lower stiffness and possible internal decay, which can significantly impact strength across 2-burn and 3-burn fire treatments.

Presenter: Notsile Dlamini

Presentation Session: MP6

Level of Study: PhD

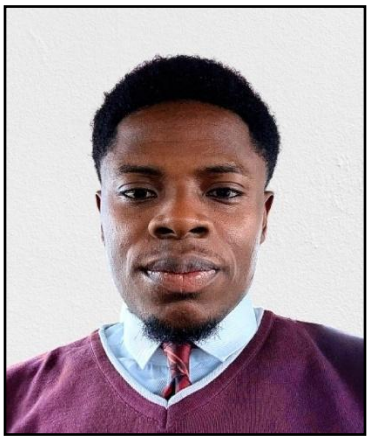
Department: Animal and Dairy Sciences

Category: Agriculture and Life Sciences

Advisor: Dr J. Feugang, Associate Research Professor, Animal and Dairy Sciences

Title: Unlocking metabolic signatures of boar semen quality using untargeted metabolomics

Abstract: Boar fertility depends on high-quality semen to achieve successful fertilization and optimize reproductive efficiency. The quality of boar semen is influenced by changes in the biochemical composition of seminal plasma (SP). Boar SP contains various biochemical components, including metabolites that are crucial for sperm function. Moreover, metabolomics techniques can identify molecular signatures associated with semen quality. This study investigated the metabolomic profile of boar seminal plasma to identify potential biomarkers associated with semen quality. Semen samples (n=64) were collected from sexually mature Duroc boars at Prestage Farms (West Point, MS) and classified as Passed or Failed based on predefined criteria. Untargeted metabolomic analysis was then conducted on seminal plasma using Ultra-High Performance Liquid Chromatography-Mass Spectrometry (UHPLC-MS). In total, 373 metabolites were detected in the positive ion mode and 478 in the negative ion mode. Eleven differentially expressed metabolites (DEMs) were identified. Nine DEMs including indole-3-acetamide, dopamine, glutamine lactate, metanephrine, betaine, allopurinol, formycin B, stearoylcarnitine, and LysoPC were upregulated in Passed samples, while cyclopentylamine and tyrosine were downregulated. These DEMs contribute to improved antioxidant defense and enhancing energy metabolism, sperm motility and fertilizing capacity, making them potential biomarkers of semen quality. Additionally, KEGG pathway analysis revealed significant enrichment in the glycine, serine, and threonine metabolism; linoleic acid metabolism; and phenylalanine and tyrosine metabolism pathways with potential implications in sperm motility. In conclusion, this study provides valuable insights into boar seminal plasma metabolites associated with semen quality. These findings could improve assessment methods and enhance male reproductive performance in swine production systems.



Presenter: Olawale Ajisafe

Presentation Session: MP2

Level of Study: PhD

Department: Comparative Biomedical Science

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Janice Chambers

Title: Drug-Drug Interaction Potential of Novel Oxime-20: A Promising Compound for Organophosphate Poisoning Treatment

Abstract: Organophosphate (OP) anticholinesterase poisoning remains a global health concern, necessitating the need for safer and more effective antidotes. Oxime-20 is a novel acetylcholinesterase reactivator, showing potential for improved efficacy in OP poisoning treatment. Given the likelihood of polypharmacy in OP management, evaluating the drug-drug interaction (DDI) risk of Oxime-20 is important for its translational development. This study examined its effects on key cytochrome P450 enzymes using two in vitro models. A fluorescence-based P450 Glo assay (Promega) was used to test Oxime-20 (1–500 μM) against CYP1A2, CYP2B6, and CYP3A4, with selective inhibitors as controls. In parallel, CYP3A4-mediated testosterone 6β-hydroxylation was assessed in Aroclor 1254–induced rat liver microsomes, with metabolite formation quantified by UPLC-MS, and statistical comparisons made between test groups. Oxime-20 demonstrated minimal inhibition of CYP1A2 and CYP3A4 below 250 μM, with notable inhibition observed only at 500 μM. By contrast, CYP2B6 activity was more strongly inhibited, suggesting potential interactions at therapeutically relevant concentrations. In the testosterone hydroxylation assay, Oxime-20 did not significantly reduce 6β-hydroxylation at therapeutic concentrations, confirming the low inhibitory potential toward CYP3A4. Overall, these findings indicate that Oxime-20 carries a low risk of CYP1A2 and CYP3A4–mediated DDIs, while interactions via CYP2B6 warrant further investigation. These results support the continued development of Oxime-20 as a promising therapeutic candidate for OP poisoning with a favorable metabolic interaction profile. (Supported by NIH U01 NS123255).

Presenter: Olufemi Farotimi

Presentation Session: MO3

Level of Study: Master's

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. L. A. Patrick, Professor, Chemistry

Title: Viability of Predictable HDX in Narrowing the Possible Number of Metabolite Identities of a Known m/z: An Exploratory Study

Abstract: The detection, identification, and quantitation of metabolites is a key application of mass spectrometry to biological questions. Chromatographic retention time, precursor mass-to-charge ratio (m/z), and fragmentation patterns are common aspects of metabolomics “features” and changes of the intensities of those features are tracked when comparing different biological samples or states to find features of interest for the problem at hand. However, translating such experimental data to a specific chemical structure is often intractable. A given m/z may be associated with numerous isomers and isobars (species with the same nominal or measured mass), which makes it difficult to assign a specific chemical structure to a known mass. Given that exchangeable protons are directly related to a chemical’s structure, predictable hydrogen-deuterium exchange (HDX) is hypothesized to provide complementary information toward narrowing down the candidate structures for a given m/z.

In the presented work, hypothetical number of exchangeable protons were assigned to an array of subsets of the Human Metabolome Database (HMDB), based on known exchange behavior obtained from literature and spot-checked experimentally to evaluate the assignments. Isobars of six model compounds and metabolites of three full biospecimen classes were considered separately for this study. In each case information for all species relevant to the given criteria were extracted from the HMDB and theoretical HDX assignments were made. The results were then analyzed to determine the extent to which HDX would hypothetically narrow possible identities of a given mass feature. The promise, potential challenges, and paths forward will be discussed.

Presenter: Oluwabori Adekanye

Presentation Session: AP2

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr Matthew Ross

Title: Lipid peroxidation triggers IL1B release in CES1KD Macrophages.

Abstract: Macrophages are immune cells derived from hematopoietic precursors. They are important cells of innate immunity that maintain host defense and tissue homeostasis. They scavenge tissues to engulf and destroy microbes and alert other cells of the immune system by secretion of lipid mediators, cytokines and chemokine and presentation of foreign antigens. This highlights their significance in adaptive immunity. To carry out their functions and depending on stimulus in their immediate environment, macrophage can either be polarized into pro inflammatory M1 macrophages or the anti-inflammatory M2 macrophages. Carboxylesterases, mostly found in the endoplasmic reticulum, belongs to α/β-hydrolase fold family of proteins and they catalyze the hydrolysis of amide or ester containing substrates into alcohol and carboxylic acids. Six have been identified in the human genome and carboxylesterase 1 and 2 have been extensively studied. We have previously reported the triacylglycerol (TAG) hydrolytic role of carboxylesterase 1 (CES1) in macrophages. Also, we have reported that CES1deficient (CES1KD) macrophages express and secrete more IL1B than control. Here, we show an upward trend of IL1B secretion when THP-1 cells were treated with arachidonic acid and oxidizing agent, menadione. Also, differentiation of CES1KD with antioxidants, ascorbic acid and alpha tocopherol attenuated the secretion of IL1B. Our results demonstrate specific mechanism in CES1 deficient induced IL1B secretion in macrophages and suggest CES1 could be a potential target in managing and regulating hyper-inflammation.

Presenter: Oluwabori Adekanye

Presentation Session: MO10

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr Matthew Ross, Professor, Comparative Biomedical Sciences

Title: Caspase 1 downstream of NLRP3 inflammasomes is more expressed and catalytically active in CES1KD macrophages

Abstract: Macrophages are cells of innate immunity that polarize into M1 or M2 phenotypes. M1 cells fight off infection, while M2 cells help resolve inflammation by clearing apoptotic cells to aid wound healing. Macrophages recognize microorganisms through damage/pathogen associated molecular pattern (DAMPs and PAMPs), secrete cytokines to kill them, and directly engulf them for lysosomal digestion. Inflammasomes are multiprotein complexes that trigger activation of caspase-1. Upon activation, caspase-1 cleaves immature pro-1L1β to mature 1L1β for subsequent secretion. Carboxylesterase 1 (CES1) is a serine hydrolase that hydrolyzes ester-containing lipids and drugs. We have demonstrated its triacylglycerol hydrolytic activity in macrophages, then showed that CES1-deficient macrophages (CES1KD) secrete more pro-inflammatory cytokines than control macrophages and exhibit a broken TCA cycle that is more pronounced than control macrophages. Here we report that CES1KD macrophages express more caspase-1 than control macrophages. Using a fluorometric kinetic assay, CES1KD exhibits greater caspase-1 like activity in baseline and when primed with Nigericin. This activity was further confirmed by the marked reduction of IL1β levels after inhibition with VX-765 caspase-1 covalent inhibitor. Together, these data suggest that CES1 plays a direct or indirect role in pro inflammatory responses in macrophages via enhanced expression and caspase1 activity. [NIH R15HL157818-01A1]

Presenter: Oluwadamilare E. Oloyede

Presentation Session: MO1

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Madhav Dhakal, Assistant Research Professor, Mississippi Water Resources Research Institute

Title: Can Tailwater Recirculation in Row Rice Reduce Water and Methane Fluxes Without a Yield Penalty?

Abstract: Traditional methods of continuous flooding in rice production cause freshwater depletion and significantly contribute to the atmospheric methane (CH4) concentration. Irrigation practices, such as intermittent flooding and furrow irrigation, can reduce evapotranspiration (ET) and CH4 emissions, ultimately making irrigated rice production more sustainable. Field trials were initiated in April 2025 at farmers' fields in the Mississippi delta to (i) evaluate irrigation systems – continuous flooding and recirculating row rice (furrow irrigation with end blocked automated tailwater recirculation system) on CH4 emissions; (ii) quantify ecosystem exchange and ET in rice; and (iii) compare rice growth and development from both irrigation systems. Methane flux was measured using open-path (non-dispersive infrared spectroscopy, LI-7700, LICOR Inc.) gas analyzers, and carbon dioxide (CO2) and water (H2O) fluxes were measured using open-path (wavelength modulation spectroscopy, LI-7500DS, LICOR Inc.) gas analyzers in eddy covariance (EC) systems on the fields. In each EC system, the velocity of vertical transport of eddies from the cropping system was measured using a 3D sonic anemometer (Gill Windmaster, Gill Instruments). Additionally, growth and developmental data were collected and monitored on a bi-weekly basis, and yield data were collected at physiological maturity. The results demonstrated that ET was reduced, with up to 6.7% increase in plant height and 8 – 19% increase in canopy cover, under recirculating row rice compared to continuous flooding. Both irrigation systems showed no differences in yield and yield parameters. The results indicate that evapotranspiration can be reduced by recirculating water in the row rice system without a significant yield penalty.

