ISAVT 2025

7TH INTERNATIONAL SYMPOSIUM ON ADVANCED VEHICLE TECHNOLOGY

CONFERENCE PROGRAM

DECEMBER 9-10, 2025

ISAVT 2025

7th International Symposium on Advanced Vehicle Technology

December 9-10, 2025

Center for Advanced Vehicular Systems

Mississippi State University

Starkville, MS, USA

CONFERENCE PROGRAM

Organized in cooperation with:

Mississippi State University

Nihon University

Nagoya University

Rajamangala University of Technology Thanyaburi

Illinois Institute of Technology

Hosted by:

Center for Advanced Vehicular Systems

Mississippi State University

ISAVT 2025

7th International Symposium on Advanced Vehicle Technology

Table of Contents

ISAVT 2025

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Tuesday, December 9, 2025

CAVS 2200	Trotter Seminar Room
08.00 - 09.00	**Registration and check in at the Center for Advanced Vehicular Systems** *Light breakfast of coffee and pastries - by Coffee Depot*
	Opening Session
09.00 – 09.20	**Welcome and Orientation** Dr. Clay Walden, Executive Director, Center for Advanced Vehicular Systems Dr. Daniel Carruth, Associate Director, Center for Advanced Vehicular Systems
	Technical Session I.
09.20 – 09.40	**Efficient Modeling for Dynamic Ship Maneuvers** Prof. Shanti Bhushan, Associate Professor, Mississippi State University, USA
09.40 – 10.00	**A Study on Condition Assessment of Tire Strain Sensors through Vertical Load Estimation** Dr. Heeyoung Jo, Senior Research Associate, Illinois Institute of Technology, USA
10.00 – 10.20	**EcoCAR EV Challenge – A Four-Year Competition in Fifteen Minutes** Dr. John Ball, Professor, Mississippi State University, USA
10.20 – 10.40	**Networking Break** *Light refreshments.*
	Technical Session II.
10.40 – 11.00	**Understanding in AI: A Brief Description of Concepts and Methodologies for Understanding in Human-AI Interactions** Dr. Alicia Ruvinsky, Senior Research Engineer, Mississippi State University, USA
11.00 – 11.20	**On Continuous Road Friction Information for Ensuring Next Generation Traffic Safety** Prof. Ichiro Kageyama, Professor Emeritus, Nihon University, Japan
11.20 – 11.40	**The MSU Autonomous Vehicle Simulator** Dr. Chris Goodin, Associate Professor, Mississippi State University, USA
11.40 - 12.00	**Study on the Body Torsional Rigidity of Personal Mobility Vehicles (PMVs) with Active Tilting** Dr. Tetsunori Haraguchi, Visiting Professor, Nagoya University, Japan
12:00 – 12:10	**Group Photo**
12.10 – 13.20	**Lunch** *Baked Potato Bar, Cookies, Carrot Cake and Drinks – by Sweet Peppers Deli.*
	Technical Session III.
13.20 – 13.40	**A Study on Parameter Optimization for Robust Motion Control Using Taguchi Method** Mr. Riku Kikuta, Graduate Research Assistant, Mississippi State University, USA
13.40 – 14.00	**Fundamental Study on Vibration Stimulation via an Automobile Seat** Prof. Yukiyo Kuriyagawa, Professor, Nihon University, Japan

14.00 – 14.20	**Multi-Objective Optimization of Distributed Generation Placement in Electric Bus Transit Systems Integrated with Fast Charging Station** Prof. Krischonme Bhumkittipich, Professor, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand
14.20 – 14.40	**Networking Break** I*ce cream - by Mississippi Agricultural and Forestry Experiment Station Sales Store*
	Technical Session IV.
14.40 – 15.00	**Lightweight Materials and Battery Research for Future Mobility: The Role of RMUTT in Thailand's Innovation Pathway** Dr. Sumonman Niamlang, Associate Professor/Vice President, Rajamangala University of Technology Thanyaburi, Thailand
15.00 – 15.20	**Nonlinear Disturbance Estimation for Mechanical Systems with Applications to Aerial Robotics** Dr. Jeremy Hopwood, Assistant Professor, Mississippi State University, USA
15.20 – 15.40	**Agricultural Autonomy** Dr. Christopher Hudson, Assistant Professor, Mississippi State University, USA
15.40 – 16.00	**Networking Break** *Light refreshments.*
16.00 – 17.30	**Technical Tours of the Mississippi State University Applied Research Center and the Center for Advanced Vehicular Systems**
18.00 –	**Dinner** *BBQ Pulled Pork Sandwich and Catfish Filet, Baked Beans, Corn Salad, and Mac and Cheese - by Little Dooey*

ISAVT 2025

7th International Symposium on Advanced Vehicle Technology

Wednesday, December 10, 2025

CAVS 2200	Trotter Seminar Room
08.00 – 09.00	**Registration and check in at the Center for Advanced Vehicular Systems** *Light breakfast of coffee and pastries - by Coffee Depot*
	Opening Session
09.00 – 09.20	**Welcome and Orientation** Dr. Daniel Carruth, Associate Director, Center for Advanced Vehicular Systems, USA
	Technical Session V.
09.20 – 09.40	**Open Innovation Campus - European New Innovation Platform** Mr. Masashi Yanai, General Manager Product Planning, SEKISUI Chemical Strategic Mobility Planning, The Netherlands
09.40 – 10.00	**Taking Autonomy Off-road: Advancing Standards and Simulation to Support Off-road Autonomous Systems** Dr. Daniel Carruth, Associate Director, Center for Advanced Vehicular Systems, USA
10.00 – 10.20	**Unsteady Aerodynamics of Tilt-Wing UAS in Transition Mode** Dr. Seshendra Palakurthy, Postdoctoral Associate, Mississippi State University, USA
10.20 – 10.40	**Networking Break** *Light refreshments.*
	Technical Session VI.
10.40 – 11.00	**Requirements-Driven Benchmarking of Autonomous Ground Vehicles** Mr. Jordon Jasper, Graduate Research Assistant, Mississippi State University, USA
11.00 – 11.20	**Study on Vehicle-Pedestrian Interaction Autonomy by Risk Potential Theory** Mr. Riku Kikuta, Graduate Research Assistant, Mississippi State University, USA
11.20 – 11.40	**Surrogate Modeling Techniques Targeting Steady Flows in Different Regimes** Mr. Alexander Way, Research Engineer, Mississippi State University, USA
11.40 – 12.00	**MSU's International Institute** Ms. Masey Smith, Deputy Director, Mississippi State University, USA
12.00 – 12.10	**Closing** Dr. Daniel Carruth, Associate Director, Center for Advanced Vehicular Systems, USA
12.10 – 13.00	**Lunch** *Sandwiches, Salads and Drinks - by Newk's*
	Post-Symposium Planning Session.
13.00 – 15.00	**ISAVT 2026 Organizing Discussion**

