2023

ANNUAL REPORT

UTARI

UNIVERSITY OF TEXAS AT ARLINGTON
RESEARCH INSTITUTE

INSIGHT TO INNOVATION

The UT Arlington Research Institute (UTARI) specializes in applying cutting-edge technologies to real-world problems. Our collaborative endeavors reflect a commitment to excellence, integrity, and respect for all, bringing economic growth and fulfillment to our families, business partners, university, and community.

A researcher at UTARI's Institute for Predictive Performance Methodologies investigates macro defects in composite materials during manufacturing.

COVER PAGE   UTARI is developing systems for mapping indoor and GPS denied environments. The AIS Division is investigating applications for this technology, including inspecting construction sites, under bridges, and inside abandoned mines, and searching and retrieving items from high shelves.

UTARI performs research and development that links discovery, development, and technology commercialization leading to technology-based economic development which benefits our society. Building sustainable relationships with regional business and industry is key to our success.

Researchers at UTARI's Institute for Predictive Performance Methodologies discuss sample setup and preparation before initiating the experiment to grow carbon nanotubes for use in composite materials to improve electrical properties.

Automation and Intelligent Systems

2023 HIGHLIGHTS

In 2023, Immobileyes, Inc., and UTARI's AIS Division were awarded a U.S. Air Force Small Business Technology Transfer (STTR) grant to support the research and development of advanced systems to counter Unmanned Aerial Systems (UASs)—i.e., drones. The Immobileyes Laser Storm™ Sensor Jamming System is a patented, laser-emitting device capable of projecting a "shower" of multiple wavelength laser beams adapted to overwhelm and blind sensors, such as cameras. The UTARI team developed deep-learning-driven computer vision to detect and track multiple UASs and control algorithms to aim the Laser Storm system at the offending drones.

The mission of the Automation and Intelligent Systems Division at UTARI is to develop robotics and automation tools to solve real-world problems. Research thrusts include autonomous vehicles and systems, service robotics, machine vision, advance manufacturing, and control systems and estimation.

UTARI's Autonomous Systems Lab focuses on research in controls design for robotic, aerospace, and autonomous systems, intelligent control, cooperative control of networked items, sensor networks, and real-time control implementation.

UTARI's biomedical technologies research scientist, Alexandra Jamieson, won top place at the Tech Transfer Office Showcase at BioNTX's iC3 Life Science Summit on September 29, 2023. Jamieson presented on the Smart Pressure Adjusting Cushion for Pressure Injuries (SPACI). SPACI was created to prevent pressure ulcers for wheelchair users. SPACI monitors and modulates seating interface pressure in real time to reduce the risk of pressure ulcers among wheelchair users.

UTARI's Biomedical Technologies Division focuses on developing clinically relevant devices and systems that can be utilized by health care providers as well as patients to enhance diagnostics, treatment, rehabilitation, and preventive care.

