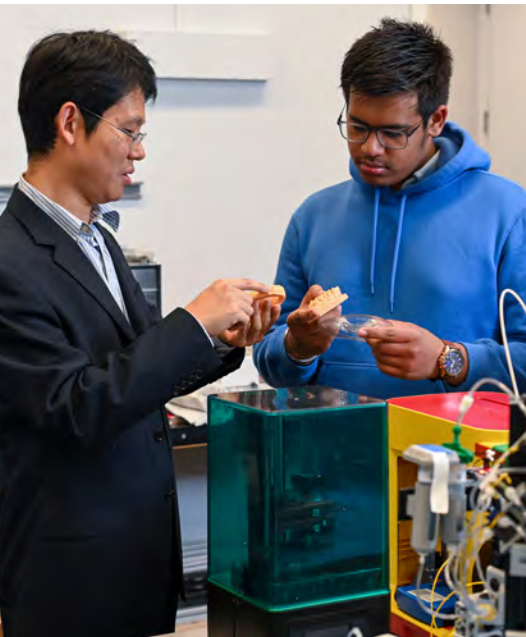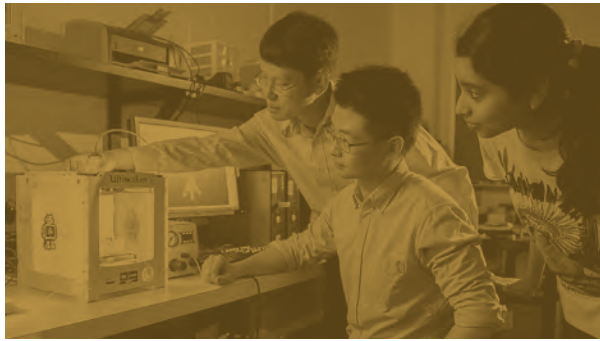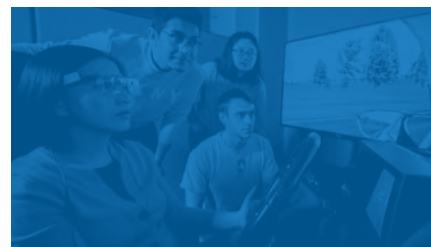**University at Buffalo**

Department of Industrial and Systems Engineering

School of Engineering and Applied Sciences

Industrial and Systems Engineering

// 2024 DEPARTMENT NEWS

Dear Alumni and Friends,

It is good to be back. I started my UB journey as an undergraduate student in 1982 and finished my UB IE PhD in 1990. I returned to my alma mater in 2022 after serving on the faculty of the Naval Postgraduate School for 32 years. So why return in 2022 and why take on the chair's role in 2024?

It certainly wasn't the weather that got me to leave Monterey, California. Although those of us who embrace Buffalo as home find its weather to be much better than its reputation.

It was UB's ISE Department students, staff, and faculty that got me to return. It is exciting to be a part of a growing, vibrant, collegial department; to face new challenges; and to give back to my alma mater.

Taking on the chair's role provides an exceptional opportunity to serve my colleagues. That said, everything you get to read about in this newsletter happened under Chair Victor Paquet's leadership. Leadership that guided significant growth in the size of the department and its expertise in data analytics, artificial intelligence, and machine learning. The positive impact of Chair Paquet's service will continue to guide the department for years to come.

This newsletter shares just some of the department's highlights. I encourage you to learn more by visiting engineering.buffalo.edu or by social media (see back of this newsletter).
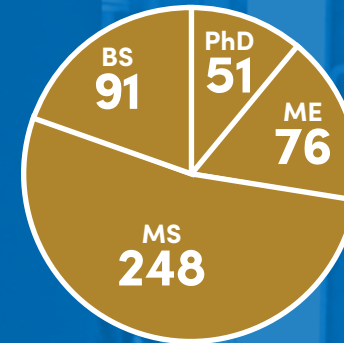
Lastly, it is great to be back! Go Bulls!