Speakers and Abstracts:

Dr. John Ball
Professor
Electrical and Computer Engineering
Mississippi State University

Research Interest: Automated Driving, ADAS, Human Machine Interaction, Virtual & Real Testing, Powertrain

Research Experience: Professor of Electrical and Computer Engineering. I also hold the Bagley College of Engineering Robert Guyton Endowed Chair for Teaching Excellence. My research areas are autonomy, signal and image processing, fusion, and wearables. I teach classing in signal processing, radar, autonomy, and wearable design and development. I am a senior member of IEEE and currently serve as a senior area editor for IEEE Signal Processing Letters. I have published 62 journal and 119 conference papers.

Title: EcoCAR EV Challenge – A Four-Year Competition in Fifteen Minutes

Abstract: The EcoCAR EV Challenge is the ultimate in collegiate experiential learning. This is a four-year competitive competition sponsored by the Department of Energy, Argonne National Labs, GM, and MathWorks. In this competition, 14 collegiate teams compete by modifying the Cadillac LYRIQ's propulsion systems and autonomy. Ass aspects of design, including requirements development and validation, coding, hardware and software integration, modelling, CAD work, mechanical and thermal analysis, project planning, etc. are integral parts of the competition. Students are given state-of-the-art software and hardware, and are trained and supported by industry and government experts. This competition is all about equipping students to be future engineers, marketing and communications specialists, and project managers in the automotive industry. This talk will highlight major components of the competition and also showcase the design choices the students made.

Prof. Krischonme Bhumkittipich
Professor
Electrical Engineering
Rajamangala University of Technology Thanyaburi (RMUTT)

Research Interest: Automated Driving, Secondary Battery, Electronics, Powertrain, Transportation Engineering

Research Experience: Professor Krischonme Bhumkittipich is a leading researcher in electric vehicles, automated driving, and powertrain systems. His work focuses on integrating EVs into power grids, optimizing PV-BESS-EV systems, and developing charging strategies using advanced optimization methods. He has contributed to electric bus conversion projects, battery and powertrain modeling, and innovative small EV designs for automated mobility, strengthening sustainable transportation research.

Title: Multi-Objective Optimization of Distributed Generation Placement in Electric Bus Transit Systems Integrated with Fast Charging Station

Abstract: This study proposes a comprehensive multi-objective optimization framework to determine the optimal placement and sizing of distributed generation (DG) units for electric bus (E-bus) transit systems equipped with high-power flash charging infrastructure. An improved Multi-Objective Grey Wolf Optimizer (MOGWO), enhanced through Euclidean distance-based Pareto ranking, is employed to minimize total power loss, voltage deviation, and voltage violations simultaneously. The framework integrates realistic operational characteristics of E-bus systems, including a 31-stop route spanning 62 km, 600 kW pantograph flash charging stations, and dynamic load variations over a 90-minute simulation period. Performance assessments using IEEE 33-bus and 69-bus distribution test systems show that the proposed MOGWO consistently delivers superior results compared with MOPSO and NSGA-II across all DG deployment scenarios. Under a three-DG configuration, MOGWO achieves minimum power losses of 0.0279 MW and 0.0179 MW for the 33-bus and 69-bus networks, respectively, while maintaining voltage deviations as low as 0.1313 and 0.1362, and successfully eliminating all voltage violations. In addition, the proposed algorithm exhibits excellent computational performance, with low result variance and fast convergence, requiring less than seven hours of processing on average. Overall, the findings validate the framework's effectiveness and scalability for improving distribution network performance.

Speakers and Abstracts:

Prof. Shanti Bhushan
Associate Professor
Mechanical Engineering
Mississippi State University
USA

Research Interest: Handling & Vibration / Tire Characteristics / Vehicle Dynamics

Research Experience: Prof. Bhushan's primary research is in the area of high fidelity CFD with emphasis in turbulent flow modeling and simulation. He has developed and validated novel turbulence/transition models, has over twenty years of experience in the use of CFD for the prediction of complex fluid flow phenomena in aerodynamics and hydrodynamics. He has published 57 Journal papers, 3 Book Chapters, and 100+ Conference papers.

Title: Efficient Modeling for Dynamic Ship Maneuvers

Abstract: Computational Fluid Dynamics (CFD) is widely used in ship hydrodynamics resistance, propulsion and seakeeping applications. Simulation of ship maneuvers is particularly challenging as it requires accurate predictions of hull-propeller-rudder interactions. The advances in high-performance computing are enabling high-fidelity simulations that can capture such physics accurately, however, they come with immense computational cost rendering CFD unusable for design cycle. The emerging machine-learning approach has the potential to develop models that can help speed-up slowest aspects of the simulation, which is modeling of the rotating propeller blade. The project focuses on development of machine-learned actuator-line model for marine propellers. The guiding hypothesis is that if an approximate model matches a blade-resolved simulation's three-dimensional momentum deficit and turbulence production, it should yield quantitatively similar open-water propeller performance (thrust, torque, power) and near-wake flow characteristics. A key measure of success is whether the ML-ALM predictions accurately capture tip vortex evolution and breakup, as these vortices dictate swirl and wake recovery.

Dr. Daniel Carruth
Associate Research Professor
Associate Director, Advanced Vehicle Systems
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Ergonomics, Automated Driving

Research Experience: Dr. Carruth serves as co-chair of the NATO Applied Vehicle Technology research working group (AVT-408) with previous appointments to technical teams (AVT-ET-194 and AVT-341). Dr. Carruth also recently completed an ASAM project to investigate requirements for standards to support modeling and simulation of off-road ground vehicles. Dr. Carruth has published over 100 conference and journal publications and has received over $23M in grant funding for his research in autonomous systems and human factors.