PRINCIPAL RESEARCH AREA

Biomedical Technologies

The REHAB Glove is a portable, feedback-controlled, programmable system capable of implementing prescribed therapeutic schemes developed by healthcare professionals.
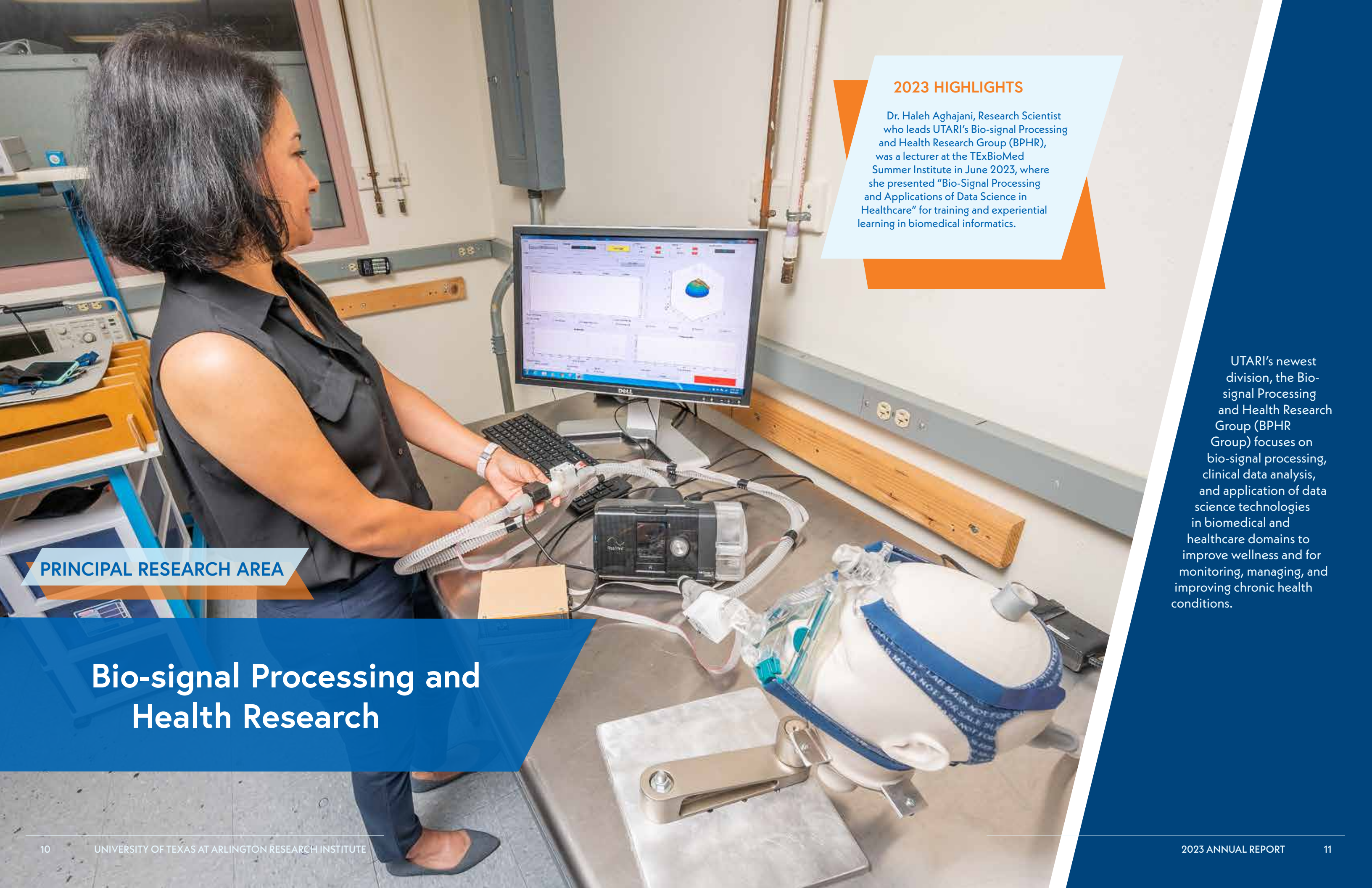
2023 HIGHLIGHTS

Dr. Haleh Aghajani, Research Scientist who leads UTARI's Bio-signal Processing and Health Research Group (BPHR), was a lecturer at the TExBioMed Summer Institute in June 2023, where she presented "Bio-Signal Processing and Applications of Data Science in Healthcare" for training and experiential learning in biomedical informatics.

UTARI's newest division, the Bio-signal Processing and Health Research Group (BPHR Group) focuses on bio-signal processing, clinical data analysis, and application of data science technologies in biomedical and healthcare domains to improve wellness and for monitoring, managing, and improving chronic health conditions.

PRINCIPAL RESEARCH AREA

Bio-signal Processing and Health Research

Institute for Predictive Performance Methodologies

2023 HIGHLIGHTS

Dr. Xin Liu was awarded a Phase II STTR subcontract by AnalySwift, ultimately for NASA's use. His team will develop ultra-efficient deep learning models to reduce the computational cost of advanced tailorable composites—innovative lightweight materials with potential applications to optimize spacecraft design.

The Institute for Predictive Performance Methodologies (IPPM) is a unique resource focused on performance prediction for advanced composites and materials through development of special material analysis, characterization, and assessment methods that enable the prediction of future performance based on current condition. IPPM specializes in heterogeneous materials including polymer, metal, and ceramic based composites for structural, electrochemical, chemical processing, nuclear fuels and nuclear waste storage, and chemical processing applications.

LEFT UTARI's IPPM researchers are investigating damage progression at the microscale in advanced materials used for structural applications in the aerospace, automotive, and energy sectors.

STUDENT RESEARCH OPPORTUNITIES

Between research assistant and volunteer opportunities, students have a multitude of ways to get involved at UTARI. In our programs, students can work with experienced research scientists, using state-of-the-art technology to develop the products of tomorrow. Each semester UTARI has dozens of students serving as research assistants and gaining hands-on experience in the labs.

FRANK LEWIS, PH.D., EARNS MULTIPLE DISTINCTIONS

Dr. Frank Lewis has been recognized as the highest-ranked scholar in the world in the two fields of Optimal Control and Reinforcement Learning by ScholarGPS™, a premier, fully indexed comprehensive database for quantifying scholarly activity. In addition, Dr. Lewis was named a Clarivate Highly Cited Researcher in 2022, and was named a Fellow of the Asia-Pacific Artificial Intelligence Association of the American Institute of Aeronautics and Astronautics, whose mission is to strengthen scientists in the field of AI and other fields worldwide to promote the development and application of AI.