Presenter: Oluwatobi Abiola

Presentation Session: AO2

Level of Study: PhD

Department: Human Development and Family Science

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Lori Elmore-Staton

Title: Childhood trauma and its influence on adult decision-making: A conceptual framework

Abstract: Experiences of trauma in childhood often leave lasting imprints that extend far beyond the early years of development. Childhood adversity, such as abuse, neglect, family instability, or exposure to chronic poverty, can disrupt developmental processes and create long-term vulnerabilities. These early disruptions are not confined to memory; they influence how individuals evaluate risks, regulate emotions, and make decisions in adulthood.

This conceptual paper explores the link between childhood trauma and adult decision-making through the lens of the socio-ecological model and life course perspective. The socio-ecological framework underscores how multiple layers of influence—individual, family, community, and societal—interact to shape the trajectory from early adversity to adult outcomes. The life course perspective highlights the cumulative impact of trauma, emphasizing how timing, duration, and context of childhood experiences affect pathways into adulthood.

Drawing on literature in human development, family science, and trauma-informed research, this work synthesizes evidence showing how trauma affects decisions related to relationships, financial management, and health behaviors. It also considers how resilience factors, such as supportive family ties and community resources, can buffer negative outcomes.

By situating childhood trauma within both developmental and societal contexts, this study emphasizes the importance of interventions that address not only individual healing but also structural barriers that reinforce cycles of adversity. This framework provides direction for future empirical research and applied outreach, offering insights into how trauma-informed practices can support healthier decision-making across the lifespan.

Presenter: Palani Ganesh Karthikeyan

Presentation Session: MO3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Mahesh K Gangishetty, Assistant Professor, Department of Chemistry

Title: Extended Non-Covalent Interaction–Driven Organic A-Site Emission in Hybrid Low-Dimensional Organic–Inorganic Cadmium Halides

Abstract: Low-dimensional organic–inorganic hybrid metal halides have attracted wide attention for applications in light-emitting diodes (LEDs), sensors, data storage, and mechanical switches due to their outstanding optical properties. Beyond stabilizing the lattice, the organic A-site cation crucially governs perovskite dimensionality, thereby enhancing exciton binding energies and radiative recombination rates. It also influences band gap modulation indirectly through structural effects, shaping the electronic properties, though it does not directly contribute to the frontier orbitals of the hybrid halides.

In this work, we focus on empowering the A-site by introducing novel aromatic ammonium cations to synthesize one-dimensional cadmium-based hybrid halides composed of corner-sharing $[CdCl_6]^{4-}$ octahedra. These materials display intriguing broadband emission with distinct contributions from both the organic cations and the inorganic octahedra. Our experiments reveal that extended non-covalent interactions at the A-site underlie the organic emission, representing a new strategy to enhance cation contributions.

To validate this role, we varied the composition systematically by substituting halides (X = Cl to Br) and introducing alkyl chains without altering the aromatic ammonium framework. All derivatives exhibited similar dual broadband emission, indicating robust contributions from both the A-site and hybridized organic–inorganic states. Comprehensive spectroscopic studies confirmed that extended non-covalent networks are central to the observed A-site emission.

Overall, this study demonstrates a unique approach that leverages rational A-site design to introduce multiple emission centers, enabling stable and efficient intrinsically white-emitting cadmium halides with strong potential for next-generation solid-state lighting technologies.

Presenter: Pankaj Prashad Joshi

Presentation Session: MO6

Level of Study: PhD

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Madhav Dhakal, Assistant Research Professor, Mississippi Water Resources Research Institute,MSU

Title: Mitigating Greenhouse Gas Emissions from Corn Through Protected Fertility Management

Abstract: Corn production relies extensively on nitrogenous (N) fertilizers, which significantly contribute to the atmospheric nitrous oxide (N2O) level. Fertilizer management practices that enhance the N uptake and reduce denitrification rates can reduce N2O effluxes. Field experiments were initiated in May 2024 to evaluate two N application levels (Low: 246 kg N ha-1 and High: 297kg N ha-1 as Urea and Urea Ammonium Sulfate), N-stabilizer (No-stabilizer and 0.75 g ai N-(n-butyl)-thiophophoric triamide (NBPT) kg-1 Urea), fertilizer placement depths (0 and 10 cm), and post-fertilization management (closing trench with mechanically or manually and open trench) on total seasonal carbon-dioxide equivalent (CO2e) emission (including N2O, CH4 and CO2), yield, and yield-scaled emission (YSE) in corn (Zea mays). Treatments were arranged in a randomized complete block design with four replications. Weekly to biweekly measurements of soil N2O, CH4, and CO2 fluxes were taken using trace gas analyzers and static flux chambers. In 2024, results showed that high N rate increased seasonal CO2 production by 12.89% than the low rate. At low N rate, CO2e and YSE were reduced by 11.79% and 12.22%, respectively, compared to the high N rate. However, depths, surface management, and inhibitors had no impact on total emissions. Yield was comparable across all treatments. Results suggest that reduced rates of nitrogen application improve nitrogen use and thus reduce N2O emissions, achieving an optimum yield.

Presenter: Parastou Ahadpour Bakhtiari

Presentation Session: AO3

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Alex Thomasson - Professor and department head of Agricultural & Biological Engineering

Co-Advisor: Dr. Xin Zhang - Assistant Professor from University of Georgia

Title: Evaluating MAVS as a ROS2-Compatible Platform for Agricultural SLAM

Abstract: Agricultural robotics is becoming increasingly important to address labor shortages and to bring precision into farming. For robots to navigate reliably in crop fields, they rely on algorithms such as Simultaneous Localization and Mapping (SLAM), which allow them to build maps and track their position. Testing these algorithms directly in the field is expensive, weather-dependent, and sometimes risky. A simulator can help, but only if it produces results that are close to what we see in reality.

This project explores the Mississippi Agricultural and Autonomous Vehicle Simulator (MAVS) as a ROS2-compatible platform for agricultural robotics research. To test its reliability, we compare how well two widely used visual SLAM algorithms—RTAB-Map and ORB-SLAM3—perform both in real field runs with the Amiga robot and in equivalent simulated environments. We focus on metrics like mapping accuracy, trajectory error, and loop-closure success to see how closely MAVS reflects reality.

Looking ahead, we are also exploring depth-transfer techniques to better align simulated and real stereo imagery. This could further improve the reliability of MAVS as a testing tool for agricultural navigation.

Presenter: Pengyu Wu

Presentation Session: MO7

Level of Study: PhD

Department: Finance and Economics

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Kenneth Roskelley, Professor, Finance and Economics

Co-Advisor: Dr. Anwar Bou Mosleh, Assistant Clinical Professor, Finance and Economics

Title: Incoming CEO Power and Corporate Tax Aggressiveness

Abstract: We examine how CEOs engage in tax avoidance during their tenure and find that newly appointed CEOs who consolidate power by marginalizing other executives and limiting board oversight tend to secure significantly lower corporate tax rates early in their careers. Notably, these powerful CEOs are more likely to pursue tax sheltering within their first three years in office, reflecting a deliberately aggressive strategy that increases the risk of detection and regulatory scrutiny. These effects are constrained in the post-SOX period and among firms with effective monitoring mechanisms, suggesting that power enables new CEO to engage in tax aggressiveness, which is risky and restricted by strong governance.

Presenter: Pengyu Wu

Presentation Session: MO7

Level of Study: PhD

Department: Finance and Economics

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Kenneth Roskelley, Professor, Department of Economics and Finance

Co-Advisor: Dr. Anwar Bou Mosleh, Assistant Clinical Professor, Department of Economics and Finance

Title: Effective Tax Rate and Insider-Informed Stock Option Exercise

Abstract: We investigate executive stock option exercises in companies that reduced their effective tax rate from the third quarter to the fourth quarter between 1996 and 2014 as a form of discretionary earnings manipulation, focusing on a subset of insider trades identified as potentially informed. In firms that decreased taxes, we observed a significant increase in informed insider exercises and decrease of performance during the year following the earnings announcement. Additionally, we find that the likelihood of surpassing analyst forecasts is positively associated with tax reduction. Overall, our findings suggest that insiders knowingly exercise options early when engaging in tax management.

Presenter: Prasanna Bayalusime

Presentation Session: MO6

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash Kumar Jha, Assistatnt Professor, Plant and Soil Sciences

Title: Simulating Nitrogen Leaching from Southern Mississippi Croplands and Its Impact on the Mississippi Sound Using Crop Model and Remote Sensing.

Abstract: Land use and land cover (LULC) changes play a pivotal role in shaping nitrogen (N) dynamics within agricultural watersheds, with far-reaching consequences for coastal ecosystems. This study employed a comprehensive approach integrating spatiotemporal LULC analysis, remote sensing, and machine learning to evaluate how agricultural nitrogen usage affects water quality in the Mississippi Sound. Using USDA Cropland Data Layer (CDL) records from 2008 to 2024, we mapped LULC transitions across the Southern Mississippi watershed and pinpointed nitrogen use hotspots based on cropping intensity and fertilizer application rates. These metrics informed an assessment of landscape vulnerability to nitrogen loss. To quantify downstream impacts, we simulated nitrogen leaching using the DSSAT crop model and remote sensing data like chlorophyll a (Chl-a), and net primary productivity (NPP) as indicators of nutrient enrichment and eutrophication in coastal waters. Regression-based machine learning models were trained on historical Chl-a, NPP, and modeled nitrogen loss data to predict spatial and temporal patterns of nutrient-driven coastal degradation. (Write results here) This integrated framework revealed strong connections between upstream agricultural practices and downstream ecological responses, identifying key zones and timeframes of heightened eutrophication risk. The study underscores the power of combining Earth observation, geospatial analytics, and predictive modeling to track and manage nutrient pollution. The findings offer a robust decision-support tool for sustainable land and nutrient management, equipping policymakers, watershed managers, and coastal conservation planners with actionable strategies to mitigate nitrogen-induced harm in vulnerable estuarine environments.

Presenter: Prattay Dey

Presentation Session: MO8

Level of Study: PhD

Department: Biological Sciences

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Justin A. Thornton, Professor, Biological Sciences

Title: Epitope Mapping of PsaA defines its interaction with Annexin A2 in Pneumococcal Adhesion

Abstract: Background: Streptococcus pneumoniae is a Gram-positive bacterium that asymptomatically colonizes the human nasopharynx but can cause severe invasive diseases. Although polysaccharide-based vaccines protect against certain invasive serotypes, they fail to protect against colonization and contribute to serotype replacement. Our research focuses on the interaction between Pneumococcal Surface Adhesin A (PsaA) and the human receptor Annexin A2 (ANXA2), an understudied interaction potentially leading to protein-based vaccine development, effective against a broader range of serotypes. We hypothesize that pneumococcus binds to the human receptor ANXA2 through PsaA and other adhesins, promoting colonization. Epitope mapping of PsaA and targeting these interactions will identify new targets for the development of protein-based vaccines against the pathogen.

Methods: Using the far-western blot technique, we previously identified ANXA2 as a receptor for PsaA. Confocal microscopy confirmed ANXA2 expression on the surface of Detroit 562 nasopharyngeal cells. Based on the crystal structure of PsaA, we designed and cloned five PsaA-derived peptides, expressed and purified them for epitope mapping. Additional far-western blot assays with S. pneumoniae whole-cell lysates probed using recombinant ANXA2 revealed further adhesins interacting with ANXA2.