Title: Taking Autonomy Off-road: Advancing Standards and Simulation to Support Off-road Autonomous Systems

Abstract: Autonomous vehicles operating off-road face unique challenges: degraded sensing, complex terrain, and limited support from existing autonomy frameworks. At Mississippi State University's Center for Advanced Vehicular Systems (CAVS), we work to address these issues through integrated research in the development of autonomy using field testing, simulation, and standards. This work focuses on developing simulation-based methods to evaluate off-road behaviors, in part using our Mississippi State University Autonomous Vehicle Simulator (MAVS) platform to test autonomy under sensor occlusion, in dense vegetation, and soft or uneven terrain. In collaboration with NATO, we are contributing to a multi-nation demonstration of a shared virtual environment for testing autonomous behaviors in off-road scenarios. The NATO effort directly informs our contributions to the ASAM OpenX standards community, where we are proposing extensions to address critical gaps in industry simulation standards, such as modeling of deformable terrain interactions, definition of vehicles, models of vegetation and other objects, and agent coordination. Our findings support the development of a simulation and standards ecosystem that enables repeatable, high-fidelity evaluation of autonomous systems in off-road contexts - an essential foundation for developing novel capabilities and advancing trust in autonomy in challenging environments.

Speakers and Abstracts:

Dr. Chris Goodin
Associate Research Professor
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Automated Driving, ADAS

Research Experience: Dr. Goodin is an Associate Research Professor at the Center for Advanced Vehicular Systems, where he is the lead developer of the MSU Autonomous Vehicle Simulator (MAVS) and the NATURE autonomy stack. From 2008-2017, he worked with the U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, MS, serving as the lead developer for the VANE and CREATE-GV.

Title: The MSU Autonomous Vehicle Simulator

Abstract: The MSU Autonomous Vehicle Simulator (MAVS) is an open-source, physics-based simulation library for off-road autonomous ground vehicles (AGV). MAVS features realistic simulations of vehicle-terrain interaction (VTI) and sensor-environment interaction for sensors like lidar and cameras. Cross-platform and HPC-enabled, MAVS has been used in a variety of applications and projects, from software-in-the-loop testing to control algorithm evaluation to synthetic data generation. This presentation will highlight some features and prior use cases for MAVS.

Dr. Tetsunori Haraguchi
Visiting Professor
Institutes of Innovation for Future Society
Nagoya University
Japan

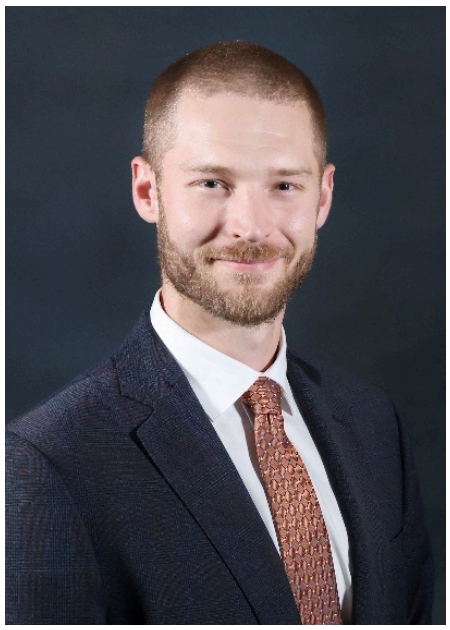
Research Interest: Automated Driving, ADAS, Handeling & Vibration / Tire Characteristics / Vehicle Dynamics, Virtual & Real Testing, Transportation Engineering

Research Experience: Tetsunori Haraguchi received his Master's degree from Kyoto University in 1978 and joined Toyota Motor Corporation, working in chassis technology and vehicle dynamics. In 2011, he became a Designated Professor at Nagoya University, starting research on ultra-compact personal mobility vehicles. He is now a Visiting Professor at Nagoya University and Senior Research Fellow at Nihon University. He received a Doctor of Engineering degree from Nihon University in 2020.

Title: Study on the Body Torsional Rigidity of Personal Mobility Vehicles (PMVs) with Active Tilting Mechanisms

Abstract: In four-wheeled vehicles, an imbalance between front and rear roll moments and roll stiffness influences steer characteristics through changes in tire vertical load. However, few studies have logically analyzed the effect of body rigidity on vehicle handling characteristics. Especially for three-wheeled PMVs (Personal Mobility Vehicles), no research has been conducted. Therefore, this study first organizes the effect of body rigidity on tire vertical load in four-wheeled vehicles using a simplified body rigidity model. Based on this, we examined the influence of body rigidity on vehicle dynamics in a three-wheeled PMV with two front wheels and one rear wheel equipped with an active tilting mechanism. The results suggest that an optimal torsional rigidity around the vehicle's longitudinal axis may exist for transient tasks in real-world scenarios, such as obstacle avoidance. Although no clear optimal value was found in simulations conducted using a vehicle dynamics analysis tool, it was observed that obstacle avoidance capability saturated at around 70% of the torsional rigidity typical of monocoque structures, confirming the impact of torsional rigidity on vehicle dynamics and validating the effectiveness of using a simplified body rigidity model for dynamic analysis as conducted in this study.

Speakers and Abstracts:



Dr. Jeremy Hopwood
Assistant Professor
Aerospace Engineering
Mississippi State University
USA

Research Interest: Automated Driving, Handling & Vibration / Tire Characteristics / Vehicle Dynamics

Research Experience: Jeremy Hopwood is an assistant professor in the Aerospace Engineering department at MSU. His research involves nonlinear modeling, control, and estimation of autonomous systems operating in uncertain environments using geometric, energy-based, and stochastic techniques. His research has primarily focused on aerospace applications, leveraging the structure of an aircraft's equations of motion to obtain improved performance and stronger safety guarantees for autonomous flight in turbulence.

Title: Nonlinear Disturbance Estimation for Mechanical Systems with Applications to Aerial Robotics

Abstract: Provably accurate disturbance estimation is essential for trustworthy autonomy, yet nonlinear dynamics and environmental uncertainty often limit the guarantees offered by traditional filtering and disturbance estimation methods. This talk presents a disturbance estimation framework that leverages the geometric structure of mechanical systems to obtain rigorous convergence guarantees. By exploiting dynamical symmetries, such as coordinate invariance or conservation laws, we achieve improved performance and broader applicability. This theoretical framework is demonstrated through the problem of wind estimation for aerial robots, where direct sensing is often impractical and standard approaches fail during aggressive maneuvers. Using a symmetry-preserving reduced-order observer, we reconstruct wind velocity directly from aircraft motion, avoiding the limitations of traditional methods. This enables provably accurate synthetic air data, improving safety, ride quality, and control performance across a wide range of flight conditions.