Robert Dell

Professor and Chair, Department of Industrial and Systems Engineering
rfdell@buffalo.edu

2024 ENROLLMENT

466
Total Students

- BS 91
- PhD 51
- ME 76
- MS 248

7
PhD Degree Conferrals

DEGREE PROGRAMS

- **BS Industrial Engineering**
- **BS/MBA 5-Year Degree**
- **MS Industrial Engineering, Concentrations in Human Factors, Operations Research, and Production Systems**
- **ME Engineering Management**
- **PhD Industrial Engineering**

25
2024 FULL-TIME FACULTY

- **20 tenured or tenure track**
- **5 teaching**

2024 US NEWS & WORLD REPORT GRADUATE RANKINGS

22nd
Overall

19th
Among Public Universities

19th
Online Engineering Management

2023-2024 FISCAL YEAR

$**3.6**m
Research Expenditures

$**9.2**m
New Grants Overall

$**3.8**m
ISE Credit

RESEARCH STRENGTH AREAS

- **Security and Defense**
- **Health and Health Systems**
- **Transportation and Logistics**
- **Advanced and Sustainable Manufacturing**
- **Critical Infrastructure Resilience**

IT'S ELECTRIC!

STRENGTHENING TRANSIT BUS CHARGING RESILIENCE

"THE AIM IS TO DEVELOP A HOLISTIC CHARGING PLAN THAT INCORPORATES MULTIPLE-RESOURCE DATA, A THOROUGH RISK ASSESSMENT, AND ANALYSIS OF BOTH LONG-TERM SYSTEM DESIGN ENHANCEMENTS AND SHORT-TERM EMERGENCY RESPONSE STRATEGIES."

— **Batta**

UB ISE and SUNY Distinguished Professor **Rajan Batta**, right, is working on a new project that is focused on strengthening the resilience of New Jersey's transit electrification, specifically targeting the charging infrastructure for electric buses.

Batta and **Ziqi Song** from UB Civil, Structural and Environmental Engineering, in collaboration with New Jersey Transit (NJ TRANSIT), aim to identify and assess resilience risks, developing a data-driven framework for modeling and analysis. This will help pinpoint potential vulnerabilities and create actionable strategies to ensure the continued operation of the electrified bus system, even in the face of disruptions.

The project emphasizes engagement with community members and stakeholders, ensuring that their input is integral to the planning process. The lessons learned, along with best practices from this initiative, will be shared broadly to support nationwide efforts to electrify transit systems.

By developing a comprehensive resilience plan, the project ensures that NJ TRANSIT's electric bus system remains operational under various challenges, safeguarding service continuity and enhancing the overall stability of the transit network. This work will serve as a model for other transit agencies across the country, contributing to the broader goal of a sustainable, reliable electric transit future. //

ROBOTIC-ASSISTED SURGEONS OFFERED A HAND

BRAIN-TRACKING TECHNOLOGY PROMISES TO AID OVERWHELMED SURGEONS
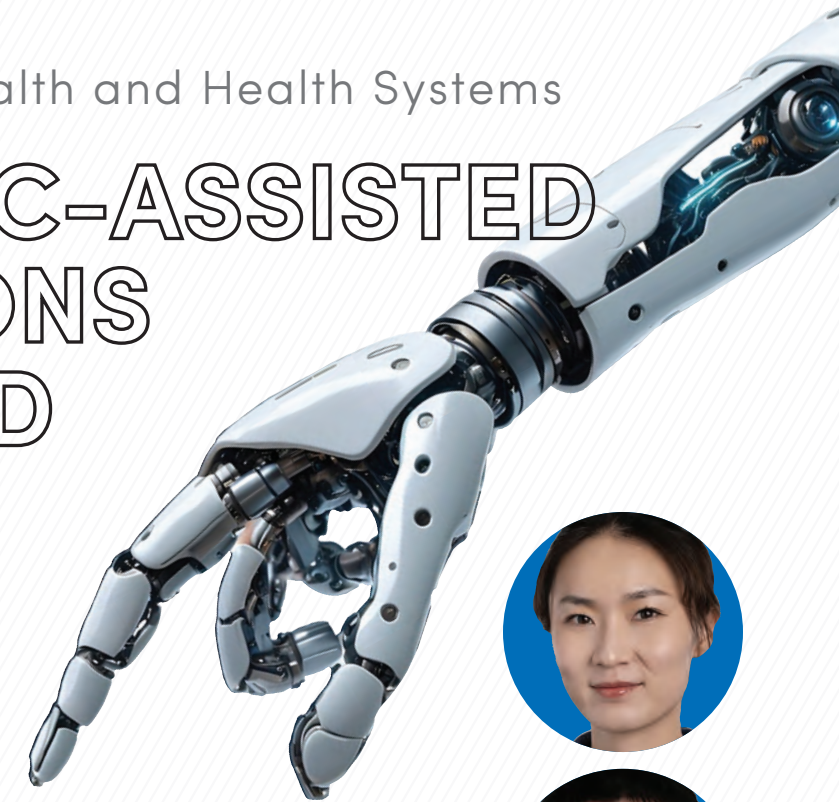
"BY COMBINING WEARABLE SENSORS, PERSONALIZED INTERVENTIONS, AND CONTEXT-AWARE AI, THIS WORK ADDRESSES CRITICAL CHALLENGES IN HIGH-STAKES ENVIRONMENTS AND SETS THE STAGE FOR BROADER APPLICATIONS IN SMARTER HUMAN-ROBOT INTERACTION."