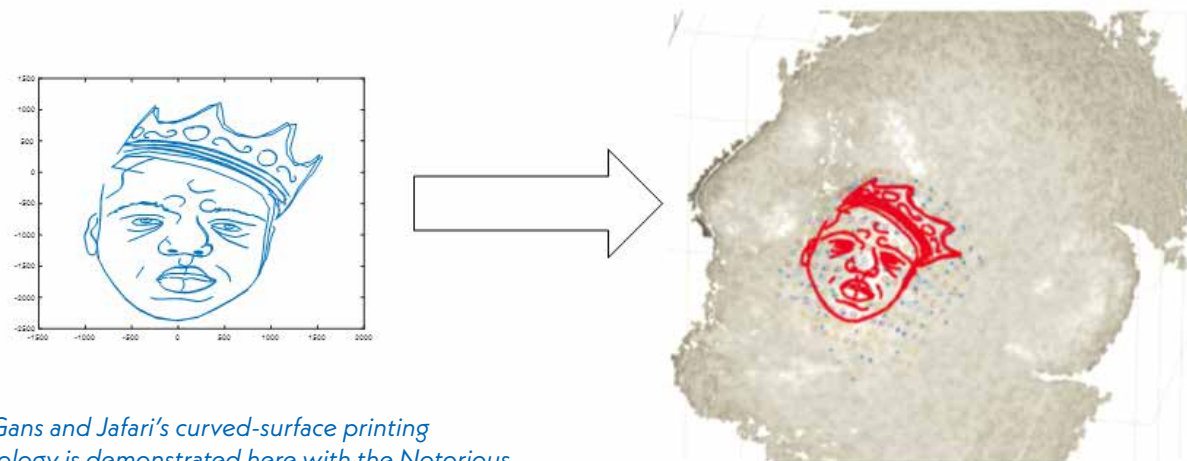## UTARI RESEARCHERS VISIT FORT MOORE

Participating in the Technical Exchange Meeting at the U.S. Army Armor and Cavalry Collection in Fort Moore, Georgia, four project teams from across the country came together for the first time to tour their collection of ground combat vehicles and collaborate on facilitating AI in combat. Students and professors were able to learn from soldiers about what it is like to operate and aim a ground combat vehicle. Dr. Nick Gans (pictured) and Cody Lundberg, Research Scientist II, collaborated with the University of Georgia, Northeastern University, and the University of Pittsburgh.

RIGHT UTARI is now home to new cutting-edge prototyping equipment, including:

- HAAS 5-axis Mill with a 12,000 RPM 30HP Spindle and 30-tool changer (far-right photo)

- Stratasys Neo SLA 3D printer with a 450mm x 450mm x 450mm build volume and minimum thickness layer of 50um (near-right photo)

- OMAX GlobalMAX Waterjet Cutter with a 31in x 61in cutting area capable of cutting up to 5-inch thick material

- A unique, large-platform, X-ray-computed tomography (CT) system manufactured by Shimadzu Corporation for Dr. Andrew Makeev's Advanced Materials and Structures Lab (AMSL)

- More information is available on UTARI's website

ABOVE TMAC, formerly the Texas Manufacturing Assistance Center and part of the Manufacturing Extension Partnership (MEP) National Network, is now headquartered out of UTARI. With satellite locations throughout Texas, the statewide organization delivers hands-on business management, technology, and operations solutions to a wide range of businesses, including manufacturing, distribution, logistics, construction, health care, and government.

Drs. Gans and Jafari's curved-surface printing technology is demonstrated here with the Notorious B.I.G. printed on the curves of a human face.

ABOVE In September 2022, Drs. Nick Gans and Bashir Jafari of UT Dallas were issued a patent by the United States Patent and Trademark Office for printing on curved surfaces ("Line width control and trajectory planning for robot-guided inkjet deposition"). This technology is designed to allow manufacturers to take advantage of cost efficiencies through automating production-line applications for printing on complex 3D surfaces. This is helpful in industries such as airplane and vehicle surface painting/coating applications, providing more accurate mapping of print trajectories onto complex, curved surfaces, reducing waste.

LEFT Dr. Nick Gans attended the Institute of Electrical and Electronics Engineers (IEEE) / Computer Vision Foundation (CVF) Winter Conference on Applications of Computer Vision (WACV), January 3–7, 2023, in Waikoloa, Hawaii, where he organized a workshop on Photorealistic Image and Environment Synthesis for Computer Vision (PIES-CV). Such public datasets, software tools, and infrastructures can enable researchers to better design, test, and compare CV algorithms and will lower barriers to entry for researchers lacking expensive hardware.

UTARI'S IPPM AT THE HARMONY SCHOOL OF INNOVATION

UTARI's IPPM visited the Harmony School of Innovation in Euless, Texas, to participate in the school's Math and Science Night on May 11, 2023. The event showcased many activities and experiments to demonstrate to students and their families how learning can be fun and engaging. UTARI showcased the fascinating world of composite materials. Students are pictured here performing catapulting exercises.

LEADERSHIP

Eileen Clements, Ph.D.
Interim Executive Director
and Director of Research

Dr. Eileen Clements oversees the research program at UTARI spanning the areas of biomedical technologies, robotics and automation, and the performance prediction of materials and structures.