Mr. Jordon Jasper
Graduate Research Assistant
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Virtual & Real Testing

Research Experience: Graduate Research Assistant at CAVS, advancing autonomous mobility for off-road, industrial, and heavy-duty vehicles. Focused on AI, sensor integration, and vehicle robotization, leveraging MAVS/NATURE stacks for modeling, simulation, and real-world validation. Past experience includes NSF REU research on graph neural networks for smart city robotics and leadership as a Resident Advisor.

Title: Requirements-Driven Benchmarking of Autonomous Ground Vehicles

Abstract: Autonomous ground vehicles are increasingly important for scouting, logistics, and mission-support, yet methods for verifying whether they meet performance requirements remain limited. Traditional pass/fail tests oversimplify system behavior, and component evaluations often fail to reflect full-system performance, making repeatable benchmarking difficult. We developed a requirements-oriented testing and benchmarking workflow using the Mississippi State University Autonomous Vehicle Simulator and a Polaris MRZR platform. A terrain-generation system created parametrized obstacles aligned with measurable requirements such as maximum traversable width or depth. The MRZR navigated between fixed endpoints while encountering systematically varied obstacles. A custom A* planner in the Nature Stack autonomy framework was evaluated under two modes: repeated trials for statistical reliability and Monte Carlo sampling to identify performance boundaries. Each run produced structured data including timing, start and end states, outcomes, and motion statistics. A continuous integration pipeline generated visual summaries showing where requirements begin to fail. This approach demonstrates that digital engineering can connect component tests, system behavior, and requirement verification into a unified, evidence-based benchmarking process. Future work will extend to more complex terrain to support standardized, data-rich evaluations for mission planning and capability assessment.

Speakers and Abstracts:

Dr. Heeyoung Jo
Senior Research Associate
Electrical and Computer Engineering
Illinois Institute of Technology
USA

Research Interest: Automated Driving, ADAS, Handling & Vibration / Tire Characteristics / Vehicle Dynamics, Virtual & Real Testing

Research Experience: I received the M.S. and Ph.D. degrees in Mechanical engineering from Nihon University, Japan, in 1994 and 1997, respectively. From 1997 to 2016, I worked at Samsung Advanced Institute of Technology, Toyota Motor Company, and Hyundai Motor Company. From 2016 to 2022, I worked at KEIT, EV company, and KIAPI in South Korea. I am currently working as a Senior Research Associate with the Department of Electrical and Computer Engineering, Illinois Tech since 2024.

Title: A Study on Condition Assessment of Tire Strain Sensors through Vertical Load Estimation

Abstract: Intelligent tire (i-Tire) sensors have recently been commercialized and applied to tire management systems in logistics trucks. The i-Tire sensor, which can detect tire conditions such as air pressure, temperature, and strain, is used to reduce costs by improving tire replacement cycles and fuel efficiency. However, since the i-Tire sensor is mounted inside the tire, it is not easy to directly check the sensor health condition. This paper proposes a method to determine the condition of a tire strain sensor. Existing sensor failure detection techniques directly measure and judge whether the sensor's output signal is abnormal, but such a method is not easy in i-Tire. Therefore, this study presented a method of estimating vertical loads using vehicle speed and sampling time based on tire strain data and determining minimum requirements to estimate vertical load value correctly. This approach is expected to contribute to increasing the safety and reliability of i-Tire sensors.

Prof. Ichiro Kageyama
Professor Emeritus
NU-CAR
Nihon University
Japan

Research Interest: Ergonomics, Automated Driving, ADAS, Handeling & Vibration / Tire Characteristics / Vehicle Dynamics, Human Machine Interaction, Human Machine Modeling, Virtual & Real Testing, Transportation Engineering

Research Experience: Prof. I. Kageyama has studied to conduct experimental and theoretical research into the dynamics of heavy-duty vehicles, passenger cars, and motorcycles. He is also conducting research into these control algorithms, including driver control algorithms Furthermore, based on the analysis of road traffic accidents, he has also studied into road surface friction estimation, proposing a method for measuring continuous μ-s characteristics and constructing a measurement system using this method.

Title: On Continuous Road Friction Information for Ensuring Next Generation Traffic Safety

Abstract: Road friction information is extremely important from the perspective of ensuring the safety of next-generation road traffic (e.g., vehicles equipped with AD and AEBS). The widespread adoption of AEBS and other technologies has statistically significantly reduced the number of road traffic accidents and fatalities in Japan. However, as these technologies become more widespread, these figures have reached saturation, necessitating new safety measures. Accident statistics show a significant increase in the number of accidents during rainy weather and snowy seasons, and it has been pointed out that these results are significantly influenced by changes in road friction. Therefore, information on the road surface friction characteristics ahead of the vehicle is extremely important for improving the safety of next-generation AD and AEBS. Our group has devised a device to continuously measure road surface friction characteristics, accumulated measurement results on various road surfaces, and is conducting research aimed at estimating road friction ahead. This presentation will provide an overview of these efforts.

Speakers and Abstracts:

Mr. Riku Kikuta
Graduate Research Assistant
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Automated Driving, ADAS, Human Machine Interaction

Research Experience: Riku Kikuta is a Graduate Research Assistant at the Center for Advanced Vehicular Systems (CAVS). He has contributed to several NATO and ARC projects, including vegetation override estimation, off-road autonomy simulation, and sensor occlusion studies. His research interests include vehicle-pedestrian interaction, on-road autonomy, and robust engineering. He recently successfully defended his dissertation titled "Study on Vehicle-Pedestrian Interaction Autonomy by Risk Potential Theory." His Ph.D. will be conferred on December 12th.

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.

Title: Study on Vehicle-Pedestrian Interaction Autonomy by Risk Potential Theory

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.

Prof. Yukiyo Kuriyagawa
Professor
College of Industrial Technology
Nihon University
Japan

Research Interest: Ergonomics, Automated Driving, ADAS, Human Machine Interaction, Human Machine Modeling

Research Experience: 2021.4- present Professor, Nihon University, College of Industrial Technology 2015.9-2016.9 Visiting Researcher, NASA Ames Research Center, Human Systems Integration Division 2010.8-2011.8 Visiting Researcher, University of Nottingham, Human Factor Research Group

Title: Fundamental Study on Vibration Stimulation via an Automobile Seat

Abstract: This study aims to realize comfortable and intuitive driving assistance by employing tactile stimulation delivered through seat vibrations, either as an alternative to or in conjunction with audiovisual cues. We investigated drivers' cognitive responses to seat vibrations with varying frequencies, in contrast to conventional systems that use a fixed frequency.