— **Yang**

Robotic-assisted surgery promises unmatched precision, allowing surgeons to perform intricate procedures with incredible accuracy. However, as the technology advances, so does the complexity of the operations. Surgeons often find themselves overwhelmed. The more intricate the task, the more mental strain it places on them. In high-stakes surgeries, this added burden can lead to mistakes—human errors that could jeopardize patient safety.

Recognizing this challenge, UB ISE Assistant Professors **Jing Yang**, top, and **Xiaoyu Chen**, below, are developing a solution with support from the National Science Foundation (NSF). They are designing neuro-adaptive technology that works in tandem with robotic systems to monitor and adjust to a surgeon's cognitive load. By tracking brain activity, the technology can detect when a surgeon is under mental stress and automatically modify the robot's actions, easing the cognitive load and preventing mental overload.

This innovation is crucial for the future of surgery. By supporting the surgeon's mental capacity rather than overwhelming it, the technology can ensure safer surgeries and better outcomes. For surgeons, it could mean performing at their best—without the fear of losing focus or making costly mistakes under pressure. //

LEVERAGING AI FOR CLINICAL SUMMARIES IN HOSPITAL CARE

UB ISE Assistant Professor **Sabrina Casucci's** groundbreaking healthcare project aims to leverage artificial intelligence (AI) to address key challenges in medicine. Casucci's effort received seed funding in the first round of UB's competitive interdisciplinary for AI research in healthcare and is one of four projects that could eventually help save lives. The initiatives include personalized drugs tailored to individual DNA, streamlined hospital admissions for older adults with complex medical needs, enhanced language development for late-talking children, and improved surgical skills and patient outcomes.

Casucci leads a team that is excited and focused on coming to the aid of a susceptible population. Casucci says, "This is a critical challenge in the care of complex older adults as developing an accurate and meaningful understanding of community-based care and understanding how these factors impact readmission risk can have a significant impact on hospital-based care and post-hospital health outcomes for these vulnerable patients."

Casucci's project is part of the broader Empire AI initiative, announced by New York Governor Kathy Hochul, which aims to position New York at the forefront of AI research. The initiative's computing center at UB will foster responsible AI research to benefit society. //

REAL TIME KIDNEY-HEALTH SCREENING MODELS COULD HELP SAVE LIVES

Many surgeons can't help but worry about one of the most common and dangerous complications: cardiac surgery-associated acute kidney injury (CSA-AKI). It is a silent threat, often going unnoticed until it is too late, leading to higher mortality rates, the need for dialysis, and long-term kidney problems.

UB ISE Assistant Professor **Xiaoyu Chen** knows that reducing CSA-AKI could dramatically improve patient outcomes, but the challenge is how to predict and manage it in real-time. That's where new research is making a difference. Chen is working with a team of scientists developing an advanced system using an interpretable neural network and Markov decision process. This system would analyze data from the patient's surgery and predict the risk of kidney injury as it occurred. By offering real-time, accurate predictions, the system will eventually help surgeons make critical decisions on the spot—adjusting treatment to prevent CSA-AKI before it becomes a serious problem.