PRINCIPAL INVESTIGATORS

Haleh Aghajani, Ph.D.
Research Scientist
Bio-signal Processing and Health Research Group

Dr. Haleh Aghajani's research interests are focused on biomedical R&D, medical devices (sensor integration, circuit design, embedded programming), clinical research, bio-signal processing, clinical data analysis, and application of data science techniques in biomedical and healthcare domains.

Ye Cao, Ph.D.
Assistant Professor of Materials Science and Engineering
Institute for Predictive Performance Methodologies

Dr. Ye Cao's research focuses on the combined phase-field modeling and scanning probe characterization of phase transition in perovskite thin film, as well as mesoscale modeling of electrochemical behavior, electrical, and transport phenomena in nanoscale functional oxides.

Nick Gans, Ph.D.
Principal Research Scientist
Division Head, Automation and Intelligent Systems

Dr. Nick Gans's research interests are in the fields of Robotics and Control Systems. Current research topics include vision-based control and estimation, nonlinear adaptive control, and machine learning. Applications include distributed control for multi-robot teams, autonomous vehicles, human/machine interaction, medical robotics, and more.

Endel Iarve, Ph.D.
Director, Institute for Predictive Performance Methodologies
Professor of Mechanical and Aerospace Engineering

Dr. Endel Iarve's research focuses on discrete damage modeling methodologies for laminated composites under a broad range of loading conditions, including compression and fatigue. He also focuses on integrated computational materials science and engineering which brings together manufacturing and performance aspects of advanced composite materials.

Frank Lewis, Ph.D.
Moncrief-O'Donnell Endowed Chair
Professor of Electrical Engineering

Dr. Lewis's research focus areas include nonlinear feedback control systems, reinforcement learning for optimal control performance, optimal synchronization of multiagent networked systems, neuropsychology for feedback control, robot decision and control, machine learning in automatic feedback systems, small autonomous rotorcraft vehicles, and aircraft control systems.

Shiyao Lin, Ph.D.
Assistant Professor of Mechanical and Aerospace Engineering
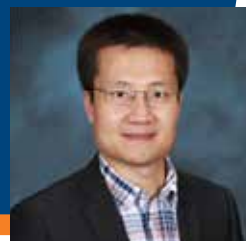Institute for Predictive Performance Methodologies

Dr. Shiyao Lin's research interests are in the structural integrity and reliability challenges of advanced materials and devices across length scales varying from nanometers to meters.

Xin Liu, Ph.D.
Assistant Professor of Mechanical and Aerospace Engineering
Institute for Predictive Performance Methodologies

Dr. Xin Lui's expertise is in data-driven multiscale modeling of composite materials and structures.

Rassel Raihan, Ph.D.
Assistant Professor of Mechanical and Aerospace Engineering
Institute for Predictive Performance Methodologies

Dr. Rassel Raihan's research focuses on the damage and life prediction of heterogeneous material systems.

Yan Wan, Ph.D.
Professor of Electrical Engineering

Dr. Wan's research interests lie in the modelling, evaluation, and control of large-scale dynamical networks, cyber-physical systems, stochastic networks, decentralized control, learning control, networking, uncertainty analysis, algebraic graph theory, and their applications to urban aerial mobility, autonomous driving, robot networking, air traffic management, microgrids, and edge computing.

Muthu Wijesundara, Ph.D.
Principal Research Scientist
Division Head, Biomedical Technologies

Dr. Muthu Wijesundara focuses on advances in technology that apply to preventative and rehabilitative technologies, as well as wound healing, adaptive equipment, and prosthetic devices and interfaces.

AUTOMATION AND INTELLIGENCE SYSTEMS

Cody Lundberg
Research Scientist II

Cody's focus is on the robotics division, focusing on commercialization with our cooperate partners and expanding the capability of UTARI's robotics.

Michail Theofanidis, Ph.D.
Post Doctoral Researcher

Michail's role is the design and analysis of machine learning and control algorithms for autonomous robotic platforms.

Michael Araujo
Research Scientist II

Michael's focus is building first of kind prototype systems, components, and R&D items across multiple engineering and research disciplines for industry.

Asif Iqbal, Ph.D.
Research Scientist II

Asif's research focuses on machine learning and robot vision.

INSTITUTE FOR PREDICTIVE PERFORMANCE METHODOLOGIES

Kevin Hoos
Senior Research Scientist

Kevin's research focuses on Discrete Damage Modeling of composite materials and the application of DDM used in composite structural analysis.

Vamsee Vadlamudi, Ph.D.
Research Scientist II

Vamsee's work is focused on developing multiphysics models to understand and predict the interaction of different damage modes in composite materials.

Hari Adluru, Ph.D.
Research Scientist II

Hari's research focuses on stress analysis and discrete damage modeling of three-dimensional textile composite materials.

Wei-Tsen "Eric" Lu, Ph.D.
Research Scientist II

Eric's research focuses on structural analysis, aiming to predict failure behavior of composites.

Zhenjia Gao, Ph.D.
Research Scientist III

Zhenjia's research focuses on discrete damage modeling methodologies for laminated composites.