Speakers and Abstracts:

	Prof. Chaomin Luo Associate Professor Department of Electrical and Computer Engineering Mississippi State University USA **Research Interest:** Automated Driving, ADAS, Human Machine Interaction, Human Machine Modeling, Virtual & Real Testing **Research Experience:** Dr. Chaomin Luo is an Associate Professor of Electrical and Computer Engineering at Mississippi State University. He holds a Ph.D. from the University of Waterloo and conducts research in robotics, control, intelligent systems, and autonomous systems. He has served in editorial and leadership roles for IEEE conferences and received multiple Best Paper Awards, including ASEE 2024 and several international robotics and intelligence venues.

Title: Autonomous Systems through Nature-Inspired Intelligence and Human-Robot Interaction

Abstract: Nature-inspired intelligence, bio-inspired AI, and dynamic evolutionary optimization - key areas of computational intelligence - are driving major advances in intelligent agents and autonomous systems. Autonomous robotics and vehicles already show significant societal and economic impact, a trend expected to accelerate. As these systems grow more capable, cybersecurity has become a critical concern. To enhance resilience, this work incorporates a cybersecurity dimension with emphasis on human-robot interaction (HRI), recognizing the human element as central to securing autonomy. The research examines user behavior, insider-threat mitigation, and human engagement with security mechanisms to better protect autonomous platforms from external attacks and internal vulnerabilities. This study presents a set of novel neural dynamics models, evolutionary computation algorithms, and evolutionary optimization methods for autonomous systems. Drawing on biologically inspired neural networks and evolutionary principles, the proposed approaches address fundamental challenges in navigation, mapping, learning, localization, and vision. Extensive simulations, comparative evaluations, and experimental validations demonstrate improvements in effectiveness, efficiency, robustness, and security across both single-robot and multi-robot systems.

	Dr. Sumonman Niamlang Associate Professor/Vice President Material Engineering Rajamangala University of Technology Thanyaburi (RMUTT) Thailand **Research Interest:** Material Science **Research Experience:** Dr. Sumonman Niamlang is a researcher in materials science focusing on advanced polymers, nanocomposites, and electroactive materials for EV batteries. Her work includes PLA/ZnO nanofiber separators, bio-based polymer electrolytes, and carbon conductive networks, aiming to enhance ionic transport, interfacial stability, and safety in next-generation solid-state and sustainable energy storage systems.

Title: Lightweight Materials and Battery Research for Future Mobility: The Role of RMUTT in Thailand's Innovation Pathway

Abstract: The rapid transformation of the global transportation sector highlights the urgent demand for lightweight structural materials and advanced battery systems, both of which are central to the development of sustainable and intelligent mobility. Reducing vehicle mass directly enhances energy efficiency and driving range, while innovations in battery chemistry and design improve safety, performance, and charging capability. Thailand, as a regional leader in automotive manufacturing, is actively positioning itself to integrate these advances into future mobility solutions. Rajamangala University of Technology Thanyaburi (RMUTT) has developed an interdisciplinary research program that combines materials engineering, energy storage, power electronics, and strategic innovation studies to support this transition. Research on lightweight alloys, composites, and hybrid structures has demonstrated the ability to reduce vehicle weight while maintaining mechanical integrity and crash resistance. Fiber-reinforced polymers and metal-polymer hybrids have been developed with a focus on durability, recyclability, and thermal stability, thereby aligning vehicle design with both safety standards and circular economy principles. In parallel, work on polymer-inorganic nanocomposites and solid/gel polymer electrolytes has opened new opportunities for battery systems tailored to electric vehicles. Electrospun nanofiber membranes and bio-derived electrolytes have shown improved ionic conductivity, enh

Speakers and Abstracts:

Dr. Seshendra Palakurthy
Postdoctoral Associate
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Handling & Vibration / Tire Characteristics / Vehicle Dynamics

Research Experience: My research interests are in the development and application of high-fidelity, multidisciplinary solvers to deliver quick, reliable solutions to design problems. Currently, I am developing a high-fidelity FSTI solver to investigate the impact of flow unsteadiness and thermal stresses on the flutter of 3D structural components in supersonic/hypersonic flows. I am also investigating the unsteady aerodynamics of the Propeller-Wing system in transition for VTOL applications.

Title: Unsteady Aerodynamics of Tilt-Wing UAS in Transition Mode

Abstract: The increasing demand for Unmanned Aerial Systems (UASs) in military and civilian sectors has accelerated research into urban air mobility, where Vertical/Short Take-Off and Landing (V/STOL) capabilities are crucial given the lack of traditional runways. Tilt-wing designs offer a promising solution by allowing smooth transitions between hover and forward flight. However, the transition phase presents unique aerodynamic challenges, including low Reynolds number effects, asymmetric wing loading, unsteady flow behavior, and propeller-induced moments. Although V/STOL technologies were studied in the mid-20th century, earlier research was limited by static or simplified dynamic testing and did not capture the unsteady phenomena relevant to modern UASs. Hence, there is a gap in our understanding of low-Re propeller-wing aerodynamics during the transitional phase, when the rotating wing and propeller experience accelerating flows, significant changes in angle of attack, and unsteady effects, warranting a fundamental investigation. This study focuses on assessing the difference between the motion of a wing in a still fluid and the flow over a fixed wing using CFD to understand unsteady aerodynamics in low-Re flows. Based on the type of motion, three sets of simulations were designed to understand the role of inertial effects on the wing. By addressing a fundamental gap in understanding unsteady wing aerodynamics, this work contributes to the development of more efficient UAS designs.

Dr. Alicia Ruvinsky
Senior Research Engineer
Institute for Systems Engineering Research
Mississippi State University
USA

Research Interest:

Research Experience: Dr. Alicia I. Ruvinsky is a seasoned research computer scientist with over 20 years of experience advancing AI, data science, and machine learning across government and industry. Specializing in human-AI collaboration for mission-critical applications like cybersecurity and autonomous systems, she has held key leadership roles at the U.S. Army ERDC and Lockheed Martin. Her innovative work has resulted in numerous publications, a patent, and multiple awards. She is also a dedicated STEM mentor committed to the responsible integration of AI into practical solutions.