With this technology, the goal is clear: to reduce the rates of kidney injury, prevent the need for dialysis, and ultimately improve the long-term health of patients undergoing cardiac surgery. //

"THIS PROJECT ADDRESSES MACHINE LEARNING PREDICTION AND CLINICAL DECISION MAKING TOWARDS ACTIONABLE DECISION SUPPORT FOR CARDIAC SURGERY-ASSOCIATED ACUTE KIDNEY INJURY MANAGEMENT."

— **Chen**
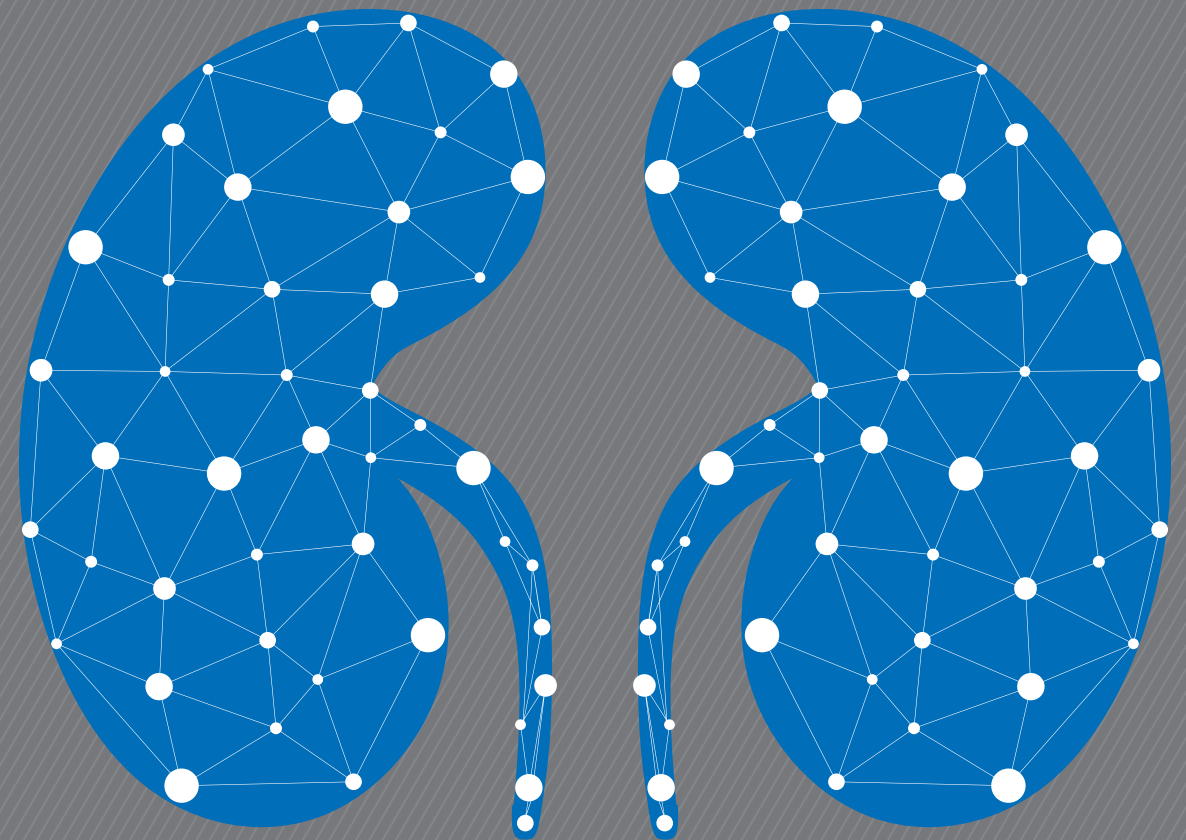
USING AI TO FIND TRANSPLANT PATIENTS

For tens of thousands of end-stage kidney patients, time is not on their side. 89,000 people are on the national transplant waiting list for a life-saving transplant, and another patient is added every eight minutes. Yet, only about 25,000 transplants occur each year in the United States.

UB ISE Assistant Professor **Prashant Sankaran**, right, is spearheading a collaborative effort using operations research and artificial intelligence to help deliver more kidneys to those in need. Collaborators include UB ISE professor and Chair **Rob Dell**, UB ISE professor **Moises Sudit**. The results could be transformative change agents and help save lives.