BIOMEDICAL TECHNOLOGIES

Aida Nasirian
Research Scientist II

Aida's focus is advancing medical device technology and solutions with liquid polymer molds design and system integration and quality assurance.

Alexandra Jamieson
Research Scientist II

Alexandra is focused on liquid polymer mold design, CAD modeling, computational simulation, and designing of preventative care biomedical devices.

Inderjeet Singh, Ph.D.
Research Scientist II

Inderjeet's work is focused on soft robotic rehabilitation devices, wearable robotics, flexible actuators, kinematics, and computational simulations.

Veysel Erel, Ph.D.
Research Scientist II

Veysel's research focuses on solid mechanics, finite element analysis, soft material modeling and characterization which involves theoretical, numerical and experimental studies.

Yixin Gu, Ph.D.
Research Scientist II

Yixin's research is focused on embedded controller prototypes' design including firmware programming/debug, electrical circuit design/debug, sensors calibration, experimental data capture, analysis and visualization.

Saurav Kumar, Ph.D.
Post Doctoral Researcher

Saurav's research focus lies at the intersection of robotics, control theory, biomechanics, and rehabilitation, with a primary emphasis on developing innovative control frameworks for powered lower-limb rehabilitation and assistive robots.

Lisa Miller
Business Development Specialist

Lisa Miler works with the UTARI research teams to connect to connect researchers to companies of all sizes, entrepreneurs, government agencies, and non-profit organizations to collaborate on research projects.

Susan Juarez
Grants Administrator III

Susan Juarez facilitates and manages grants, both pre and post award, to facilitate a streamlined grants process for UTARI researchers and their collaborators.

Priscila Walsh
Financial Analyst

Priscila is responsible for the financial operations of the institute with her primary focus being fund administration for state-sponsored programs, endowment, and gift accounts.

Ron LaPosa
Facility Manager

Ron LaPosa is responsible for assisting in daily activities of the UTARI campus's facilities, working with vendors, as well as maintenance and installation of facilities equipment.

Clayton Webb
Equipment Technician

Clayton Webb operates and manages UTARI's extensive manufacturing and prototyping equipment and processes, such as 3-D printers, water jet cutters, CNC mills, laser cutters, etc.

Jared Beaty
Information Technology Manager

Jared Beaty is responsible for managing UTARI's IT infrastructure and systems, as well as promoting efficiency, ensuring information security, enhancing functionality, and increasing usability.

Kenny Gibbs
Assistant Information Technology Manager

Kenny Gibbs is responsible for maintaining UTARI's IT infrastructure and systems, as well as to promote efficiency, ensure information security, enhance functionality, and increase usability.

Evenita Crim
Administrative Assistant II, HR Liaison

Evenita Crim is responsible for administrative services relating to human resources.

Xochitl Villalpando
Administrative Services Officer II
**Executive Administrative Assistant**

Xochitl Villalpando is responsible for supporting the administrative duties for the Executive Director as well as managing on-site events and student recruitment.

Beth Macomb
Administrative Assistant I

Beth Macomb is responsible for administrative duties related to personnel, budgeting, travel, and procurement.

Project title	Sponsor	UTARI lead investigator
Rapid Aeroservoelastic Design Framework for Morphing Unmanned Aerial Systems	Army	Xin Liu
An Ultra-Efficient High-fidelity Tool for Thermomechanical Design of Tailorable Composites	NASA	Xin Liu
Machine Learning-aided Multiscale Modeling of Fatigue Damage in Composite Structures	Air Force	Xin Liu
Design Tow-Steered Composites Reflector for Space Applications Using Multiscale Modeling and Transfer Learning	UTA	Xin Liu
An Efficient High-fidelity Design Tool for Advanced Tailorable Composites	NASA	Xin Liu
Comprehensive Performance Evaluation of sub-6 GHz V2X-Assisted mmWave Communication Scheduler	Industry	Yan Wan
Edge Computing Resource Uncertainty Characterization	Industry	Yan Wan
Energy Resiliency	Navy	Yan Wan
A Biobehavioral Approach to Understand the Multilevel Determinants of Cardiovascular Health in Black Women	American Heart Association	Haleh Aghajani
Small UAS Detection and Classification for Rapid Multiple C-UAS Operations using a Novel Multi-Wavelength Directed Energy Technology	Air Force	Nick Gans
Enhanced Open Networked Airborne Computing Platform	NSF	Yan Wan
Intelligent Golf Swing Coach	Industry	Nick Gans
Seat Cushion Manufacturing	UTA	Muthu Wijesundara
Multiscale Defect Analysis of Advanced Composites	NASA	Xin Liu
Evaluation of an Elbow Exoskeleton to Reduce the Risk of Work-related Musculoskeletal Disorders	UTA	Muthu Wijesundara