Results: Binding assays of PsaA peptides revealed the C-terminus of PsaA interacting with ANXA2. Far-western blot analysis of pneumococcal whole-cell lysates probed with recombinant ANXA2 revealed multiple bands, indicating additional pneumococcal proteins interact with ANXA2.

Conclusion: Our findings establish ANXA2 as a critical host receptor for pneumococcal adhesion. Defining the PsaA-ANXA2 interaction and identifying novel adhesin-receptor pairs could lead to next-generation protein-based pneumococcal vaccines that limit colonization and offer protection across diverse serotypes.

Presenter: Rejane Paulino

Presentation Session: MP5

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Vitor Souza Martins, Assistant Professor, Department of Agricultural & Biological Engineering

Title: Unlocking aquatic spectral features with orthogonal transformations

Abstract: Inland, coastal, and open ocean waters are optically diverse ecosystems and collectively impart colors that uniquely shape the appearance of Earth's surface. These colors arise from the interaction of sunlight with dissolved and particulate matter within the water column, including phytoplankton, other suspended particulate matter such as minerals, and colored dissolved organic matter. Together, these materials absorb and scatter the incident light in a spectrally selective manner, producing the bulk of optical properties of natural waters. These optical properties control the shape and intensity of the remote sensing reflectance (Rrs, $sr{-}1$) spectra, the universal radiometric quantity used to describe the observed color of water bodies. Although the aquatic remote sensing community has made considerable effort to interpret the spectral composition of water and its "color meaning", a major challenge persists in determining how colorful these ecosystems can be. In this study, we introduced the concept of orthogonal transformations for aquatic systems through a novel approach named Orthogonal Components of Water (OCW). The OCWs consist of three orthogonal components - "brightness", "greenness", and "blueness" - each constructed to key optical features associated with sediments, phytoplankton, and clear waters, respectively. These components are expected to capture the spectral composition of water, be broadly applicable across diverse water types, and remain mappable and intuitive for end-users. Transformation coefficients were obtained for NASA's Plankton, Aerosol, Cloud, Ocean Ecosystem (PACE) satellite, which measures $Rrs(?)$ via its Ocean Color Imager. These coefficients were derived using the Gram–Schmidt orthogonalization technique (Jackson, 1983), combined with a stringent endmember selection process from a robust dataset of simulated and in situ Rrs measurements (n=12,867). The OCWs were qualitatively and quantitatively assessed across diverse aquatic systems in a global approach. These evaluations confirmed the reliability of the OCW results for systematic use and improving the interpretability of water color in aquatic systems.

Presenter: Rezwana Rahman Setu

Presentation Session: AO5

Level of Study: PhD

Department: Biochemistry, Nutrition, and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr. George Popescu, Institute for Genomics, Biocomputing & Biotechnology - IGBB.

Title: Analysis of Systemic Acquired Resistance by Monitoring Redox-Mediated Transcriptional Dynamics in Arabidopsis

Abstract: In plants, systemic acquired resistance (SAR) provides long-lasting, broad-spectrum protection against pathogens through a priming mechanism involving redox and phytohormonal signaling. However, there is limited knowledge regarding transcriptional dynamics during SAR onset and the redox involvement in SAR maintenance. Our previous work has identified several key genes to understand the regulatory dynamics of SAR onset. Here, we investigate these dynamics by analyzing the transcriptional activity of GRXS13 (Glutaredoxins, At1g03850), a disease resistance-related CC-type GRX strongly inducible by SA. To track these dynamics, we fused a luciferase reporter gene to the promoter region of GRXS13 by gateway cloning. We transformed A. thaliana wild-type Columbia ecotype (Col-0) and the SAR-defective top2 mutant plants with this GRXS13 reporter construct using Agrobacterium-mediated floral dip transformation. We infiltrated T2 generation plants with Pseudomonas syringae pv. tomato DC3000 expressing avrRPT2 to prompt SAR. Promotor transcriptional activity was then tracked by monitoring bioluminescence at two-hour intervals after infection for four days in 12 h light and 12 h dark diurnal cycles. We observed oscillatory dynamics of the GRXS13 expression in planta during SAR onset and compared it with the transcriptional response of SAR driver genes previously identified. Comparative analysis of GRXS13 dynamics in Col-0 and the top2 mutant provides insights into how dysregulated redox signaling affects SAR onset. In the future, we plan to analyze the transcriptional dynamics of a larger set of SAR marker genes to further understand the role of redox signaling in plant immunity.

Presenter: Rezwana Rahman Setu

Presentation Session: MP6

Level of Study: PhD

Department: Biochemistry, Nutrition and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr. George Popescu, Institute of Genomics, Biocomputing & Biotechnology.

Title: Analysis of Systemic Acquired Resistance by Monitoring Redox-Mediated Transcriptional Dynamics in Arabidopsis

Abstract: In plants, systemic acquired resistance (SAR) provides long-lasting, broad-spectrum protection against pathogens through a priming mechanism involving redox and phytohormonal signaling. However, there is limited knowledge regarding transcriptional dynamics during SAR onset and the redox involvement in SAR maintenance. Our previous work has identified several key genes to understand the regulatory dynamics of SAR onset. Here, we investigate these dynamics by analyzing the transcriptional activity of GRXS13 (Glutaredoxins, At1g03850), a disease resistance-related CC-type GRX strongly inducible by SA. To track these dynamics, we fused a luciferase reporter gene to

the promoter region of GRXS13 by gateway cloning. We transformed A. thaliana wild-type Columbia ecotype (Col-0) and the SAR-defective top2 mutant plants with this GRXS13 reporter construct using Agrobacterium-mediated floral dip transformation. We infiltrated T2 generation plants with Pseudomonas syringae pv. tomato DC3000 expressing avrRPT2 to prompt SAR. Promotor transcriptional activity was then tracked by monitoring bioluminescence at two-hour intervals after infection for four days in 12 h light and 12 h dark diurnal cycles. We observed oscillatory dynamics of the GRXS13 expression in planta during SAR onset and compared it with the transcriptional response of SAR driver genes previously identified. Comparative analysis of GRXS13 dynamics in Col-0 and the top2 mutant provides insights into how dysregulated redox signaling affects SAR onset. In the future, we plan to analyze the transcriptional dynamics of a larger set of SAR marker genes to further understand the role of redox signaling in plant immunity.

Presenter: Richard Boateng

Presentation Session: MP3

Level of Study: Master's

Department: Biological Sciences

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Gordon Donna, M. Professor, Biological Sciences

Co-Advisor: Dr. Thornton Justin, A. Professor, Biological Sciences

Title: Calcium-mediated loss of actin cables correlates with occidiofungin resistance

Abstract: Calcium is an important divalent cation linked to diverse cellular activities through its role as a signaling molecule. In fungi, calcium has been shown to alter sensitivity to antifungal agents, including the compound occidiofungin. In vitro studies have also revealed a role for calcium in regulating biomechanical properties of the cytoskeletal filament, actin. These studies suggested that differences in the composition of charged amino acids at the N-terminus of different cytosolic actin isoforms may influence their bundling properties leading to different structural organization and functions within cells. Given prior results from the lab showing that calcium induces resistance to occidiofungin and that the biological target of occidiofungin is actin, we hypothesize that calcium-mediated changes in actin organization may be driving the resistance detected for occidiofungin. We propose to directly test this in an in vivo setting using a Saccharomyces cerevisiae Δact1 shuffle strain expressing ACT1 from Candida albicans and S. cerevisiae as these differ in the number of charged amino acids at their amino terminus. Analysis of growth kinetics of strains expressing these ACT1 genes found no difference in cell doubling time when comparing growth in media with and without supplemental calcium. Preliminary microscopy results found 59% of the cells expressing S. cerevisiae ACT1 lacked actin cable organization within the first two hours of calcium exposure with actin cables returning by three hours of exposure. Results from this study will provide a link between cellular events regulating actin organization and occidiofungin bioactivity which can be leveraged to improve antifungal efficacy.

Presenter: Richard H. Lloyd, III

Presentation Session: AO2

Level of Study: PhD

Department: History

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Christian Flow, Assistant Professor, Department of History

Title: Words of the Nation: Irish Women and the Politics of Language Revival

Abstract: This paper examines the role of Irish women in the Gaelic League between 1893 and 1919, focusing on their contributions to the language revival through education and cultural activism. While much scholarship emphasizes the efforts of male leaders, women's work in teaching, organizing, and promoting Irish proved central to embedding the language into both public and private life. By framing instruction as a natural extension of domestic responsibilities, women positioned themselves within accepted gender norms while simultaneously using those norms as a platform for cultural and political agency. Their activism highlights how conformity and dissent operated in tandem, allowing women to broaden their influence without directly challenging prevailing expectations. Drawing on League pamphlets, writings by women leaders, and other primary sources, this study underscores the significance of women's efforts at multiple levels of education, from primary schools to universities. These activities not only sustained the revival but also advanced a vision of national identity in which language became inseparable from political belonging. Recognizing women's role in this process complicates traditional narratives of the Gaelic Revival and demonstrates how education functioned as a key site of resistance to cultural erasure. By situating women at the center of this history, the paper shows the revival as a gendered project in which educational activism offered Irish women new avenues for visibility, authority, and participation in shaping the nation.

Presenter: Rideeta Islam Aishy

Presentation Session: AO4

Level of Study: Master's

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Hasan C. Tekedar, Assistant Research Professor, Department of Comparative Biomedical Sciences

Co-Advisor: Dr. Mark L. Lawrence, Director and Professor, Department of Comparative Biomedical Sciences

Title: Adaptive Evolutionary Dynamics and Associated Fitness costs in Edwardsiella ictaluri under Colistin Stress

Abstract: Background: Aquaculture is an important part of global food production but is threatened by bacterial diseases often managed with antibiotics. Prolonged use of antibiotics has contributed to the emergence of multidrug-resistant (MDR) bacteria, complicating treatment. Resistance genes can persist in aquaculture environments, emphasizing the need to understand resistance evolution. Adaptive Laboratory Evolution (ALE) provides a powerful approach to study antibiotic resistance under controlled conditions. We developed an ALE model using Edwardsiella ictaluri 93-146, the causative agent of enteric septicemia in channel catfish, to investigate colistin resistance.
Methods: ALE was conducted by exposing four independent replicates of E. ictaluri 93-146 to stepwise increases in colistin concentration, ultimately reaching 324-fold the minimum inhibitory concentration (MIC). Phenotypic characterization included growth curves, antibiotic susceptibility tests, biofilm formation, and MIC breakpoint analysis. In frame deletion method was used to knock out the insertional sequence (IS) to evaluate its role in antibiotic resistance development.
Results: Whole-genome sequencing of evolved populations identified a 46,504-bp chromosomal deletion spanning a contiguous region. Additional single-nucleotide polymorphisms accumulated in genes implicated in efflux, regulation, and stress responses. The deletion was bounded by IS element suggesting transposition-mediated rearrangement. ALE with IS mutant did not adapt to higher antibiotic concentrations.
Conclusion: Colistin exposure promotes SNP accumulation and large-scale genomic deletions in E. ictaluri, providing important insight into the mechanisms and trade-offs of antibiotic resistance evolution in aquaculture pathogens.