Researchers are coming at the problem from two fronts. The first is improving the time to the next deceased donor organ offer and its quality predictions for informed decision-making. Recent policy changes, in response to the alarming rate of organ discard, require doctors and patients to make decisions about accepting or rejecting deceased donor organ offers within a given time window. This adds additional pressure on the decision-making process, and in such cases, having accurate decision-making aids is helpful.

Next, improving large-scale living transplant exchanges considering individual fairness. Organ transplant is straightforward if the patient and the related donor are compatible. However, in cases where patients and donors are incompatible, all such pairs are entered into the Kidney Paired Donation pool. As of 2023, about 25 percent of kidney transplants were through living donations. More advanced methods must be developed to cater to the steady growth in living donations, involving a larger pool of incompatible patient donors while ensuring health equity. //

ENHANCING SPACE DOMAIN AWARENESS THROUGH COLLABORATIVE AUTONOMY FOR DISTRIBUTED SATELLITES

UB ISE Professor **Moises Sudit** is contributing to the Air Force Office of Scientific Research's Collaborative Autonomy and Resiliency for Distributed Satellites (CARDS) initiative, advancing space domain awareness. CARDS aims to develop a framework for optimal collaboration among satellites in a decentralized network, enhancing their ability to collect and process critical data.

The challenge lies in the system's complexity. The CARDS framework is NP-hard, meaning it requires advanced algorithms to coordinate diverse satellites with varying communication, computing power, and coordination capabilities. To address this, the project will design algorithms that integrate both new and legacy systems.

The goal of CARDS is to maximize information gain from Areas of Interest (AOI), balancing mission-specific needs, sensor types, operational time, environmental factors, and other constraints. By optimizing satellite resource use, CARDS ensures efficient data collection across multiple AOIs with conflicting priorities.

This initiative is setting the stage for a more resilient and adaptive space surveillance system, one that can meet the increasing demands of space operations in an ever-changing environment. Through CARDS, AFOSR is advancing the capabilities of space operations, enhancing both satellite collaboration and the efficiency of space-based data collection. //

"THE INTEGRATION OF MACHINE LEARNING AND OPTIMIZATION METHODS HAS UNLOCKED NEW POSSIBILITIES IN TACKLING NP-HARD PROBLEMS. THIS FUSION HAS PROPELLED AN EXCITING FRONTIER IN RESEARCH."

— **Sudit**
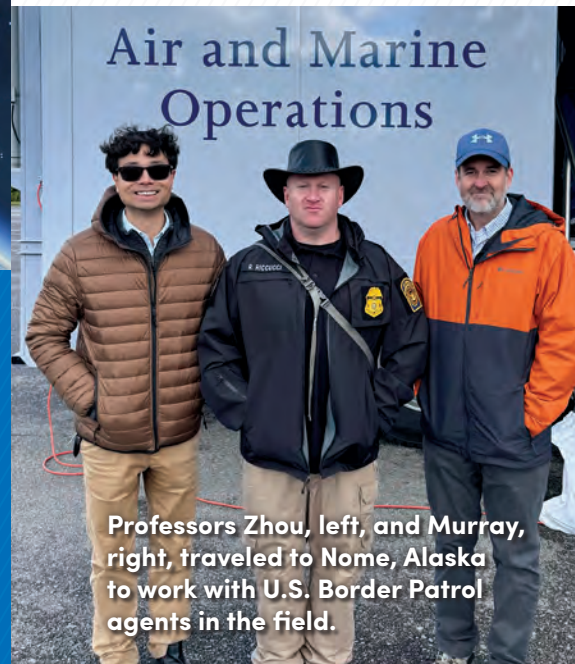
Professors Zhou, left, and Murray, right, traveled to Nome, Alaska to work with U.S. Border Patrol agents in the field.

REAL-TIME BORDER SECURITY

Border patrol agencies face uncertainty in their daily operation caused by intelligent adversaries who frequently shift tactics. This unpredictable environment, where threats emerge in real-time, requires dynamic solutions, both proactive and reactive, because the days of static patrols are not sufficient in today's ever-changing climate. To address this complex problem, UB ISE Morton C. Frank Professor **Jun Zhuang** and UB ISE Associate Professor **Chase Murray** are leading the effort to equip border patrol agencies with the software to adapt and respond to the uncertain challenges posed by adversaries.