Title: Understanding in AI: A Brief Description of Concepts and Methodologies for Understanding in Human-AI Interactions

Abstract: As artificial intelligence (AI) tools become increasingly embedded in human computational environments, their ability to provide understanding is crucial for enabling humans to confidently build awareness, make informed decisions, and interact safely with the world. In this context, "understanding" in AI extends beyond mere data processing and prediction; it encompasses the ability to interpret, explain, and communicate meaning in ways that foster trust and collaboration. This presentation explores concepts and methodologies of understanding in AI, distinguishing between explainability (post-training decision logic) and interpretability (design-stage decision logic). We examine why these concepts are vital for effective human–AI interactions, discuss the challenges posed by complex, opaque models, and review practical approaches to achieving meaningful understanding. Finally, we consider the ethical and practical implications, addressing questions of transparency, accountability, regulation, and the potential for misuse. By framing understanding as both a technical requirement and a relational process, this talk clarifies its essential role in building effective, trustworthy AI systems.

Speakers and Abstracts:

Ms. Masey Smith
Deputy Director
International Institute
Mississippi State University
USA

Research Interest:

Research Experience: International Research and Development

Title: MSU's International Institute**Abstract:** The International Institute at Mississippi State University (MSU) supports the university's global mission by facilitating global programming. The International Institute houses several key offices and provides services for faculty, staff, and students, including study abroad, international student services, international research development, and the English Language Institute. The institute aims to foster a diverse and global campus environment through international exchange, academic and cultural programs, and global partnerships to address worldwide challenges and even serves as a U.S. passport office. Key functions and services: Internationalization: Promotes an international academic and cultural environment through global outreach, research, and academic programs for the entire university community. Study Abroad Office: Facilitates and expands study abroad opportunities for students to gain new perspectives and skills internationally. International Services Office: Provides support for inbound international students, scholars, and visiting faculty regarding immigration, visa regulations, and social programming. Research Development Office: Acts as a hub for international research, assisting faculty with identifying funding opportunities, developing international partnerships, and managing global projects. English Language Institute: Offers intensive English programs to prepare international students for academic coursework and cultural integration at the university.

Mr. Alexander Way
Research Engineer
Center for Advanced Vehicular Systems
Mississippi State University
USA

Research Interest: Automated Driving, Human Machine Modeling, Virtual & Real Testing

Research Experience: My research focuses on surrogate modeling of high-speed flows using novel AI/ML techniques to accelerate multidisciplinary design optimization (MDAO). I have been at Mississippi State University for nearly four years and recently completed a Ph.D. in Computational Engineering. I hold a Bachelor of Science in Mechanical Engineering from the University of Alabama and worked for several years in the aerospace industry prior to joining MSU.

Title: Surrogate Modeling Techniques Targeting Steady Flows in Different Regimes

Abstract: This presentation details a variety of deep-learning architectures used to develop surrogate models of steady-state fluid flows, which can emulate flow fields and surface load distributions. The discussion enumerates the benefits and drawbacks associated with both physics-informed models and purely data-driven architectures. Example applications include two- and three- dimensional problems across subsonic, transonic, supersonic, and hypersonic regimes. Additionally, a data-driven surrogate model for convective heat transfer is presented and coupled with an optimization algorithm to enable gradient-based trajectory optimization of a hypersonic vehicle considering aerothermodynamic constraints. Overall, this work showcases several emerging surrogate modeling strategies and highlights how surrogate models can be used to accelerate engineering tasks which would otherwise be computationally intractable.

Speakers and Abstracts:

Mr. Masashi Yanai
Director Design Studio
SEKISUI Europe B.V.
The Netherlands

Visiting Fellow
Nagoya University Green Mobility Reseach Center
Nagoya University
Japan

Research Experience: Mr. Yanai started his career with the Mitsubishi Motor Corporation in 1995 working on body engineering. In 2015, he joined Sekisui Europe where his now Director of the Design Studio. He is also a Visiting Fellow at the Green Mobility Institute at Nagoya University.

Title: Open Innovation Campus - European New Innovation Platform

Abstract: The presentation will introduce a new way of innovation and collaboration with Industry, Academia and Government as part of the new eco system in Europe..

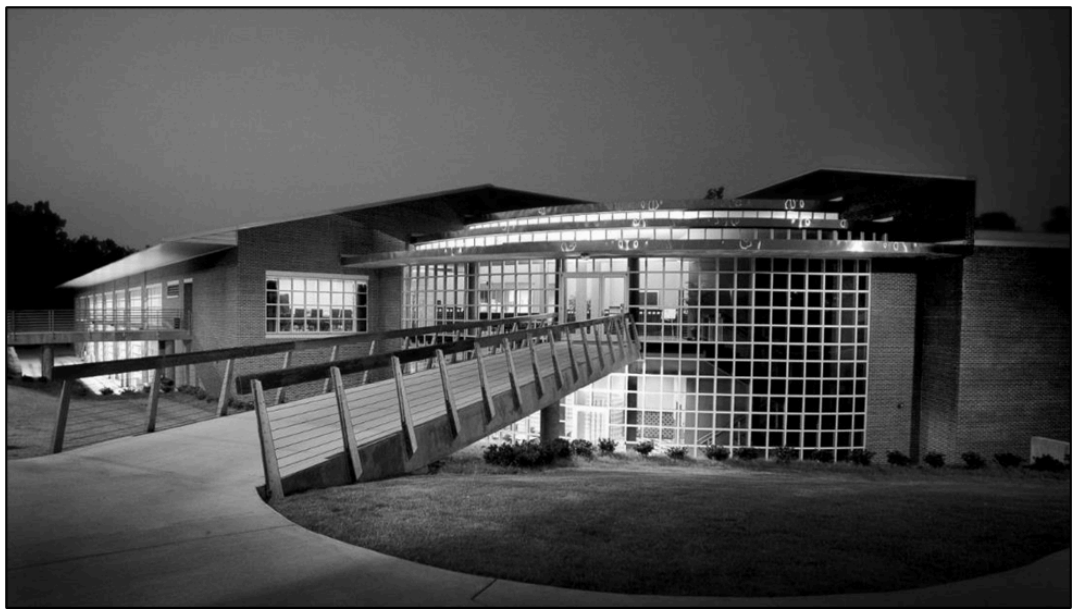
Dr. Christopher Hudson
Assistant Professor
Computer Science and Engineering
Mississippi State University
USA