Presenter: Rideeta Islam Aishy

Presentation Session: MP2

Level of Study: Master's

Department: Comparative Biomedical Sciences

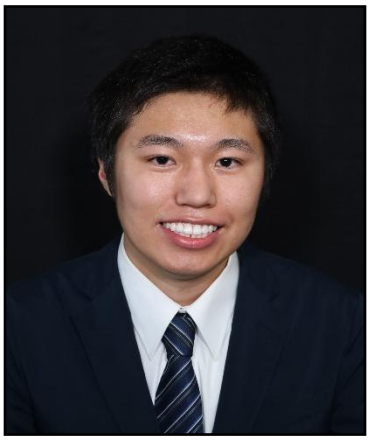
Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Hasan C. Tekedar, Assistant Research Professor, Department of Comparative Biomedical Sciences

Co-Advisor: Dr. Mark L. Lawrence, Director and Professor, Department of Comparative Biomedical Sciences

Title: Insights into Adaptive Evolution and Fitness Trade-offs in Aeromonas hydrophila under Oxytetracycline Dihydrate Stress

Abstract: Background: Aquaculture is a vital source of global food production but remains highly vulnerable to bacterial diseases. These infections are frequently managed with antibiotics, yet prolonged use contributes to the emergence of multidrug-resistant (MDR) pathogens. Such resistance genes can persist and disseminate in aquaculture environments, underscoring the need to understand their evolutionary trajectories. Adaptive Laboratory Evolution (ALE) provides a powerful platform to study antibiotic resistance under controlled conditions that mimic environmental pressures. Here, we applied ALE to Aeromonas hydrophila ML09-119 to investigate resistance evolution against oxytetracycline dihydrate (OTC), one of the FDA-approved antibiotics for aquaculture.
Methods: Two independent ALE strategies were designed. In the first, six replicates of A. hydrophila were serially passaged with OTC using a two-fold increment approach, gradually doubling concentrations. In the second, replicates were exposed to stepwise increases based on minimum inhibitory concentration (MIC) values until high-level resistance emerged.
Results: Whole-genome sequencing of evolved populations revealed structural genomic changes, including deletions in araF across several replicates. Additional mutations included SNPs, insertions, and frameshifts in genes related to efflux regulation, ribosomal activity, and transcriptional control. Notably, SNPs occurred in tetR regulators, RNA helicase (rhlB), aminotransferase, and porin family proteins, implicating diverse resistance mechanisms. Phenotypic assays indicated fitness trade-offs, such as altered growth rates, reduced motility, and shifts in stress tolerance.
Conclusion: Prolonged OTC exposure drives both SNP accumulation and structural gene deletions in A. hydrophila. The two ALE strategies demonstrate distinct evolutionary paths, offering new insight into resistance dynamics in aquaculture pathogens.



Presenter: Riku Kikuta

Presentation Session: AO3

Level of Study: PhD

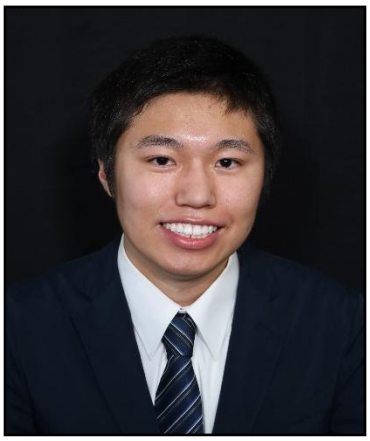
Department: Computational Engineering

Category: Engineering

Advisor: Keiichi Motoyama, Research Professor, Center for Advanced Vehicular Systems

Title: A Study on Parameter Optimization for Robust Motion Control Using Taguchi Method

Abstract: The development of autonomous driving systems aimed at reducing traffic accidents is progressing rapidly. One key task in such systems is path following, often achieved using PID control. While various optimization approaches—such as machine learning and genetic algorithms—have been proposed to tune PID parameters, they sometimes suffer from a lack of robustness. In particular, deadtime is difficult to predict and control, making it a major challenge for maintaining robust performance across diverse scenarios. This study proposes a robust parameter optimization method based on the Taguchi method and applies it to PID-based steering control. Experimental results demonstrate that the proposed approach improves system robustness against deadtime disturbances, as measured by an increased signal-to-noise (S/N) ratio.



Presenter: Riku Kikuta

Presentation Session: MO9

Level of Study: PhD

Department: Center for Advanced Vehicular Systems

Category: Engineering

Advisor: Dr. Daniel W. Carruth, Associate Research Professor, Center for Advanced Vehicular Systems

Title: Dynamic Pedestrian Trajectory Estimation for Autonomous Vehicle Using Risk Potential Theory

Abstract: Various self-driving assistance systems, such as Advanced Driver Assistance Systems (ADAS), are currently under active development. Among the key tasks in autonomous driving, pedestrian avoidance is particularly critical to ensure safe transportation. To achieve this, it is essential to understand both driver and pedestrian intentions. One effective approach for modeling such behavior is the Risk Potential theory. This study proposes a Risk Potential-based path planning framework that incorporates pedestrian dynamics into the planning process. Unlike conventional methods, the proposed system accounts not only for pedestrian positions, but also their velocity and orientation, enabling prediction of future trajectories. As a result, the planner can generate more adaptive and anticipatory paths. Experimental results demonstrate that our method outperforms existing Risk Potential-based planners in terms of path appropriateness and responsiveness to dynamic pedestrian behavior.

Presenter: Ruchita Bhattarai

Presentation Session: MO6

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Prakash Kumar Jha, Assistant Professor, Plant and Soil Sciences

Title: Calibration and Validation of CERES-Maize for Simulating Corn Phenology and Yield in Mississippi

Abstract: Corn (Zea mays L.) is a vital crop for food, feed, and biofuel systems in the United States, yet its productivity is increasingly threatened by climate variability and resource inefficiencies. Despite advances in agronomic practices, limited cultivar-specific modeling and optimization strategies hinder the development of resilient corn production systems in Mississippi. Without targeted adaptation measures, climate-induced yield losses and environmental degradation may compromise food security and economic sustainability. This study aimed to calibrate and validate the CERES-Maize model for two hybrid cultivars (DK 70-27 and DK 70-45) using field experiments conducted in 2024 and 2025 at North Farm, Starkville, MS, and across MAFES trial locations. Genetic coefficients were estimated using GENCALC and GLUE, and model performance was evaluated using R2, RMSE, MBE, and d-index. Results showed high model accuracy (above 0.9 R2 and 0.9 d-index), highlighting its potential as a robust tool for enhancing decision-making in crop management.

Presenter: Ryanne Murray

Presentation Session: AO4

Level of Study: Master's

Department: Pathobiology and Population Medicine

Category: Forest Resources and Veterinary Medicine

Advisor: Barbara Kaplan, Professor, Department of Comparative Biomedical Sciences

Co-Advisor: Beth Peterman, Assistant Clinical Professor, Department of Pathobiology and Population Medicine; Kaylin McNulty, Assistant Clinical Professor, Department of Pathobiology and Population Medicine; Debra Moore, Assistant Clinical Professor, Department of

Title: Analysis of PCBs, naphthalene, and heavy metals in common bottlenose dolphins (Tursiops truncatus) and their prey species in the Mississippi Sound

Abstract: Common bottlenose dolphins (Tursiops truncatus) are native to the Mississippi Sound, a region characterized by significant human activity that can contribute to elevated levels of environmental contaminants, such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and heavy metals. To investigate the sources of contaminants in this population, we selected five fish species that are common prey items of bottlenose dolphins to compare the chemical profiles in the tissues of fish to those found in the dolphins. Tissue samples (blubber/fat, kidney, liver, and muscle) were collected from necropsies from stranded bottlenose dolphin and fish. Samples were analyzed for 7 PCBs, naphthalene, and 9 heavy metals. We found that PCBs were readily detected in dolphin tissues; however, there was almost no detection of PCBs in fish tissues. Due to this, the fish PCB results are pending as analytical methods are being revised to improve detection. Naphthalene was detected in all dolphin tissues and all fish tissues except fish fat. Heavy metals were detected in all dolphin tissues and almost all fish tissues, except for cadmium in fish muscle. Mercury was biomagnified to the highest degree in the kidney, liver, and muscle. These results suggest that biomagnification may not be a major mechanism for bioaccumulation of PCBs, naphthalene, or most heavy metals, suggesting that chemical bioaccumulation in dolphins comes from alternative sources. Regardless of the mechanisms of exposure or bioaccumulation, the presence of these contaminants in this dolphin population might impact their overall health, highlighting the importance of long-term surveillance.

Presenter: Sachin Promodh Cooray

Presentation Session: AP3

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Nuwan Wijewardane , Assistant Professor , Agricultural and Biological Engineering

Co-Advisor: Dr. Mary Love Tagert , Extension Professor , Agricultural and Biological Engineering Dr.Hussein Gharakhani , Assistant Professor , Agricultural and Biological Engineering Dr. Raju Bheemanahalli Rangappa ,Assistant Research Professor,Plant and Soil Sciences

Title: Optimizing ROI Size and Sampling Strategies in Hyperspectral Imaging for Greenhouse Plant Phenotyping

Abstract: Hyperspectral Imaging (HSI) is an advanced technology in plant phenotyping that enables the analysis of plant health, stress response, nutrient status, and physiological traits using spectral information. However, many previous studies rely on the per-leaf average spectrum, which is not effective in greenhouse conditions due to the shading effect. Averaging spectra across an entire leaf leads to feature dilution and reduces classification accuracy under greenhouse conditions. This study examined the effect of the region of interest (ROI) size and per ROI sampling density on soybean genotypes (DS25-1, William 82, and DT97-4290) classification performance using spectral data derived from greenhouse hyperspectral imaging. ROI configurations included 2x2, 4×4, 6×6, 8×8, and 10×10-pixel blocks, with sampling densities of 8, 16, 32, 40, 48, 56, and 64 points per leaf. Multiple ML classification models, including Gradient Boosting (GB), k-Nearest Neighbors (KNN), Logistic Regression (LOGREG), Multilayer Perceptron (MLP), Random Forest (RF), and Support Vector Machine with RBF kernel (SVM-RBF), were trained on these spectral index subsets and benchmarked against the whole-leaf average spectrum, which was used as the baseline for comparison. Statistical analyses (ANOVA) and composite scoring were applied to determine ROI and sample size settings that best balance accuracy with computational efficiency. Results demonstrated that moderate ROI sizes (6×6 or 8×8) combined with intermediate sampling densities (32–48 points) achieve near-optimal genotype classification accuracy compared to the baseline. ROI-based sampling with spectral indices coupled with ML classifiers outperformed whole-leaf averaging, offering a more robust and computationally efficient framework for hyperspectral imaging pipelines in greenhouse soybean phenotyping.

Presenter: Saida Zinnurine

Presentation Session: AO4

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Mark Lawrence, Professor & Director, Department of Comparative Biomedical Sciences.