Dr. Nick Gans and alumni Charles Brown and Charles Brown, Jr., teamed up to develop AI technology to improve one's golf swing.
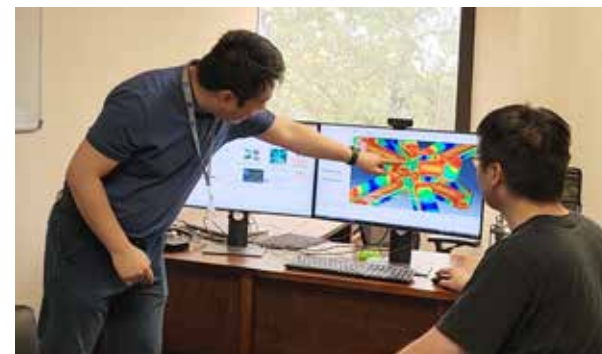
Dr. Xin Liu has been awarded by NASA a Phase 1 Minority University Research and Education Project (MUREP). The selected project is for "Multiscale Defect Analysis of Advanced Composites."

PUBLICATIONS AND PRESENTATIONS

AUTONOMOUS AND INTELLIGENT SYSTEMS DIVISION

Gans, N.R., Lundberg, C.L., Forsythe, J., Ensing, P., and Bourlai, T., "Targeting Simulation for Assessment of Lay Error Under Varying Conditions," National Defense Industrial Association (NDIA) Ground Vehicle Systems Engineering And Technology Symposium, Novi, MI, August 2023. Best Paper in the Modeling Software and Simulation Track, Finalist for Best Paper at the Conference.

Grohman, M.G., Brown, M.J., Gans, N.R., and Edwards, J.G., "Work in Progress: Student Learning Experiences in the Research Lab: Qualitative Analysis of Two Types of Leadership-Mentorship Style," Proceedings of the American Society for Engineering Education (ASEE) Annual Conference & Exposition, 2023.

Davoodi, M. Iqbal, A., Cloud, J.M., Beksi, W.J., and Gans, N.R., "Rule-Based Safe Probabilistic Movement Primitive Control via Control Barrier Functions," Institute of Electrical and Electronics Engineers (IEEE) *Transactions on Automation Science and Engineering*, November 2022.

UTARI staff gathered at the Celebration of Research and Innovation at College Park Center on April 24, 2023.

Iqbal, A., Thapa, R., and Gans, N.R., "Reinforcement Learning Based Loop Closure Detection," *Journal of Intelligent & Robotic Systems*, vol. 106, no. 51, October 2022.

BIOMEDICAL TECHNOLOGIES DIVISION

Jamieson, A.R., Singh, I, Nguyen, D.V., Waghmare, K.C., Singh, B.G. C., Gu, Y., and Wijesundara, M.B.J., "Integrating an Assistive Soft Robotic Glove with an Immersive Virtual Reality Hand Rehabilitation Game," 2023 IEEE 11th International Conference on Serious Games and Applications for Health (SeGAH), Athens, Greece, 2023, pp. 1-8, doi: 10.1109/SeGAH57547.2023.10253774.

Singh, I., Erel, V., Gu. Y., Jamieson, A.R., Patterson, R. M., and Swank, C., and Wijesundara, M.B.J., "Development of Soft Pneumatic Actuator Based Wrist Exoskeleton for Assistive Motion," 2023 Institute of Electrical and Electronics Engineers / American Society of Mechanical Engineers' (IEEE/ASME) International Conference on Advanced Intelligent Mechatronics (AIM), Seattle, WA, USA, June 2023, pp. 359-366, doi: 10.1109/AIM46323.2023.10196235.

Erel, V., Singh, I., Lindsay, A.R., Shi, W.Y., and Wijesundara, M. B.J., "Corrugated Diaphragm Actuator for Soft Robotic Applications," *J. Mech. Des.* (2022), 144(4): 045001.

Chung, C.S., Grindle, G.G., Brown, J.D., Gebrosky, B., Wei Carrigan, W., Nuthi, P., Wijesundara, M.B.J. & Cooper R.A., "Anthropomorphic model rigid loading indenter with embedded sensor development for wheelchair cushion standard testing," *Medical & Biological Engineering & Computing*, November 2022.

INSTITUTE FOR PREDICTIVE PERFORMANCE METHODOLOGIES

Hoos, K.H., Zhou, E., Iarve, E.V., Popelar, C., Riha, D., and Mollenhaue, D.H. "Independent Mesh Method and RX-FEM Modeling of 3d Interlock Woven Composites with Open Hole," Universitat de Girona. Grup de Recerca en Anàlisi i Materials Avançats per al Disseny Estructural (AMADE), 2023.

Adluru, H.K., Zhou, E., Hoos, K.H., Popelar, C., Ballard, M.K., Mollenhauer, D., Riha, D., Selvarathinam, A.S., and Iarve, E.V. "Performance Prediction Of Interlock Woven Composites By Independent Mesh Method," *Composites Part A: Applied Science and Manufacturing*, 2023.