Real-time Reconfigurable Intelligence-based Patrol Strategies (RTRIPS) will utilize techniques from operations research, decision analysis, game theory, and computer science for the development of optimal patrol strategies that can be updated, reconfigured and visualized in real time. The intelligence data will then be utilized via emerging artificial intelligence techniques. This will allow border agents to conduct analyses about different patrol strategies, placement of technology, and resource matters. //

BUILDING A CODE OF DIGITAL MANUFACTURING ETHICS

UB ISE Associate Professor **Chi Zhou** is helping to create a digital ethics framework for the advanced manufacturing process in the fast-evolving manufacturing world.

The goal of the NSF-funded research is to create methods and tools that embed ethics at every stage of the product life cycle, from design to fabrication to service. Working with local industry partners, the team of researchers will test their solutions in real-world manufacturing settings. The project doesn't stop at technology; it also emphasizes the importance of promoting ethics and regulatory compliance across the entire manufacturing ecosystem.

On a technical level, the project targets three main areas: protecting intellectual property, monitoring manufacturing processes to ensure ethical behavior, and tracking products to prevent misuse. Once developed, these tools and resources, including software and educational materials, will be made available to the public to promote an ethical future for Industry 4.0. //

New ISE faculty members Ojelade, left, and Jin, right.

WELCOMING OUR NEW FACULTY

Yu (Chelsea) JIN
Assistant Professor, PhD, UNIVERSITY OF ARKANSAS

Jin enjoys research into quality inspection, control, and monitoring for advanced manufacturing; Predictive modeling, simulation, and optimization for smart manufacturing or service systems; and data analytics for system intelligence.

Aanuoluwapo OJELADE
Distinguished Research Fellow, PhD, VIRGINIA TECH

Ojelade's research interests include physical ergonomics and occupational biomechanics; biomechanical simulation; wearable technologies; and automated ergonomic solutions. **//**

FACULTY AWARDS AND HONORS

Rajan Batta received the **2024 INFORMS Military and Security Society Koopman prize**. The award recognizes the outstanding publication in INFORMS "Unmanned Aerial Vehicle Information Collection Missions with Uncertain Characteristics."

Ann Bisantz, dean of undergraduate education, has been **named a SUNY Distinguished professor**. Professor Bisantz is one of only four women in the School of Engineering and Applied Sciences to have received this recognition for having achieved national or international prominence within their field.

Lora Cavuoto is the **Human Factors and Ergonomics Society Woman Mentor of the Year** and received the **2024 National Safety Council Rising Stars of Safety Award**. She is recognized for outstanding contributions in the mentorship and professional advancement of women within the Human Factors and Ergonomics community as well as her proven track record of safety leadership.

Cecilia Martinez is the recipient of the **Institute of Industrial and Systems Engineers 2024 Society of Engineering Management Teaching Award**. This award honors an individual who significantly advanced the knowledge and practice of engineering and management systems in the realm of industrial engineering.

Chi Zhou is one of the recipients of the **2024 SUNY Chancellor's Awards for Excellence** which honors recipients for consistently superior professional achievement and the ongoing pursuit of excellence.

Jun Zhuang received a **2024 Fellow Award** for his outstanding leadership and service to IISE. The Morton C. Frank Professor and associate dean for research for the School of Engineering and Applied Science, has been a fellow of the Society of Risk Analysis since 2022. **//**

Professors Jun Zhuang, left, and Rajan Batta, right, present the Teaching Assistant of the Year award to graduate student John Becker.

HONORING OUR BEST AND BRIGHTEST

More than 30 awards and scholarships were presented during the annual ISE Student Awards luncheon.