Title: Vaccine Optimization and Virulence Modulation of Virulent Aeromonas Hydrophila with Mutations in RTX Toxin genes

Abstract: Aeromonas hydrophila causes Motile Aeromonad Septicemia (MAS) in channel catfish. In 2009, a clonal type emerged, designated virulent A. hydrophila (vAh), that led to the loss of 5.5 million pounds of fish in the US and continues to threaten the aquaculture industry. Comparative genomic analysis revealed that RTX toxins, encoded by rtxC and rtxA, are unique to vAh compared to other sequenced A. hydrophila strains. vAhΔrtxC, vAhΔrtxA, and double-deletion vAhΔrtxA-C mutants were constructed using the in-frame deletion method. RTX-deficient mutants demonstrated efficacy as live attenuated vaccine candidates due to reduced virulence and strong protection against wild-type vAh (Figure 1). This study aimed to optimize vaccine delivery via immersion exposure and assess the role of RTX toxin in vAh virulence. The ability of the mutants to replicate intracellularly was compared to wild-type strain using the J774A.1 murine macrophage cell line, while the invasion was compared using EPC fathead minnow epithelial cell line. Interestingly, intracellular survival in J774A.1 cells decreased from 1 to 3 hours post-infection in RTX-deficient strains compared to wild-type, but from 3 to 6 hours, RTX-deficient strain replication remained constant while wild-type strain decreased. Similarly, RTX-deficient vAh had significantly reduced invasion of EPC cells at 3 hours post-infection compared to wild-type, but there was no difference at 6 hours post-infection. Growth of vAh under iron restriction increases virulence. As previously reported, we found that growing vAh in the presence of iron chelator deferoxamine mesylate (DFO) caused significantly increased mortalities following immersion exposure. However, RTX-deficient vAh remained attenuated when grown with iron restriction. Furthermore, RTX-deficient vAh provided 100% protection at 21 days post-vaccination against immersion challenge with wild-type vAh grown under iron restriction, compared to 42.5% mortalities in sham-vaccinated fish. This study highlights that RTX toxin played a role in early cellular invasion and intracellular survival of vAh, and disruption of RTX toxin demonstrated its protective efficacy as a vaccine against MAS, including when grown under iron restriction.

Presenter: Saida Zinnurine

Presentation Session: AP2

Level of Study: PhD

Department: Comparative Biomedical Sciences

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Mark Lawrence, Professor & Director, Comparative Biomedical Sciences

Title: Characterization of RTX and Chitinase-deficient mutants of virulent Aeromonas hydrophila

Abstract: Aeromonas hydrophila is a Gram-negative motile, mesophilic species that causes Motile Aeromonad Septicemia (MAS), which is characterized by a destructive systemic infection in channel catfish. In 2009, an emergent clonal group of A. hydrophila strains referred to as virulent A. hydrophila (vAh) was responsible for the loss of 5.5 million pounds of market-size fish in the US, and it remains a major threat for the catfish aquaculture industry. Our comparative genomic analysis indicated that genes encoding several putative secreted enzymes, including chitinase and RTX (repeats in toxin) family proteins, are unique to vAh. Chitinase is a glycosyl hydrolase encoded by chiA that hydrolyzes chitin. The vAh RTX toxin is encoded in an operon consisting of two genes (rtxC and rtxA) that encode cytolysin-activating lysine-acyltransferase and membrane-damaging MARTX multifunctional-autoprocessing repeats-in-toxin holotoxin, respectively. The objective of this study was to decipher the role of chitinase and RTX toxin in virulence of vAh in catfish. In this study, construction of the vAhΔchiA, vAhΔrtxC, vAhΔrtxA, and double deletion vAhΔrtxA-C mutants was accomplished by an in-frame deletion method. Growth kinetics, hemolysis of 1% catfish and sheep red blood cells, and biofilm formation for each of the mutants was compared to parent wild-type strain. Virulence and live attenuated vaccine potential of mutants were evaluated by intraperitoneal injection in channel catfish. There was no difference in growth kinetics between the wild-type vAh and mutants. vAhΔrtxC and vAhΔrtxA-C mutants showed significantly decreased hemolytic activity ($p \leq 0.05$) compared to parent strain vAh in hemolyis of 1% catfish RBCs. RTX toxin cytolysin-activating lysine-acyltransferase significantly contributed to vAh biofilm formation at 24h and 72h. RTX toxin demonstrated a highly significant ($p \leq 0.001$) role in the virulence of vAh in channel catfish. Furthermore, vaccination of catfish with three attenuated mutants (vAhΔrtxC, vAhΔrtxA, and vAhΔrtxA-C) provided significant ($p \leq 0.001$) protection against experimental infection with the virulent wild-type strain at 21 days post-vaccination. Catfish vaccinated with vAhΔrtxC, vAhΔrtxA, and vAhΔrtxA-C had 0% mortalities after experimental infection with 5*10^6 CFU vAh compared to 47.5% mortalities in sham vaccinated catfish. These findings demonstrated that chitinase and RTX toxin contribute to hemolytic activity and biofilm formation of vAh. Chitinase has no significant role in the virulence of vAh. Importantly, RTX toxin plays a significant role in vAh virulence in catfish, and the deletion mutant has vaccine potential for protection against MAS caused by vAh.

Presenter: Sam Theobald

Presentation Session: MO2

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Agriculture and Life Sciences

Advisor: Dr. Mary Love Tagert

Title: Case Study on Variable Rate Irrigation in Northeast Mississippi

Abstract: In Northeast Mississippi, access to groundwater is limited due to drilling depths, and only 37% of the annual precipitation in the region occurs during the growing season. As a result, on-farm water storage (OFWS) systems have been built throughout the region in recent years. These systems capture and store precipitation and runoff that can be used for irrigation during the growing season. Due to the limited amount of rainfall received during the growing season, producers in Northeast Mississippi have a finite amount of water to use for irrigation. This study evaluates the benefits of sector control variable rate irrigation (VRI) on a production field under center pivot sprinkler irrigation in Noxubee County, MS. Two irrigation treatments were applied both to a “dry” irrigation management zone in one section of the field and a wet irrigation management zone in another section of the field. Each zone was sub-divided into six different pie-shaped sectors, and both irrigation treatments were replicated three times in each zone. Granular matrix sensors were placed in the centroid of the outermost span of each sector to measure soil water tension in the rooting zone throughout the growing season. Soil water tension values and yield are being compared over the past three growing seasons to determine the effectiveness of VRI. Three other production fields on the same farm are being evaluated to create a guide for producers looking to implement VRI on their farm.

Presenter: Samadhi Nisansala Nawalage

Presentation Session: MP1

Level of Study: PhD

Department: sustainable bioproducts

Category: Forest Resources and Veterinary Medicine

Advisor: Prof. Jilei Zhang, Sustainable Bioproducts

Title: Effect of Biochar Particle Size on the Carbothermal Synthesis of Graphene-Shelled Zero-Valent Iron for Copper Removal

Abstract:

Heavy metal (HM) contamination of waterways poses serious environmental and public health risks. Chronic exposure to metals such as copper (Cu^{2}), even at trace levels, can degrade water quality and bioaccumulate in living organisms, leading to adverse health effects. Biochar (BC), derived from agricultural and forest residues, has emerged as a sustainable, low-cost matrix for nanoscale zero-valent iron (nZVI) due to its porosity, and functional groups. Graphene-shelled nZVIs (BC-G@nZVIs) synthesized during carbothermal reduction of iron on BC, can enhance nZVI dispersion, limit oxidation, and improve long-term reactivity for heavy metal remediation. However, nZVI aggregation and low iron utilization often limit the efficiency of BC-G@nZVI composites. The biochar matrix, particularly its particle size, pore structure, and surface area, plays a critical role in controlling iron dispersion, particle size, and reduction behavior during synthesis. However, the specific influence of these parameters on the formation and performance of BC-G@nZVIs remains poorly understood, which hinders optimization for effective Cu^{2} removal from water ways. This study examines how biochar particle size affects the structural and functional properties of BC-G@nZVI composites. Biochar grains of four size ranges (<75 μm, 75–125 μm, 125–250 μm, and >250 μm) were loaded with 15% Fe and converted into BC-G@nZVIs via carbothermal reduction. The resulting composites were characterized using XRD, SEM, TEM, EDS, and preliminary adsorption studies. Results showed that decreasing biochar particle size improved nZVI crystallinity, dispersion, and iron utilization, resulting in enhanced Cu^{2} removal capacity. Building on these findings, future work will focus on optimizing the biochar matrix through activation methods to increase surface area and pore accessibility, further improving Fe^{0} loading, reactivity, and heavy-metal adsorption efficiency for sustainable water treatment applications.

Presenter: Samjhana Panthi

Presentation Session: MP1

Level of Study: PhD

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Robert Grala

Title: Timber price trends, transmission, and the impact on loblolly pine plantation management in the United States South

Abstract: This research determined timber price trends, volatility, and their impacts on optimal harvesting decisions for loblolly pine plantations in the southern United States (US). Maximum land expectation values (LEVs) were calculated for loblolly pine plantation management schedules using discounted cash flow (DCF) analysis across a range of real, before-tax discount rates, site indexes, and planting densities. Annual percentage rates of change (APRs) of real quarterly pine stumpage prices in $/tonne over 25 to 40 years were determined for pine sawtimber (PST), chip-n-saw (CNS), and pulpwood (PPW) obtained from the Timber Mart-South. Volatility was described by the trend models' mean square errors. Price trends and volatilities were incorporated into the DCF analyses to determine the implications of long-term pine stumpage market stochasticity on maximum LEV and optimal rotation. The negative price trends reduced the optimal rotation age and maximum LEV compared with the base case of the Faustmann model's constant timber prices. Investing at a higher discount rate on pine timberland with low site quality did not benefit landowners economically. Thus, current landowners and investors should consider alternative strategies to prevent financial losses. This study helps stakeholders understand the impact of stochastic timber prices on rotation age in their timberland and allows for better decision-making.

Presenter: Seth Givens

Presentation Session: MP6

Level of Study: Master's

Department: Agricultural and Biological Engineering

Category: Agriculture and Life Sciences

Advisor: Dr. N. Wijewardane, Professor, Agriculture and Biological Engineering

Co-Advisor: Dr. M. L. Tagert, Professor, Agriculture and Biological Engineering

Title: Integrating Handheld Sensors and 3D Scanning with Phenospex system to Assess Heat and Drought Stress in Soybean

Abstract: Phenospex 3D scanning systems provide high-resolution measurements of plant structural and physiological traits, while handheld sensors offer portable, lower-cost options for greenhouse phenotyping. Despite their widespread use, few studies have explored how these platforms can be integrated or whether handheld measurements reliably reflect 3D scan-derived traits under abiotic stress conditions. This study investigates the relationships between Phenospex-derived canopy traits and handheld sensor data, including chlorophyll content, pigment indices, and vegetation indices, in three soybean genotypes (Williams 82, DS25-1, and DT97-4290) grown under four treatments: control, drought, heat, and combined heat + drought. Measurements are collected weekly during the reproductive stage to capture dynamic responses to stress. Phenospex-derived morphological traits (canopy height, projected leaf area, and structural volume) are compared with ground-truth measurements using linear regression models. Physiological traits, such as chlorophyll content and vegetation indices, are predicted using machine learning approaches applied to handheld sensor data. Model performance is evaluated with coefficients of determination (R^2) to quantify associations, root mean square error (RMSE) to estimate prediction error, and k-fold cross-validation to assess reliability across samples. By identifying which handheld traits serve as reliable proxies for high-resolution 3D measurements under heat and drought stress, this work provides a practical framework for soybean stress phenotyping in greenhouse environments and supports broader adoption of high-throughput phenotyping for crops.