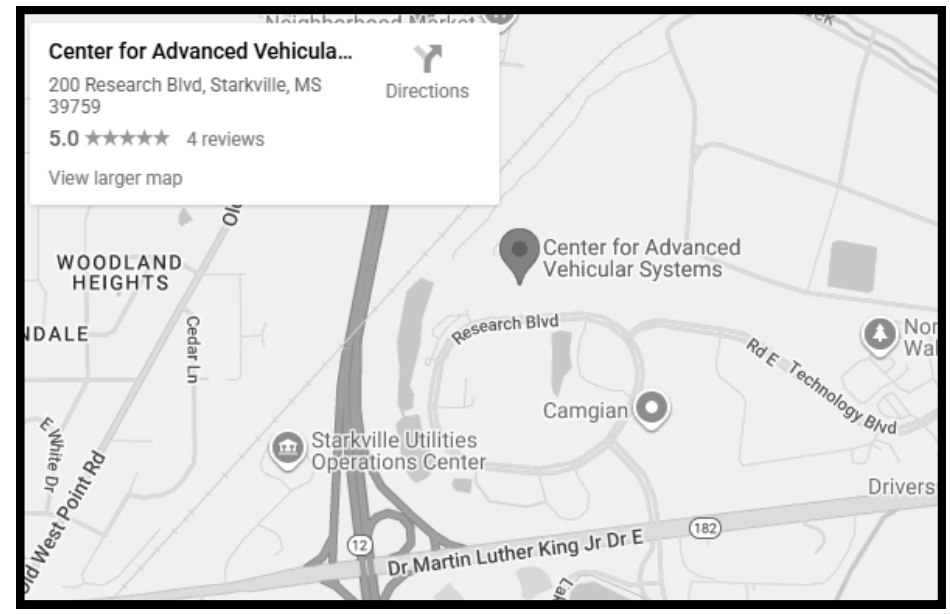
Research Interest: Autonomy

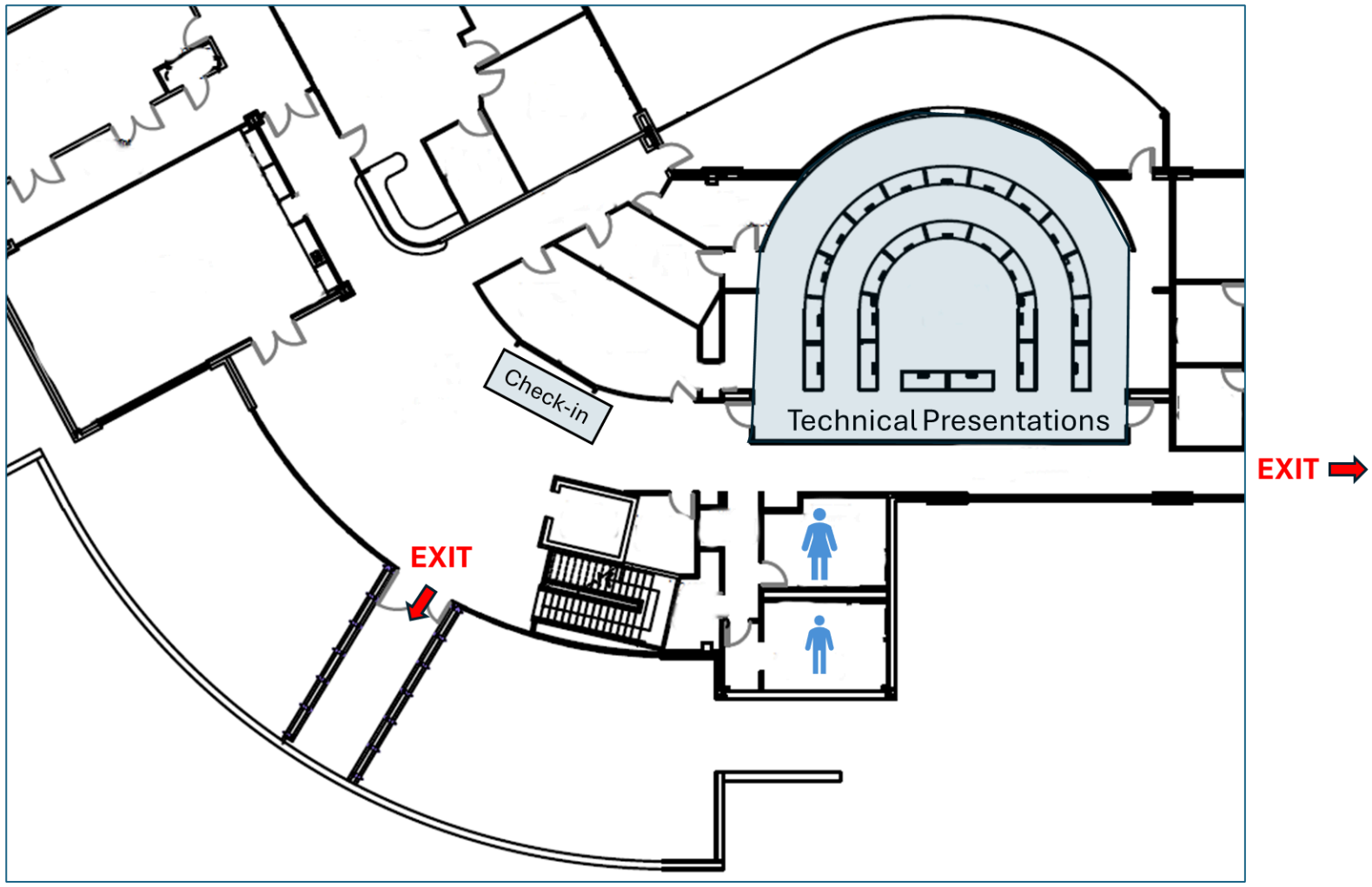
Research Experience: Dr. Hudson works on a variety of projects focusing on offroad autonomous systems. This works explores both modeling and simulation combined with real world testing and validation. His dissertation focused on the effects of ecological simulation for ground vehicle mobility forecasting. Dr. Hudson's work extends into Virtual Reality, with a focus on designing interactions in dynamic environments to explore human computer interactions in complex scenarios in a safe and controlled manner. This work involves interactions with and around autonomous systems and immersive training for controlling remote systems.

Information for Participants:

Conference Venue:	Center for Advanced Vehicular Systems
Address:	200 Research Boulevard
Information:	tel.: +1 662 325 5431
	email: isavt-admin@msstate.edu
Website:	https://www.cavs.msstate.edu/conferences/isavt/







Information for Participants:

Conference Programme Changes
The conference organizing committee reserves the right to alter the program at any time.

Conference Languages
English is the official language of ISAVT 2025. All printed and online materials for the conference will be published in English.

Presentation
The program consists of invited presentations organized into sessions of 3-4 20 minute presentation slots. Presentations should be 15 minutes with 5 minutes allowed for questions from the audience. Presenters may use their own laptop or may use the Conference laptop. HDMI and USB-C connections are available. If you are using the Conference laptop, please provide a Powerpoint or PDF file to the organizers during a break prior to your session.

