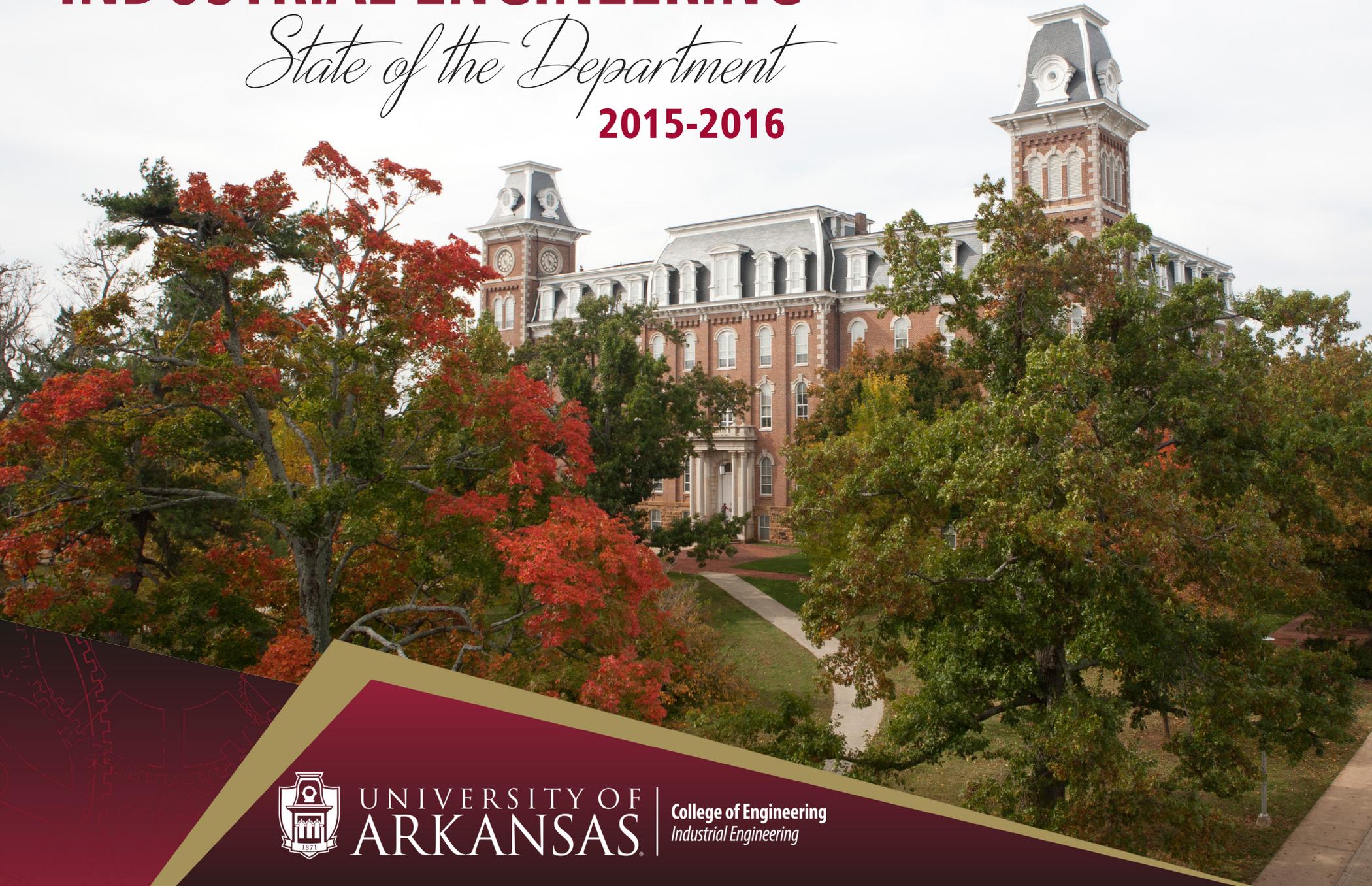


# INDUSTRIAL ENGINEERING

*State of the Department*

**2015-2016**



UNIVERSITY OF  
**ARKANSAS**

College of Engineering  
*Industrial Engineering*

# Department Vision

To be a nationally-competitive, student-centered, Industrial Engineering program serving Arkansas and the world through undergraduate and graduate studies, through leading-edge research programs, through contributions to the profession, and through our unique access to major organizations with world-class logistics and distribution operations. To be a model program providing a broad, personalized undergraduate experience, contemporary graduate and professional programs, and research emphasizing the application of quantitative modeling and analysis. To be leaders in the industrial engineering profession.

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**On the cover:** *Constructed in 1875, Old Main was one of the first permanent buildings to be erected on the Arkansas Industrial University Campus. It is the oldest building on campus and the only one built in the 19th century still standing. Because of expense, the installation of clockworks was put off during the initial construction. In 2005, the clock was installed as part of the culmination of the Campaign for the Twenty-First Century.*

*Photos courtesy of University Relations*

# Welcome

## Edward A. Pohl, Ph.D. - Department Head

Dear Alumni and Friends of UA-IE,

As we begin the 2016-2017 academic year we pause to reflect on the department's progress and review the accomplishments of the past year. This report provides an overview of the IE program at the University of Arkansas and also highlights the outstanding achievements and significant accomplishments of our students, alumni, faculty and staff.

Faculty and staff members continue to bring visibility to our program through notable honors. Dr. Richard Cassady received the Albert G. Holzman Distinguished Educator Award from the Institute of Industrial and Systems Engineers (IISE) along with the Alan O. Plait Tutorial Excellence Award from the Reliability and Maintainability Symposium (RAMS). In addition, we are excited to report that Dr. Ashlea Bennett Milburn was selected for the National Science Foundation CAREER Award for her research on Social Data and Emergency Response. Dr. Milburn