Presenter: Seung Heon Lee

Presentation Session: AO5

Level of Study: Master's

Department: Biochemistry, Nutrition and Health Promotion

Category: Agriculture and Life Sciences

Advisor: Dr. Seung-Joon Ahn (Associate Professor, Department of Biochemistry, Nutrition and Health Promotion)

Title: Functional Insights into PBAN and PBAN-r across Developmental Stages of Helicoverpa Zea via RNAi and CRISPR

Abstract: The corn earworm (Helicoverpa zea) is a destructive pest of corn, cotton, and soybean, with control increasingly undermined by resistance to Bt crops and insecticides. The pheromone biosynthesis activating neuropeptide (PBAN) and its receptor (PBANR) regulate female sex pheromone production and mating, making this pathway a potential target for species-specific management. To investigate PBAN signaling, developmental and tissue-specific expression was profiled. PBAN transcripts were enriched in the central nervous system, consistent with its neuroendocrine role. RNAi experiments tested functional outcomes: larval injections showed no difference in weight gain between dsPBAN and control (dsGFP). In adults, however, qRT-PCR confirmed reduced PBAN transcript abundance, though variability limited statistical significance ($p=0.096$). Field assays with female moths further revealed that dsPBAN and dsPBANR females attracted fewer males than dsGFP, indicating reduced attractiveness when PBAN signaling is disrupted. These findings suggest PBAN influences mating timing and success more strongly than larval development. To resolve RNAi variability, CRISPR/Cas9 knockouts of PBAN and PBANR are in progress to establish stable, heritable disruptions. By integrating expression profiling, RNAi, CRISPR, and behavioral assays, this study seeks to determine whether PBAN signaling can be exploited as a novel, species-specific strategy for managing the corn earworm.

Presenter: Sifat Zina Karim

Presentation Session: AP3

Level of Study: PhD

Department: Electrical and Computer Engineering

Category: Engineering

Advisor: Dr. John E. Ball

Title: Attention Enhanced Perceptual Image Anomaly Detection for Ultrasound Imagery

Abstract: This paper proposes a novel model, SEPIAD, with an integration of the Squeeze and Excitation attention block into the architecture of the Perceptual Image Anomaly Detection model, PIAD. The dataset used in this work consisted of 2813 images, with 2014 normal and 799 abnormal images of abdominal organs, curated from 342 patients at MH Samorita Medical College and Hospital in Dhaka, Bangladesh. Perceptual Image anomaly Detection (PIAD) leverages adversarial losses and perceptual losses trained solely on normal images. To enhance this framework, we have proposed a lightweight architecture, SEPIAD, using the Squeeze and Excitation (SE) blocks to focus more on the important feature channels, enhancing anomaly detection on ultrasound images without raising the model complexity. After training, the proposed model, SEPIAD, calculates the abnormality of the input image as the perceptual dissimilarity between it and the closest generated image of the modeled data distribution. SEPIAD outperformed the baseline model, PIAD, achieving a Receiver Operating Characteristic Area Under the Curve (ROC AUC) of 0.95, outperforming the baseline model by at least 8\%, proving the model's effectiveness in Ultrasound image analysis, which has an inherently noisy structure, low contrast, and subtle organ boundaries.

Presenter: Sijin Guo

Presentation Session: MO10

Level of Study: PhD

Department: Sustainable Bioproduct

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Jilei Zhang, Professor, Sustainable Bioproducts

Title: Green Graphene for Grey Infrastructure: Sustainable Nanomaterials in Cement

Abstract: Graphene-based nanomaterials have shown potential to improve cementitious composites by accelerating hydration and enhancing strength, but their high cost challenges limit large-scale application. This study explores our products - lignin-derived graphene (LG), a renewable and low-cost alternative, compared with commercial graphene nanopowders (GNP) to evaluate their influence on hydration mechanisms and strength development. Cement paste and mortar samples were prepared with adding dosages of GNP and LG, and their early hydration behavior was analyzed using microscopic techniques, while long-term compressive strength was also measured. Results indicated that both GNP and LG provided heterogeneous nucleation sites that promoted hydration. GNP incorporation achieved the highest strength gains, while LG contributed moderate improvements but demonstrated clear potential as a sustainable reinforcement. This study highlights that lignin-derived graphene provides a promising pathway to low-cost and environmentally friendly alternatives for future large-scale applications in construction materials.

Presenter: Simran Pandey

Presentation Session: MP1

Level of Study: Master's

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Sabhyata Lamichhane, Assistant Professor, Department of Forestry

Title: The economic footprint of natural disturbances: A case study of Southern Pine Beetle in Mississippi's pine forests.

Abstract: Forests occupy approximately 64% of Mississippi's total land area, significantly contributing to the state's economy through income generation, job creation, and tax revenue. However, natural disturbances such as wildfires, hurricanes, drought, and insect outbreaks pose a serious threat to forest health and ultimately to the forest product industry. In particular, the southern pine beetle (SPB) has been the most important insect disturbance affecting Mississippi's pine forests, causing extensive changes in the forest environment and widespread tree mortality. Such outbreaks significantly disrupt the timber market equilibrium. While prior studies have explored SPB impacts from an ecological perspective, there is limited recent empirical analysis quantifying specific economic losses and market responses in Mississippi's forestry sector. Therefore, this study aims to quantify the short and long-term economic impacts of the SPB outbreaks in the Mississippi's forestry sector, utilizing total salvaged timber volume and timber prices data from 2000 to 2024. A welfare analysis will be conducted to assess changes in producer and consumer surplus. We expect to observe a significant net transfer of economic surplus from timber producers to wood-using firms during and post-outbreak periods, reflecting broader implications for forest sector resilience and management policy in the face of increasing natural disturbances.

Presenter: Suharsha Baskarla

Presentation Session: MO8

Level of Study: PhD

Department: Forestry

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Krishna Poudel, Associate Professor, Forestry

Title: Climate Effects on Forest Carbon Sequestration: A National-Scale Analysis of the U.S. Forests

Abstract: United States forests account for approximately 80% of the North American carbon sink; yet fundamental gaps remain in understanding how climate variability interacts with stand characteristics to influence carbon sequestration across diverse forest ecosystems. This study quantifies the relative importance of climate versus stand structural factors in determining carbon sequestration using 1,443,565 forest subplots from 439,198 FIA plots spanning the period from 1999 to 2022. We employed Structural Equation Modeling to analyze climate-carbon relationships across six major Forest Vegetation Simulator variants and 32 regional forest type combinations.

Stand structural attributes emerge as the primary determinant of forest carbon storage, explaining 80.6% to 84.9% of the total variance across all major forest regions. Climate variables explained an additional 17.5 to 27.3% of stand structural variation, with climate primarily influencing carbon storage indirectly through structural modification. Twenty-eight of 32 regional forest type combinations (87.5%) exhibited significant temperature effects, with responses ranging from strong positive effects ($\beta = 0.423$ for Northeast Maple-Beech-Birch) to severe negative responses ($\beta = -0.825$ for Great Plains Oak-Hickory). These findings support structure-focused management strategies while demonstrating that effective carbon management requires geographically differentiated approaches.

Presenter: Sujita Balami

Presentation Session: AP2

Level of Study: PhD

Department: Pathobiology and Population Medicine

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Matt J. Griffin, Research Professor, Pathobiology and Population Medicine, CVM

Co-Advisor: Dr. Larry Hanson, Professor, Comparative Biomedical Sciences, CVM

Title: Identification of Potential Live-Attenuated Vaccine Candidate Against Edwardsiella piscicida in Catfish

Abstract: Historically, the US catfish industry has predominantly focused on the culture of channel catfish (Ictalurus punctatus). However, recent advancements in hybridization strategies have removed obstacles to mass production of channel catfish x blue catfish (I. furcatus) hybrids. Resulting offspring exhibit heterosis, demonstrating improved growth, increased tolerance to low dissolved oxygen, and reduced susceptibility to several channel catfish pathogens. As such, hybrids have increased in popularity over the past decade and now account for more than 50% of the industry. However, coinciding with increased hybrid production has been the emergence of Edwardsiella piscicida, a gram-negative enteric pathogen that is 10X more virulent in hybrid catfish than channels. Based on diagnostic submissions to the Aquatic Research and Diagnostic Laboratory in Stoneville, MS, hybrids account for ~50% of total diagnostic submissions but >95% of E. piscicida diagnoses. There are currently no commercially available vaccines to prevent E. piscicida outbreaks. In this study, selected E. piscicida isolates were attenuated by passage in media with increasing concentrations of rifampicin (RIF) to create live attenuated vaccines (LAVs). Resulting RIF mutants were tested for attenuation in hybrid catfish via intracelomic injection. Of the 19 mutants evaluated, eight were significantly attenuated compared to their wild type parents. Rechallenge of survivors demonstrated five of the attenuated mutants also conferred strong protection against the wild-type strain S11-285, with relative percent survival exceeding 75%. Three of the most protective mutants, along with an additional isolate developed using the same method, were tested as oral (coated in feed) and immersion (1 h bath) vaccines in both channel and hybrid catfish. Results revealed oral vaccination with isolates S07-346MT and S11-285R resulted in significantly improved survival compared to sham controls. Immersion vaccination with attenuated strains failed to elicit protection. Ongoing experiments are focusing on optimizing oral vaccination strategies for these two candidate LAVs in both hybrid and channel catfish, with an emphasis on enhancing efficacy through booster dosing at 28 days post-vaccination or the immune enhancement through administration of functional feeds.