Kevin H Hoos K.H., Adluru, H.K., Zhou, E., Popelar, C., Ballard, M.K., Iarve, E.V., and Mollenhauer, D. "Progressive Damage Analysis of Open Hole Compression Specimens Containing Complex 3D Textile Architectures Using Discrete Damage Modeling and Independent Mesh Method," American Society for Composites 38th Technical Conference, Woburn, MA, September 2023.

Goyal, V., Hoos, K.H., Lu, W.-T., and Iarve, E.V., "Fail-Safe Prediction For Bonded Composite Structures Using Discrete Damage Modeling," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023.

Riha, D.S., Kirby, M., Stanfield, M., Bhamidipati, V., Zhou, E., Forghani, A., Iarve, E.V., Hoos, K.H., Adluru, H.K., Ballard, M.K., Selvarathinam, A.S., and Mollenhauer, D. "Organic Matrix Composites Process-to-Performance, Evaluation, Research and Analysis (OPPERA)," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023.

Hoos, K.H., Adluru, H.K., Iarve, E.V., Zhou, E., Ballard, M.K., and Mollenhauer, D., "Progressive Damage Analysis of Complex 3D Textiles with Open Holes using Independent Mesh Method and Discrete Damage Modeling," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023.
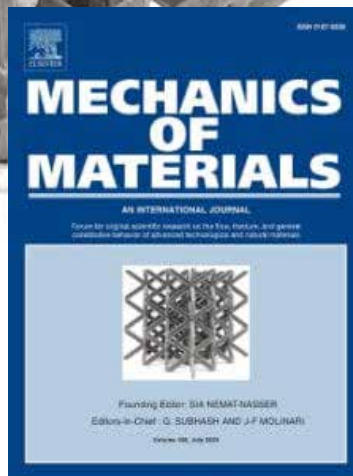

Aida Nasirian, M.S., UTARI, and Faith Meza, MPH, CPH, Baylor Scott & White Institute for Rehabilitation, won first place at the American Spinal Injury Association's Annual Scientific Meeting held in Atlanta, GA, in April 2023. Additional researchers Pavan Nuthi, Muthu Wijesundara, Melissa Allman, and Seema Sikka contributed to the poster, "Feasibility Study of Smart Seat Cushion for Automated Interface Pressure Modulation," which focuses on evaluating the smart seat cushion's functionality in mapping, redistribution, and offloading the seating interface pressure.
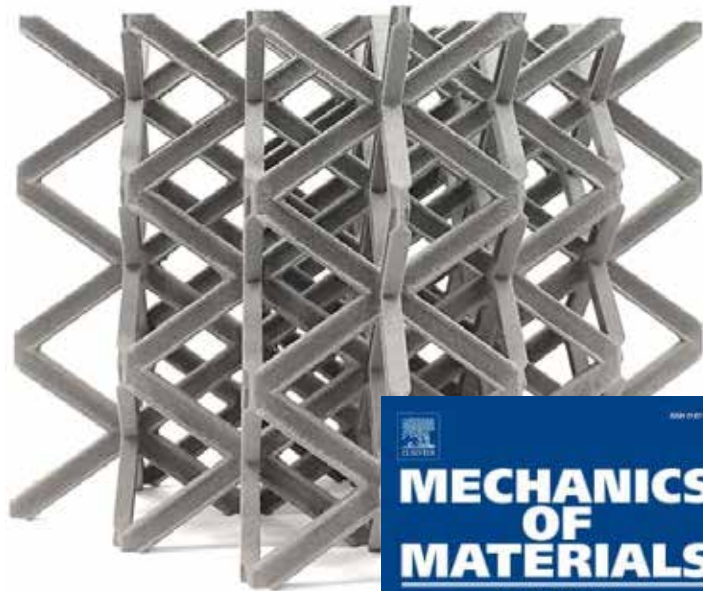
Dr. Xin Liu's new type of beam lattice metamaterials, using I-shaped beams instead of circular-shaped beams, was featured on the cover of *Mechanics of Materials*, Volume 182 (2023).

Lu, W.-T., Iarve, E.V., and Liang, Y.-J. "An Analytical Formulation Of Unidirectional Composite Curved Beam With Out-Of-Plane Fiber Waviness Under Bending," *Journal of Composite Materials*, 2023.

Iarve, E.V., "Performance Prediction of Notched and Unnotched Interlock Woven Composites by Independent Mesh Method and RX-FEM," International Conference on Composite Materials, Belfast, Ireland, July–August 2023.

Lu, W.-T., Curry G., Adluru, H.K., Seneviratne, W., and Iarve, E.V., "Rx-FEM Modeling of Fatigue Damage Growth in Composites with Local R-ratio by Using Strength Tracking Method," American Society for Composites 38th Technical Conference, Woburn, MA, September 2023.

Iarve, E.V., "Extension of the Regularized Extended Finite Element Method to High-Density Arbitrary Interacting Networks," International Centre for Numerical Methods in Engineering, Composites 2023 Conference, Sicily, Italy, September 2023.