2024 Undergraduate Student Awards

FREDRERICK H. THOMAS MEMORIAL SCHOLARSHIP

Liam Scime, Bryan Steines

KARWN/THOMAS SCHOLARSHIP

Mohrael Attia, Roman Sergeev

ABBY PAQUET SCHOLARSHIP

Bianca Burgess, Karen Cheng, Daniel Muniz, Tawsif Siddiqui, Ayami Waraw

KEITH F. SAFIAN SCHOLARSHIP

Becky Paul Odionhin

STEVEN E. AND BARBARA S. GROSS SCHOLARSHIP

Nicholas Sutton, Rafia Tabassum

2024 Graduate Student Awards

THOMAS DRURY SCHOLARSHIP

Poulomee Roy

JOHN ZAHORJAN STUDENT SCHOLARSHIP

Maimaiti Aji, Nicholas Fago, Carl Lam, Muhammad Shabbir, Parry Tu

GRADUATE STUDENT RESEARCHER OF THE YEAR

Aditya Chivate

TEACHING ASSISTANT OF THE YEAR

John Becker

GRADUATE STUDENT SERVICE AND LEADERSHIP AWARD

Nastaran Oladzad-Abbasabady

ENGINEERING MANAGEMENT STUDENT SERVICE AND LEADERSHIP AWARD

Amy Faville

75 YEARS AGO, DOROTHY PRICE MADE **HER**STORY

In 1949, **Dorothy Price** (formerly Gracz) graduated from the School of Engineering and Applied Sciences with a bachelor's degree in industrial engineering, making her the first woman to earn an engineering degree from the University at Buffalo.

Price, who passed away in 2008, began her journey in engineering with an aircraft engineering and drafting course at Cornell University. During World War II, she was recruited to work at the Curtis–Wright Corporation as an engineer's aid, helping engineers make corrections on blueprints for cargo and fighter planes. Price's aptitude for the job prompted her boss to encourage her to study engineering after the war ended.

"I HAD NO IDEA WHAT I WAS GOING TO DO WITH THIS DEGREE, BUT I NEVER ONCE FELT LIKE, 'WHAT AM I DOING HERE?'"

— Price

While the significance of her achievement continues to draw acclaim, Price's son, Jim Moynihan, noted that his mother would often say, "I was the first, but there were others," acknowledging four other female students who enrolled in SEAS during her time as an undergraduate.

According to Moynihan, Price helped start a chapter of the Society for Advancement of Management at SEAS, one of the school's first student engineering clubs, and was elected to serve as secretary.

After graduating, she worked in industry for several years before pursuing a career as a physics teacher.

In 1999, Price returned to UB to receive the Vital Partners Award, commemorating the 50th anniversary of her graduation and recognizing her as a role model for future generations of women in engineering.

When accepting the award, she encouraged women with an interest in math and the sciences to pursue engineering, saying, "It can be preparation for unlimited opportunities in any field." //

RECENT PHD GRADS RETURN FOR ACADEMIC JOB PANEL

Once UB ISE always UB ISE! Three recent PhD graduates are giving back to the department by helping current PhD students prepare for a career in academia.

Assistant professors **Zhiyuan Wei**, California Polytechnic State University, above left; **Aditya Chivate**, California Polytechnic State Polytechnic University, center; and **John Becker**, United States Naval Academy, above right, were the featured speakers at a recent job panel sponsored by the UB chapter of INFORMS.

They discussed best practices for transferring the academic experience to landing a job; when you should apply and what they are experiencing as assistant professors. //

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SPEAKER SPOTLIGHT

Professor **Anand Gramopadhye**, Clemson University Dean of the College of Engineering, Computing and Applied Sciences and UB ISE MS/PhD alumnus highlighted and presented as part the spring Distinguished Seminar Series.

Gramopadhye's presentation focused on the ever-changing journey of an industrial engineer and how it has evolved dramatically over the years, from the early days of the internet revolution to today's rapidly advancing fields of AI, next-generation mobility, and sustainable solutions. He reminded attendees that industrial engineering remains pivotal, bridging the gap between humans, machines, systems, and technology.

Gramopadhye, a 1992 UB ISE PhD alumnus, reminded us that industrial engineers must continuously adapt, constantly retooling their skills and approaches to address society's most pressing challenges. He noted that as both educators and practitioners in the field, industrial engineers face the challenge of evolving faster than ever to stay relevant. He added that this requires not just keeping pace with technological advances, but also focusing on work that truly matters—solutions that can have a lasting, meaningful impact.