was also selected to receive the IISE Teaching Excellence Award in Transportation and Logistics. Dr. Heather Nachtmann was named a Fellow by IISE. In addition, Dr. Letitia Pohl, the 2016-2017 University of Arkansas Outstanding Faculty Advisor, was recognized by the National Academic Advising Association with a Certificate of Merit for Faculty Academic Advising. Ms. Carrie Pennington, administrative analyst, was recognized by the Arkansas State Employee Association as an Outstanding State Employee.

Also a notable honor, alumnus Kevin McManus (BSIE 1980) was named a Fellow by IISE. McManus is a member of our distinguished alumni group, the Arkansas Academy of Industrial Engineering. He writes the monthly performance improvement column for *Industrial Engineer* magazine and is the chief excellence officer for Great Systems! and an international trainer for the trademarked TapRoot.

We celebrated many student successes during the past year. Our students continue to study abroad and participate in global internships and research experiences. We are especially proud of our two senior design teams who successfully competed in the General Donald

Keith Capstone Design Competition at the United States Military Academy in West Point, NY, with one team finishing in first place in their track.

Department research interests continue to grow and diversify. The hard work of several of our faculty members has enabled the launch of two additional multi-disciplinary research institutes.

First, the emerging Institute for Advanced Data Analytics (IADA) takes statistics and analytics to the next level, serving as the catalyst for big data and analytics research, innovation, and practice by partnering with industry organizations seeking solutions to their data problems. Next, the Arkansas Security Research and Education Institute (ASCENT) was established to identify and solve modern security challenges in the areas of cyber, transportation, critical infrastructure, and food/water. You will find more detailed information about these two institutes within the report.

We hope you enjoy learning more about the department activities and successes as you review this publication. Please feel free to visit the department the next time you are in the area. We would love to show you the new and interesting things going on in the department.