Presenter: Sujita Balami

Presentation Session: MO10

Level of Study: PhD

Department: Pathobiology and Population Medicine

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Matt J. Griffin, Research Professor, Pathobiology and Population Medicine, CVM

Co-Advisor: Dr. Larry Hanson, Professor, Comparative Biomedical Sciences, CVM

Title: Evaluating an Orally Delivered Bivalent Vaccine against Edwardsiellosis in Channel Catfish (Ictalurus punctatus)

Abstract: Edwardseilla spp. cause tremendous losses to the US catfish industry. In 2023, Edwardsiella ictaluri and E. piscicida accounted for 43.2% of disease diagnoses at the Aquatic Research and Diagnostic Laboratory in Stoneville, MS. An experimental live-attenuated E. ictaluri vaccine (LAV), distributed to participating farms under veterinary prescription, has substantially reduced losses to E. ictaluri, the causative agent of enteric septicemia of catfish (ESC). Previous experiments have reported the ESC-LAV is cross-protective against the closely related E. piscicida in channel (Ictalurus punctatus) and hybrid catfish (I. punctatus × I. furcatus), although to a lesser extent (~60-70% RPS against E. piscicida vs. 95-100% RPS against E. ictaluri). This led researchers to investigate whether this cross-protective effect could be improved by co-administering the LAV with an E. piscicida bacterin. This study evaluated the efficacy of the orally delivered E. ictaluri LAV paired with a formalin-killed E. piscicida bacterin and β-glucan (0.1% of feed for 14 days) as an oral adjuvant. Fish were distributed to seven treatment groups + controls for evaluation against E. ictaluri and E. piscicida (7 treatments/pathogen, 5 replicates/treatment, 20 fish/tank): LAV alone, LAV + β-glucan, LAV + bacterin, LAV + β-glucan + bacterin, β-glucan + bacterin, β-glucan alone, or bacterin alone. Thirty-six days post-vaccination, fish were challenged with E. ictaluri (immersion) or E. piscicida (injection). Results indicated that the LAV alone gives high protection against E. ictaluri (RPS=97%) and neither bacterin nor β-glucan improved or negatively interfered with the LAV. After E. piscicida challenge, the most notable finding was the LAV significantly improved survival, consistent with previous reports, however there were no substantial improvements attributed to the bacterin or β-glucan. Anti-E. piscicida antibody activity was not significantly improved in any treatment over controls. Comparably, while survival was not significantly improved over the LAV alone, anti-E. ictaluri antibody activity was significantly increased in fish receiving the LAV + β-glucan oral adjuvant, suggesting a more robust immune response to vaccination. Results indicate the efficacy of the LAV is not impaired by the presence of the E. piscicida bacterin and may be enhanced by β-glucan supplementation. One limitation of this study is the reduced susceptibility of channel catfish to E. piscicida infection, resulting in negligible mortality upon E. piscicida challenge, which may have masked any protective effects from the treatments. This study will be repeated in hybrid catfish to determine if co-administration of the LAV with an E. piscicida bacterin can improve the cross-protective benefit of the LAV against E. piscicida in hybrids.

Presenter: Susmita Ghimire

Presentation Session: MO2

Level of Study: Master's

Department: Biochemistry, Health Promotion, and Nutrition

Category: Agriculture and Life Sciences

Advisor: Dr. Jiaxu Li

Title: Overexpression and Knockdown of RALF8 and H2B genes in rice to modulate drought stress response

Abstract: Rice (Oryza sativa) is a critical staple food for over half the world's population, especially in Asia, Africa, and Latin America, but climate change-induced droughts threaten its production, affecting more than 20% of rice-growing areas and global food security. This research proposes to enhance drought tolerance in the Kitaake rice variety using Agrobacterium-mediated transformation to overexpress the RALF8 and H2B genes via the pU1301 vector and silence RALF8 using RNAi with the pANDA vector. RALF8, a signaling peptide, and H2B, a histone protein regulating gene expression, show promise in improving root growth, water retention, and stress responses based on studies in other plants, though their roles in rice remain underexplored. The methodology includes extracting genomic DNA with the CTAB method, cloning genes with PCR and restriction digestion, transforming Agrobacterium and Kitaake embryo, and validating transgenic lines with PCR, and DNA sequencing. Preliminary data confirm some successful transformations, with ongoing efforts to optimize RNAi lines. Our ongoing work will focus on checking if the transformations work and how they affect drought response, such as plant survival and recovery, to help develop drought-resistant rice for sustainable farming in dry areas.

Presenter: Swayamjit Saha

Presentation Session: AP4

Level of Study: PhD

Department: Building Construction Science

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Jingdao Chen

Title: Interpretable Per-Person Safety Assessment from CCTV Frames with Pose-Guided Heuristics

Abstract: We present a lightweight, interpretable pipeline for per-person, frame-level safety assessment in monocular video. The system detects humans with Yolov8 and extracts 2D skeletal keypoints via Yolov8-Pose, then derives pose-guided features - torso verticality, stride width, knee flexion angles, and short-term centroid velocity. A compact decision tree fuses these cues to assign multi-label outcomes with explicit rationale: SAFE (eg. standing, walking, climbing stairs) or UNSAFE (eg., fallen/falling, improper walking with strong forward lean).

Presenter: Tanveer Shaikh

Presentation Session: AO6

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Nicholas Fitzkee, Professor, Department of Chemistry

Title: Engineering Protein Corona Composition to Modulate the Biological Response to Nanoparticles

Abstract: Nanoparticle-based drug delivery systems face significant clinical translation challenges, with only 0.7% of administered nanomedicines reaching tumor sites, primarily due to uncontrolled protein corona formation that fundamentally alters nanoparticle behavior in biological fluids. Rather than viewing the protein corona as an obstacle, we developed a rational engineering approach to harness this biological phenomenon for enhanced therapeutic targeting. Using selective ^{13}C isotope labeling and NMR spectroscopy, we investigated competitive binding dynamics between key serum proteins (bovine serum albumin, BSA; transferrin, Tf; fibronectin, Fn; and immunoglobulin G, IgG) on 15 nm gold nanoparticles, revealing a hierarchical binding specificity: transferrin ≈ fibronectin > albumin > immunoglobulin G. This competitive binding pattern enabled rational design of multi-protein coronas with defined compositions that demonstrated effective cancer cell selectivity (3% uptake) while reducing macrophage recognition (1% uptake) compared to bare nanoparticles. Proteomics analysis confirmed that engineered coronas maintain distinct protein signatures even after serum exposure, with selective modulation of complement proteins and retention of targeting moieties. Most significantly, the engineered BSA+Tf+Fn+IgG corona achieved selective tumor accumulation (13 ppm/g) in vivo, representing a 6.5-fold improvement over bare nanoparticles, a 2.6-fold improvement over PEGylated nanoparticles, and approximately 4% ID/g—substantially exceeding the 0.7% median efficiency reported for nanomedicines. This study establishes protein corona engineering as a powerful strategy for precision control of nanoparticle-biological interactions. Embracing, rather than avoiding, the protein corona can deliver efficient tumor targeting while reducing off-target effects, and this may lead to next-generation nanomedicines with enhanced therapeutic efficacy and improved translational potential.

Presenter: Tanveer Shaikh

Presentation Session: MP3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Nicholas Fitzkee, Professor, Department of Chemistry

Title: Structural Characterization of Complement C3 Variants and Nanoparticle Interactions

Abstract: Complement component C3 contains a reactive thioester domain (TED) crucial for immune activation. The C3dg (40 kDa) fragment retains the functional TED while being more tractable for structural studies. To isolate TED contributions and optimize structural characterization, we systematically engineered C3dg variants (3-Cys, 1-Cys, and 0-Cys) and purified C3d (35kDa) for enhanced structural definition. Purification optimization revealed protein aggregation, which was minimized using 150 mM NaCl to ensure monomeric species. Second virial coefficient analysis revealed attractive protein-protein interactions with pH-dependent behavior. Binding capacity analysis using ^{1}H-NMR revealed monolayer coverage on gold nanoparticles. Isothermal titration calorimetry demonstrated C3dg binding to serum-coated NPs. CD thermal denaturation showed cysteine residues contribute significantly to protein stability. 1H 15N-TROSY NMR spectra showed variable signal quality across variants with 60% of signals observed for 3-Cys C3dg, 70% for 1-Cys C3dg, 68% for 0-Cys C3dg and 78% for C3d. Our findings provide quantitative insights into complement C3 stability and interactions with both bare and serum-coated nanoparticles, advancing rational design for controlled immune targeting.

Presenter: Taofiq Abdulraheem

Presentation Session: MO3

Level of Study: PhD

Department: Chemistry

Category: Education, Arts and Sciences, and Business

Advisor: Dr Amanda Patrick, Professor, Chemistry

Title: Gas-phase Dissociation and Thermal Decomposition of Ionic Liquids

Abstract: Ionic liquids (ILs) are compounds with a wide liquid range that consist exclusively of ions. They often have properties, such as high thermal stability, low vapor pressure, a wide liquid range, and a wide electrochemical window, that make them suitable for a range of applications. Examples of these applications include solvents for biomass dissolution and chemical reaction media, next-generation "green" spacecraft propellants, high temperature lubricants, and electrolytes or electrolyte additives for various electrochemical devices. Given the variety of uses (including many at elevated temperatures) and the need for re-use and recycling of ILs, it is important to understand their thermal stability and decomposition products. Understanding this at a molecular level and identifying trends in structural-property relationships could allow for improved design or selection for specific applications. Furthermore, it is necessary to develop mass spectrometric (MS) characterization methods to both characterize decomposition products and for monitoring of IL purity or environmental release. This talk will overview the motivation for the studies presented and then summarize the methods, results, and impact of two studies. In the first study, the dissociation pathways of ionic liquid cations were studied by collision-induced dissociation (CID)-MS and a class-based screening approach based on characteristic ions was introduced. In the second study, pyrolysis-gas chromatography (Pyr-GC)-MS was used to characterize the small-molecule thermal transformation products of various ionic liquids at high temperatures, with a focus on the effects of cation motifs and substituent identity. Finally, the outlook of this work will be discussed.

Presenter: Thainara Lima

Presentation Session: MO9

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Vitor Martins, Agricultural and Biological Engineering

Title: Exploring the Potential of Medium-Resolution Satellites for Algal Bloom Detection in Nearshore Waters: A Benchmark Study of CNN and Transformer Models

Abstract: Monitoring floating algal blooms is critical for understanding ecosystem dynamics and supporting coastal management. Traditionally, coarse-resolution sensors such as MODIS have been used for bloom detection, but their limited spatial resolution often results in data gaps in nearshore regions and uncertainties in offshore bloom estimates. Medium-resolution sensors, such as Sentinel-2 MSI and Landsat-8/9 OLI, offer a promising alternative by capturing smaller bloom patches that would otherwise remain undetected. However, leveraging these datasets effectively requires the development of reliable and automated methods for bloom mapping. In this study, we investigate the potential of medium-resolution satellite imagery for algal bloom mapping by conducting a benchmark evaluation of deep learning architectures tailored for semantic segmentation. We assessed both Convolutional Neural Network (CNN) and a Vision Transformer (ViT)-based approach called Swin Transformer using a high-quality, globally distributed dataset. Despite the spectral complexity of coastal waters, both models demonstrated strong capability in identifying floating algal features. ResUNet achieved the highest accuracy, with omission and commission errors of 29% and 31%, respectively, and balanced true positive and true negative rates of ~90%. Swin Transformer also performed competitively, effectively capturing bloom extent with a true positive rate of 87%. Comparisons against MODIS-derived products highlighted the value of medium-resolution sensors in resolving fine-scale bloom structures, particularly in coastal and nearshore waters. These results demonstrate that advanced deep learning methods, combined with Sentinel-2 and Landsat imagery, provide a powerful framework for accurate global algal bloom mapping.