Conference Proceedings
This program constitutes the conference proceedings.

Refreshment
A light breakfast and lunch will be provided at designated times on both days of the Conference. A dinner will be catered and provided at CAVS on Tuesday, December 9th, starting at 6PM. Coffee and light refreshments will be provided during networking breaks. Additional drinks and snacks are available in vending machines downstairs.

Registration and Check-In
The check-in desk is located in the CAVS Lobby outside of the Trotter Seminar room (CAVS 2200). Please visit the check-in desk to receive your badge and welcome bag.

Parking
Parking is available in the CAVS parking lot. You must register your vehicle with the ParkMobile app and purchase a parking pass. Please see one of the organizers to request an access code for free parking for the two days of the Conference. Please see https://www.transportation.msstate.edu/parking/visitor for more information.

Smoking
Mississippi State University is a smoke-free campus and smoking in any form is prohibited on campus, including cigarettes, cigars, pipes, e-cigarettes, and hookah. Visitors may smoke in their **closed** personal vehicle. See https://www.smokefree.msstate.edu/faq for more information.

Building Access
The lobby and Trotter Seminar room are openly accessible. The remainder of CAVS is a secure research facility. If visiting the other areas of CAVS, you must be escorted by a CAVS employee at all times. CAVS has a full kitchen and several refrigerators available for any medical or personal cold storage needs.

Information for Participants:

Emergency Information

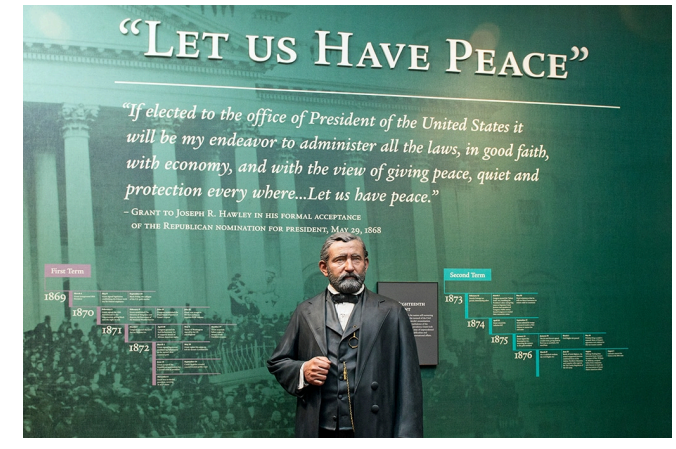
If an emergency, accident, or incident arises during your time at the Conference, notify an organizer immediately. They will know what actions need to be taken. For all other emergencies, call 911 for emergency assistance.

MSU Campus Police: 662-325-2121

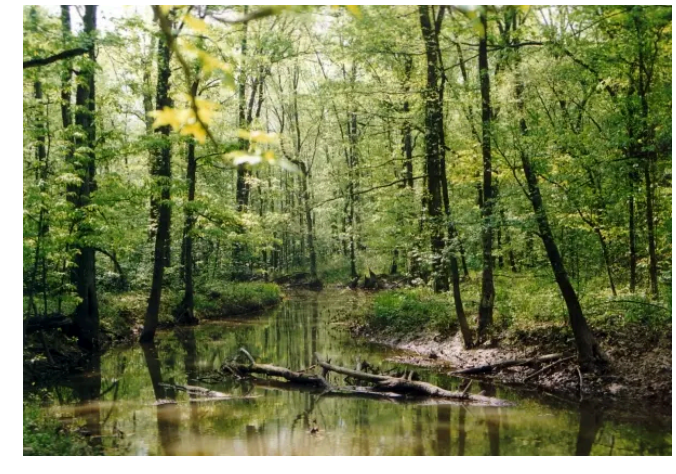
Local Hospital: OCH Regional Medical Center, 400 Hospital Rd, Starkville, MS 39759

Tourism Information

Ulysses S. Grant Presidential Library
Hours: 8a - 5p
Website: https://www.usgrantlibrary.org/
The Ulysses S. Grant Presidential Library Museum presents the four eras of Ulysses S. Grant's life – cadet, general, President, and elder statesman – as an engaging, interactive experience. The museum is located on the top floor of the Mitchell Memorial Library on the Mississippi State University campus.



Sam D. Hamilton Noxubee National Wildlife Refuge
Website: https://www.fws.gov/refuge/sam-d-hamilton-noxubee
Established in 1940, Noxubee National Wildlife Refuge manages habitat for the conservation of migratory birds. The refuge is located in three counties of Mississippi, Noxubee, Oktibbeha, and Winston. In 2012, the refuge was renamed Sam D. Hamilton Noxubee National Wildlife Refuge in honor of Sam D. Hamilton, a former director of the Fish and Wildlife Service who grew up in this area.



Joe Frank Sanderson Center
Hours: 5:30a - 11p
Stay healthy and fit with a guest pass ($12/day) to the Sanderson Center's 150,000 square feet of recreation space. Facilities include two workout areas, an indoor track, indoor gymnasium space, and a pool.

Mississippi Agricultural and Forestry Experiment Station Sales Store
Hours: 9a - 4:30p
Website: https://www.msucheese.com/
Mississippi State University has been crafting its iconic dairy products since 1938, when the original teakwood hoops for our famous Edam "cannon ball" cheese arrived from Holland. Today, MSU's award-winning Holstein and Jersey herds supply the Custer Dairy Processing Plant, where students learn hands-on in a modern teaching and research facility.

Visitors can stop by the store to pick up fresh MSU dairy products, including ice cream, cheese, butter, and campus-favorite specialties like Muscadine Ripple.

Useful Links

Title	Link
Visit Starkville - Tourism Information	https://starkville.org/
Visit Starkville - Where to Eat	https://members.starkville.org/list/ql/restaurants-food-beverages-22
Visit Starkville - Where to Shop	https://members.starkville.org/list/ql/shopping-specialty-retail-23
Mississippi State University	https://www.msstate.edu/
Mississippi State University Welcome Center	https://www.visit.msstate.edu/
Mississippi State University Traditions	https://www.msstate.edu/about/traditions
Mississippi State University Points of Pride	https://www.msstate.edu/about/points-of-pride
Center for Advanced Vehicular Systems	https://cavs.msstate.edu/
Oktibbeha County, MS	https://www.oktibbeha.ms.gov/

Sponsorship

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