Iarve, E.V., "Regularized Extended Finite Element Modeling Of Textile Composites," 2023 U.S.-Japan Joint Symposium for Composite Materials, organized by Composite Materials Research Division, Tokyo University of Science, Tokyo, June 2023.

Liu, X., "Machine Learning-Assisted Multiscale Structural Mechanics of Advanced Materials and Structures" at National Science Foundation (NSF) Research Traineeship, Machine Learning and Data Science in Materials Research (MLDSMR) seminar, University of Akron, September 2023.

Liu, X., "Multiscale Thermal-Mechanical Analysis of Tow-Steered Composite Plate Structures Using a Mixed-Fidelity Neural Network Model," American Society for Composites 38th Technical Conference, Woburn, MA, September 2023.

Liu, X., "Predicting Mechanical Behavior of Additively Manufactured Mechanical Metamaterials Using Point Cloud Representation Learning," American Society of Mechanical Engineers, Aerospace Structures, Structural Dynamics, and Materials (SSDM) Conference, San Diego, CA, June 2023.

Liu, X., "An Integrated Design Tool for Tow-steering Composites in Abaqus and MSC.Patran/Nastran," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023.

Liu, X., Kobir, M.H., Yang, Y., Jiang, F. and Kothari, T., "Improving stiffness and strength of body-centered cubic lattices with an I-shape beam cross-section," *Mechanics of Materials*, 182, 2023, p.104665.

Tian, S., Long, Y., Liu, X., Leone, F.A. and Yu, W., "A New MSG-based Design Framework for Tow-steered Composites," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023, p. 0582.

Liu, X., Liu, B., Kothari, T., Tian, S., Long, Y., Leone, F. and Yu, W., "An Integrated Design Tool for Tow-steering Composites in Abaqus and MSC.Patran/Nastran," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023, p. 2594.

Yang, Y., Liu, X. and Kan, C., "Point cloud based online detection of geometric defects for the certification of additively manufactured mechanical metamaterials," *Journal of Manufacturing Systems*, 65, 2022, pp. 591-604.

Dr. Gans and Cody Lundberg, Research Science II, won best paper in the Modeling Simulation and Software Session at the 2023 Ground Vehicle Systems Engineering Technology Symposium hosted by the National Defense Industrial Association in Novi, Michigan, August 2023. The paper was titled "Targeting Simulation for Assessment of Lay Error Under Varying Conditions."

Rahman, M., Vadlamudi, V., and Raihan, R., "Relaxation Behaviors of Adhesive Bonded Carbon Fiber Reinforced Composites Using Dielectric Relaxation Spectroscopy and Thermally Stimulated Depolarization Current." American Society for Composites 38th Technical Conference, Woburn, MA, September 2023.

Rabby, M.M., Rahman, M., Das, P.P., Vadlamudi, V., and Raihan, R., "Carbon Fibers Recycling from Degraded Prepregs and Mechanical Properties or Recycled Composite," Society of the Advancement of Material and Process Engineering, Conference Proceedings, Seattle, WA, April 17-20, 2023.

Das, P.P., Elenchezhian, M., Vadlamudi, V., and Raihan, R., "Artificial Intelligence Assisted Residual Strength and Life Prediction of Fiber Reinforced Polymer Composites," American Institute of Aeronautics and Astronautics (AIAA) SciTech Forum, National Harbor, MD, January 2023, 14(20), 4403, p. 0773.

Rabby, M.M., Das, P.P., Rahman, M., Vadlamudi, V., and Raihan, R., "Prepreg age monitoring and qualitative prediction of mechanical performance of composite using dielectric state variables," *Polymers and Polymer Composites*, 30, 2022, 09673911221145053.

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Qhobosheane, R.G., Rabby, M.M., Vadlamudi, V., Reifsnider, K., and Raihan, R., "Smart Self-Sensing Piezoresistive Composite Materials for Structural Health Monitoring," *Ceramics*, 2022, 5(3), 253-268.

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ADVANCED CONTROLS AND SENSORS GROUP

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Partha Pratim, UTARI Research Assistant and Ph.D. student, was selected to participate in the acclaimed Prognostics and Health Management (PHM) Society Doctoral Consortium in Salt Lake City, Utah, in October 2023.

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Dr. Endel Iarve was invited to be the keynote speaker at the International Conference on Composite Materials (ICCM) in Belfast held July 30–August 4, 2023. ICCM brings together leading researchers and practitioners to report and exchange ideas on the latest developers in the advancement and exploitation of a wide range of composites materials and structures.

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Dr. Yan Wan has been elected to American Institute of Aeronautics and Astronautics Associate (AIAA) Fellow Class of 2023. AIAA Associate Fellows are "individuals of distinction who have made notable and valuable contributions to the arts, sciences, or technology of aeronautics or astronautics."

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The REHEAL Glove is an advanced hand wound care system that enables delivery of localized treatments including therapeutic drug delivery and Negative Pressure Wound Therapy (NPWT).