Gramopadhye believes that the future of industrial engineering lies in the ability to embrace change and contribute to the world in ways that improve lives and systems. By doing so, he says that we ensure that industrial engineering continues to play a vital role in shaping a better tomorrow. //

Our ongoing seminar series brings speakers from academia and industry to talk about cutting-edge research related to industrial and systems engineering.

For more info on our past and upcoming speakers visit:
ubseas.info/ise-seminar-series
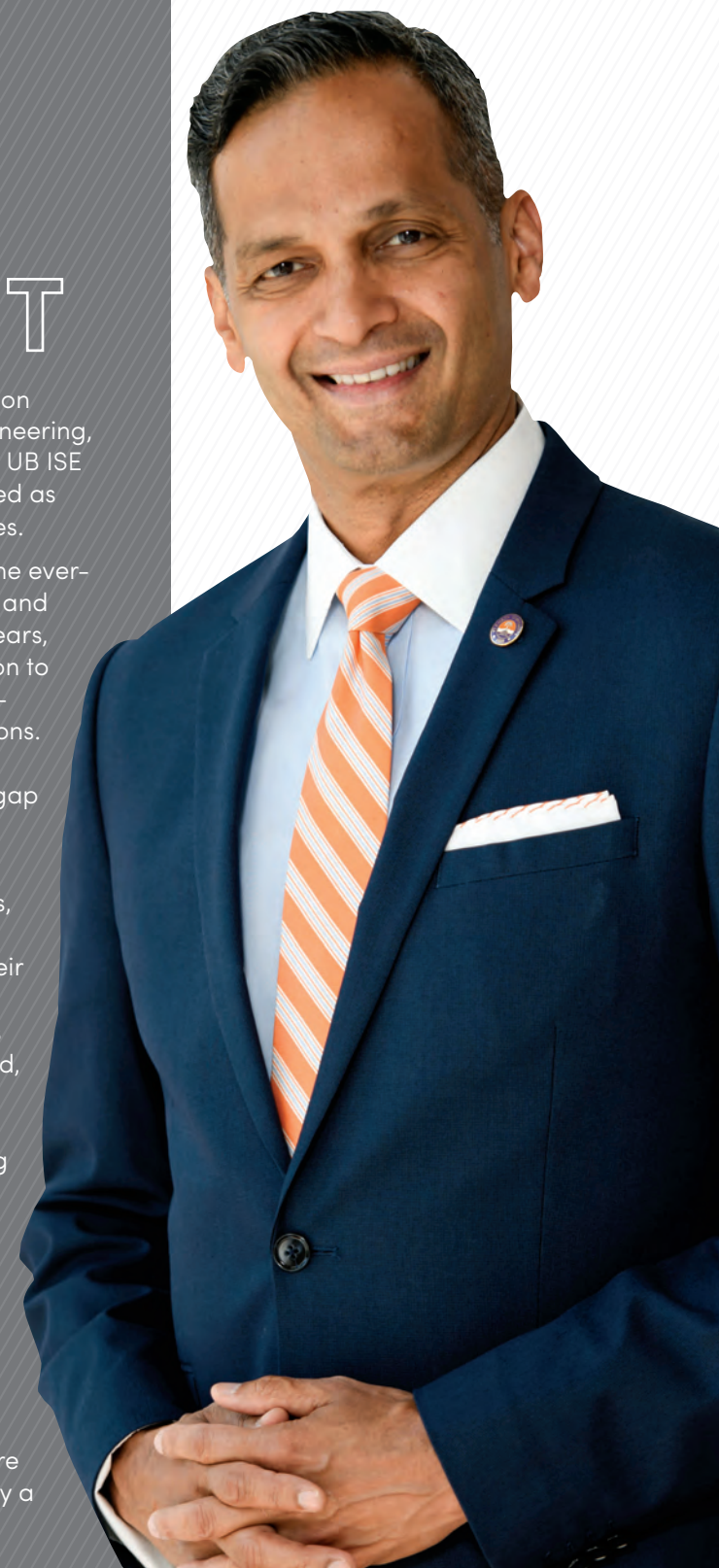
University at Buffalo

Department of Industrial
and Systems Engineering

School of Engineering and Applied Sciences

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