Sincerely,



Edward A. Pohl, Ph.D.  
Department Head and  
21st Century Professor of Industrial Engineering





**C. Richard Cassady, Ph.D.**  
Professor

Dr. Cassady serves as Director of Freshman Engineering for the College of Engineering. His primary research interests are in repairable systems modeling. He also conducts research in the areas of reliability engineering, statistical quality control, and sports applications of operations research. Dr. Cassady teaches courses in reliability and maintainability engineering, operations research, probability and statistics, and statistical quality control. He joined the faculty in 2000.

Education:  
Ph.D. Industrial and Systems Engineering (Virginia Tech)  
M.S. Industrial and Systems Engineering (Virginia Tech)  
B.S. Industrial and Systems Engineering (Virginia Tech)



**W. Art Chaovalitwongse, Ph.D.**  
Professor and  
21st Century Research Leadership Chair

Dr. Chaovalitwongse's research group conducts extensive Analytics research, ranging from basic computational science/statistics, applied mathematical modeling, and translational research at the interface of engineering, medicine, and other emerging disciplines. He joined the faculty in 2016.

Education:  
Ph.D. Industrial Engineering & Systems Engineering (University of Florida)  
M.S. Industrial Engineering & Systems Engineering (University of Florida)  
B.E. in Telecommunication Engineering (King Mongkut Institute of Technology)



**Justin R. Chimka, Ph.D.**  
Associate Professor

Dr. Chimka is director of graduate programs in industrial engineering. His research interests include statistical modeling, monitoring and detection. He teaches courses in applied statistics, production and operations analysis. Dr. Chimka joined the faculty in 2002.

Education:  
Ph.D. Industrial Engineering (University of Pittsburgh)  
M.S. Industrial Engineering (University of Pittsburgh)  
B.S. Industrial Engineering (University of Pittsburgh)



**John R. English, Ph.D., PE**  
Professor, Dean & Irma F. and Raymond F.  
Giffels Endowed Chair in Engineering

Dr. John English's research focuses on quality and reliability engineering. He has published numerous articles and book chapters in the field of logistics and material handling. His awards include the Halliburton Research Award, the Dr. Theo Williamson Award from *Integrated Manufacturing Systems* and the Continuing Professional Development Best Paper Award from the American Society for Engineering Education. He is a

fellow of the Institute of Industrial Engineers. Dr. English returned to the college in 2013.

Education:  
Ph.D. Industrial Engineering and Management (Oklahoma State University)  
M.S. Operations Research (University of Arkansas)  
B.S. Electrical Engineering (University of Arkansas)



**Carol S. Gattis, Ph.D.**  
Adjunct Associate Professor and  
Associate Dean Emeritus of the Honors College

Dr. Gattis remains involved in several areas undergraduate research, international education, service learning, k-12 math and science education, student recruitment and retention, and diversity. She currently serves as the Associate Dean Emeritus of the Honors College. Dr. Gattis joined the faculty in 1991.

Education:  
Ph.D. Engineering (University of Arkansas)  
M.S. Electrical Engineering (University of Arkansas)  
B.S. Electrical Engineering (University of Arkansas)



**Joseph Geunes, Ph.D.**  
Professor and John and Mary Lib White Systems  
Integration Chair in Industrial Engineering

Dr. Geunes is an active researcher in the area of production and logistics planning, supply chain management, and operations research. He joined the faculty in 2016.

Education:  
Ph.D. and M.B.A. (Penn State University)  
B.S. Electrical Engineering (Drexel University)



**Haitao Liao, Ph.D.**  
**Professor, James M. Hefley and Marie G. Hefley**  
**Professor in Logistics and Entrepreneurship**

Dr. Liao's research interests include reliability models, maintenance and service logistics, prognostics, data analytics, and probabilistic risk assessment. In his research, he focuses on reliability engineering, applied probability and statistics, applied operations research, probabilistic risk analysis, and sensors and signal processing. He joined the faculty in 2015.