Presenter: Trisa Das

Presentation Session: MO6

Level of Study: Master's

Department: Plant and Soil Sciences

Category: Agriculture and Life Sciences

Advisor: Dr. Te-Ming Tseng, Professor, Plant and Soil Sciences

Co-Advisor: Dr. Fernanda Reolon de Souza, Postdoctoral Associate, Plant and Soil Sciences

Title: Phenolic Bioherbicides: Advancing Sustainable Management of Herbicide-Resistant Palmer Amaranth in Southern U.S. Soybean Production

Abstract: Soybean (Glycine max) is a major cultivated crop in the southern United States, with nearly half of its annual production being exported to global markets. However, Palmer amaranth (Amaranthus palmeri), an aggressive and herbicide-resistant weed, severely threatens soybean productivity by causing yield losses of up to 70% and as high as 80% in some cases. Its prolific seed production and resistance to nearly all herbicide modes of action make its management extremely challenging. To address this problem, this study evaluated the potential of allelochemicals, caffeic acid, coumarin, and chlorogenic acid, as natural bioherbicides for suppressing Palmer amaranth while ensuring soybean safety. A greenhouse experiment was conducted using a split-plot randomized complete block design with both pre-emergence (at planting) and post-emergence (three weeks after emergence) applications. The treatment involved various concentrations of the three allelochemicals. The measured parameters included plant height, visual injury, photosynthetic activity, and fresh and dry shoot and root biomass, and data were statistically analyzed using JMP software. It is hypothesized that allelochemicals will induce stress in Palmer amaranth by generating reactive oxygen species (ROS), thereby reducing photosynthesis, inhibiting cell division and elongation, and significantly decreasing biomass. Preliminary findings suggest reductions of up to 70% in the growth of Palmer amaranth under certain treatments, with minimal effects on soybean. This study highlights the promise of allelochemical-based bioherbicides as eco-friendly alternatives to synthetic herbicides, offering sustainable weed management strategies in soybean systems that reduce economic losses and support long-term agricultural profitability.

Presenter: Udit Bhatta

Presentation Session: MO8

Level of Study: Master's

Department: Geosciences

Category: Education, Arts and Sciences, and Business

Advisor: Dr. Narcisa Pricope, Professor, Geosciences

Title: Measuring Flood Readiness Gaps: An Index Framework for Community Preparedness and Resilience in Mississippi

Abstract: Mississippi faces increasing flood risk from riverine(fluvial), surface(pluvial) and coastal hazards, intensified by climate variability. This physical exposure is compounded by socioeconomic disparities and limited institutional capacity, leaving many communities highly vulnerable to future flood events.

This study develops a composite Readiness Gaps Index (RGI) to evaluate community preparedness for flooding across Mississippi counties and census tracts. Twenty-six indicators spanning socioeconomic, institutional, health, and infrastructure characteristics were compiled and analyzed. Principal Component Analysis (PCA) was used to generate statistically derived weights and construct the index. This readiness gaps index, overlayed with the flood risk data, results reveal that 36.6% of counties fall within the highest flood readiness gap category, while 37.4% of census tracts are classified as highly at risk. These findings highlight substantial disparities in preparedness across the state and underscore the need for targeted intervention in vulnerable communities. To support decision-making, an interactive dashboard is developed to visualize and compare readiness gaps, enabling local planners to identify priority areas and enhance resilience strategies. Together, the analysis and tools provide an evidence-based framework for aligning state and federal resources with the most at-risk communities, with the goal of strengthening Mississippi's flood resilience.

Presenter: Vandana Dharan

Presentation Session: AO1

Level of Study: PhD

Department: Wildlife, Fisheries, and Aquaculture

Category: Forest Resources and Veterinary Medicine

Advisor: Dr. Peter Allen, Professor, Wildlife, Fisheries, and Aquaculture

Co-Advisor: Dr. Larry Hanson, Professor, Comparative Biomedical Sciences

Title: Hematological and Biochemical Analysis of Ictalurid Herpesvirus I (IcHV1) Infection in Channel Catfish, Ictalurus punctatus.

Abstract: Disease progression is better understood by revealing the pathophysiological mechanisms underlying the clinical infections. Blood indices are highly correlated to fish health, as the organism works to maintain homeostasis in response to disease-induced stress. Tissue damage can lead to cell lysis, resulting in the release of enzymes into the bloodstream and an increase in serum enzyme activity. Evaluating hemato-biochemical indices helps predict metabolic disturbances and early prognosis. Viral infections often damage hematopoietic tissues, such as the kidney and spleen, with associated blood biochemical changes indicating specific pathophysiological responses. Ictavirus ictaluridallo 1 (Ictalurid herpesvirus 1, IcHV1) is a major pathogen infecting fry and fingerlings of channel catfish, posing a significant threat to hatchery operations. A better understanding of IcHV1-associated pathophysiological alterations in channel catfish is warranted to unravel why infected fish fail to maintain homeostasis and how physiologically relevant tissues contribute to mass mortality. In this study, naïve channel catfish (~40 g) were exposed to IcHV1 via immersion at a sub-lethal dose, while the control group received serum-free media. Venous blood was collected on days 1, 2, 3, 5, 7, and 14 post-infection for blood and plasma analysis, including gas values, oximetry parameters, electrolytes, metabolites, and enzyme profiling using a blood-gas analyzer and clinical chemistry analyzers. Significant alterations in circulating biochemical markers were observed in infected fish, suggesting impaired physiological functions that may lead to severe clinical signs during active IcHV1 infection. The study also provides critical insights into potential off-target damage to vital organs, which can compromise systemic homeostasis.

Presenter: Yasas Gamagedara

Presentation Session: MO4

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Nuwan K. Wijewardane, Assistant Professor, Department of Agricultural & Biological Engineering

Co-Advisor: Dr. Gary Feng, Research Soil Scientist, United States Department of Agriculture - Agricultural Research Service, Dr. Mary Love Tagert, Assistant Professor, Department of Agricultural & Biological Engineering, Dr. Vitor S. Martins, Assistant Professor, Dep

Title: Leveraging MIR Spectroscopy and Machine Learning to Predict Soil Hydraulic Properties

Abstract: Understanding soil–water interactions is critical for managing water retention and movement, directly influencing crop productivity and irrigation strategies. Direct measurement of soil hydraulic properties (SHPs) is labor-intensive, time-consuming, and costly. Pedotransfer functions (PTFs), such as Rosetta 3, estimate SHPs from readily available dynamic soil properties (DSPs). Spectroscopy, particularly in the visible–near-infrared (vis–NIR) and mid-infrared (MIR) regions, provides a rapid, non-destructive approach to capturing soil chemical signatures and has shown promise for predicting DSPs. However, its application for SHP prediction remains underexplored. This study compared Rosetta 3-based PTFs with spectroscopy-driven models for predicting Mualem–van Genuchten SHP parameters and derived properties, including field capacity (FC) and permanent wilting point (PWP). Laboratory values of FC and PWP were generated using the centrifuge method for 335 soil cores collected from Mississippi. While Rosetta 3 model 3 offered modest improvements over model 2, both were generally outperformed by spectroscopic models. The Vis–NIR-based models showed moderate performance (R^2 values) (FC: 0.65; PWP: 0.70), whereas MIR-based models consistently achieved higher accuracy (FC: 0.80; PWP: 0.80). Among modeling techniques, partial least squares and ridge regression outperformed tree-based approaches. Sample preparation significantly influenced prediction accuracy, with fine-ground and non-fine-ground samples outperforming fresh samples, highlighting the importance of consistent particle size and moisture content. These results demonstrate that MIR spectroscopy, combined with optimized regression models and proper sample preparation, is a reliable and cost-effective tool for estimating SHPs. This approach enables rapid soil health assessment and supports data-driven water resource management at larger spatial scales.

Presenter: Yehani Thamokshya Ekanayake

Presentation Session: AP3

Level of Study: PhD

Department: Agricultural and Biological Engineering

Category: Engineering

Advisor: Dr. Nuwan Wijewardane, Assistant Professor, Agricultural and Biological Engineering

Co-Advisor: Dr. Vitor S. Martins, Assistant Professor, Agricultural and Biological Engineering

Title: Predicting Soil Fertility Properties from Fresh Soil Spectra Using MIR and Vis–NIR Spectroscopy with Machine Learning

Abstract: Soil fertility properties are central to crop productivity and environmental sustainability, yet their laboratory determination is often costly, destructive, and time-consuming. Nondestructive sensing methods such as mid-infrared (MIR) and visible–near infrared (Vis–NIR) spectroscopy provide rapid, and non-destructive alternatives for soil property analysis. In this study, fresh soil samples collected from benchmark series in Mississippi were scanned using three spectrometers: ATR (MIR), ASD (Vis–NIR), and ARC (MIR), and used to predict fertility-related properties including phosphorus (P), potassium (K), magnesium (Mg), calcium (Ca), cation exchange capacity (CEC), and pH (water and buffer). Spectral preprocessing was performed using Savitzky–Golay smoothing combined with Standard Normal Variate (SG+SNV). Data were divided into 80% calibration and 20% validation sets, and three machine learning techniques; Partial Least Squares Regression (PLSR), Random Forest (RF), and Neural Networks (NN) were applied to calibrate spectra with laboratory measurements. Results showed that in general, exchangeable cations (Ca, Mg) and cation exchange capacity (CEC) were predicted with high accuracy ($0.80 < R^2 < 0.94$), while pH demonstrated moderate to strong predictability ($0.61 < R^2 < 0.82$). In contrast, predictions for P and K were less reliable ($R^2 < 0.6$). Among spectrometers, ATR and ASD generally provided robust performance, whereas ARC exhibited variable results depending on the property and model. PLSR offered the most consistent predictions, while RF and NN showed property-specific variation. These findings highlight the potential of applying MIR and Vis–NIR spectroscopy with SG+SNV preprocessing on fresh soils for rapid fertility assessment, while emphasizing the challenges of predicting P and K under fresh conditions.

Presenter: Yue Zhao

Presentation Session: MO4

Level of Study: PhD

Department: Civil and Environmental Engineering

Category: Engineering

Advisor: Dr. Jun Wang. Associate Professor, Civil and Environmental Engineering

Title: Evaluating attention allocation in Human-Robot Collaboration in construction tasks

Abstract: The integration of robots in construction has the potential to enhance work efficiency. As the level of interaction between workers and robots keeps increasing, it becomes crucial to evaluate whether human-robot collaboration (HRC) introduces additional cognitive load, leading to distraction during construction tasks. While existing research largely addressed human factors at lower human-robot interaction levels (e.g., coexistence, cooperation), it remains unclear how HRC (i.e., an interaction level higher than coexistence and cooperation) impacts workers' attention, possibly causing distractions and unsafe behaviors. This study investigated attention allocation by comparing solo and collaborative tasks in an immersive virtual reality (VR)-based construction environment. An eye tracking device was used to collect fixation and blink data while participants completed the construction tasks (three task stages) in the developed VR system, and questionnaires were used to collect attention scores. The collected data were analyzed using statistical methods to describe attention changes and performance, which were the two aspects used to represent attention allocation in this study. The results indicated that HRC significantly affected attention allocation, with participants showing higher blink rates and increased distraction during the middle and last stages of the collaborative tasks compared to solo tasks. Also, the observed attention changes were associated with longer task completion times and higher frequencies of distraction events, highlighting the cognitive demands in HRC. This study highlighted the importance of optimizing HRC implementation to minimize distraction and enhance safety in construction environments, while also providing insights into the feasibility of safely integrating robots into the construction industry.

The GSA and the Graduate School Thank all Volunteers!

MISSISSIPPI STATE UNIVERSITY™
GRADUATE STUDENT ASSOCIATION

MISSISSIPPI STATE UNIVERSITY™
THE GRADUATE SCHOOL