Education:  
 Ph.D. Industrial and Systems Engineering (Rutgers University)  
 M.S. Industrial and Systems Engineering (Rutgers University)  
 M.S. Statistics (Rutgers University)  
 B.S. Electrical Engineering (Beijing Institute of Technology)



**Ashlea Bennett Milburn, Ph.D.**  
**Assistant Professor**

Dr. Milburn's research interests include applying operations research tools and techniques to problems encountered in healthcare, humanitarian and transportation systems. She is especially motivated by the modeling and analysis of challenges associated with disaster relief and the delivery of home healthcare. Dr. Milburn teaches courses in probability and statistics, healthcare systems, and transportation logistics. She joined the faculty in 2010.

Education:  
 Ph.D. Industrial and Systems Engineering (Georgia Tech)  
 M.S. Industrial and Systems Engineering (Virginia Tech)  
 B.S. Industrial Engineering (University of Arkansas)



**Heather Nachtmann, Ph.D.**  
**Professor and Associate Dean of Research,**  
**College of Engineering**

Dr. Nachtmann serves as the Director of the Maritime Transportation Research and Education Center and the Mack-Blackwell Transportation Center. Her current research program focuses on economic and decision analysis of transportation systems focusing on inland waterways. She has taught courses in engineering economy, cost analysis, and decision modeling. She joined the faculty in 2000.

Education:  
 Ph.D. Industrial Engineering (University of Pittsburgh)  
 M.S. Industrial Engineering (University of Pittsburgh)  
 B.S. Industrial Engineering (University of Pittsburgh)



**Kim LaScala Nedy, Ph.D., PE, CFPIM, PEM**  
**Professor & Dean, Graduate School and**  
**International Education**

Dr. Nedy's research interests include engineering management, engineering economic analysis, sustainable engineering, and integrated resource management. She has taught courses in project management and IE design. Dr. Nedy joined the faculty in 2008.

Education:  
 Ph.D. Industrial Engineering (Wichita State University)  
 M.S. Industrial Engineering (University of Pittsburgh)  
 B.S. Industrial Engineering (University of Pittsburgh)



**Sarah Nurre, Ph.D.**  
**Assistant Professor**

Dr. Nurre's current research interests are in applying network optimization, scheduling, integer programming, and optimization algorithms to relevant applications such as infrastructure restoration, multi-layer interdependent network protection, vehicle routing for the military and public sector, and the integration of electric vehicles with a smart grid. She joined the faculty in 2015.

Education:  
 Ph.D. Decision Sciences and Engineering Systems (Rensselaer Polytechnic Institute)  
 M.E. Industrial and Management Engineering (Rensselaer Polytechnic Institute)  
 B.S. Mathematics (Rensselaer Polytechnic Institute)



**Gregory S. Parnell, Ph.D.**  
**Research Professor of Industrial Engineering and**  
**Director of the M.S. in Operations Management**

Dr. Parnell's research interests include decision analysis, systems engineering and resource allocation in the areas of defense, national security, homeland security, and R&D planning. He teaches courses in decision models, systems engineering, project management, operations management and industrial engineering design. He joined the faculty in 2013.

Education:  
 Ph.D. Engineering-Economic Systems (Stanford University)  
 M.S. Systems Management (University of Southern California)  
 M.E. Industrial & Systems Engineering (University of Florida)  
 B.S. Aerospace Engineering (State University of New York at Buffalo)



**Harry A. Pierson, Ph.D.**  
Assistant Professor

Dr. Pierson's research interests include collaborative robotics and agile automation. Applications include distribution center operations and low-volume, high-mix manufacturing environments. Additionally, he conducts research in additive manufacturing (commonly referred to as 3D printing). Dr. Pierson teaches courses in applied robotics and manufacturing processes. He joined the faculty in 2014.

Education:  
Ph.D. Industrial and Systems Engineering (The Ohio State University)  
M.S. Engineering Management - Manufacturing Engineering (University of Missouri-Rolla)  
B.S. Mechanical Engineering (University of Missouri-Rolla)



**Edward A. Pohl, Ph.D.**  
Professor, Department Head &  
21st Century Professor of Industrial Engineering

Dr. Pohl's research interests include reliability and risk analysis, large-scale systems engineering and analysis, probabilistic design, engineering optimization, and supply chain analytics. He teaches courses in quality control, engineering statistics, non-linear programming, heuristics, risk modeling, systems engineering, project management, global engineering and innovation. Dr. Pohl joined the faculty in 2004.

Education:  
Ph.D. Systems and Industrial Engineering (University of Arizona)  
M.S. Reliability Engineering (University of Arizona)  
M.S. Engineering Management (University of Dayton)  
M.S. Systems Engineering (Air Force Institute of Technology)  
B.S. Electrical Engineering (Boston University)



**Letitia M. Pohl Ph.D.**  
Clinical Assistant Professor

Dr. Pohl serves as the undergraduate academic advisor. Her interests include facility logistics, transportation security and engineering education. Dr. Pohl teaches courses in engineering economic analysis, operations management, and human factors/ergonomics. She joined the faculty in 2012.

Education:  
Ph.D. Industrial Engineering (University of Arkansas)  
M.S. Systems Engineering (Air Force Institute of Technology)  
B.S. Mechanical Engineering (Tulane University)



**Chase Rainwater, Ph.D.**  
Associate Professor, John L. Imhoff Chair in  
Industrial Engineering

Dr. Rainwater's research interests lie in the areas of large-scale optimization, integer programming and supply chain logistics. In addition, he conducts research in areas of healthcare planning, homeland security, and reliability. Dr. Rainwater teaches courses in probability and statistics, optimization and decision support systems. He joined the faculty in 2009.

Education:  
Ph.D. Industrial and Systems Engineering (University of Florida)  
B.S. Industrial Engineering (University of Arkansas)



**Ronald L. Rardin, Ph.D.**  
Distinguished Professor Emeritus

Dr. Rardin officially retired in 2013, but remains active teaching for our distance education programs. His research and teaching interests center on large-scale optimization modeling and algorithms, including their application in healthcare delivery, transportation and logistics, and energy planning.

Education:  
Ph.D. Industrial and Systems Engineering (Georgia Institute of Technology)  
M.P.A. Municipal Administration (University of Kansas)  
B.A. Mathematics/Political Science (University of Kansas)



**Manuel D. Rossetti, Ph.D., PE**  
Professor and Associate Department Head

Dr. Rossetti's research is focused on the design, analysis and optimization of transportation, inventory, healthcare and manufacturing systems, using stochastic modeling, computer simulation, information systems, and heuristic modeling techniques. He teaches courses in the areas of probability modeling, discrete event simulation, object-oriented and database systems, transportation/logistics modeling, and inventory modeling. He serves as the Director of the Center for

Excellence in Logistics and Distribution (CELDi) Dr. Rossetti joined the faculty in 1999.

Education:  
Ph.D. Industrial and Systems Engineering (The Ohio State University)  
M.S. Industrial and Systems Engineering (The Ohio State University)  
B.S. Industrial Engineering (University of Cincinnati)



**Kelly Sullivan, Ph.D.**  
Assistant Professor

Dr. Sullivan's research focuses on developing and applying operations research methodology to design systems that are resilient against disruption. His primary research interests lie in the areas of integer programming, network optimization, and reliability. Dr. Sullivan teaches courses in probability and statistics, operations research, and network optimization. He joined the faculty in 2012.

Education:  
Ph.D. Industrial and Systems Engineering (University of Florida)  
M.S. Industrial Engineering (University of Arkansas)  
B.S. Industrial Engineering (University of Arkansas)

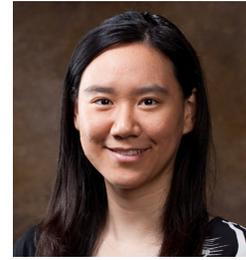


**John A. White, Ph.D., PE**  
Distinguished Professor & Chancellor Emeritus

After serving for eleven years as Chancellor of the University of Arkansas, Dr. White joined the faculty of the Department of Industrial Engineering full-time in 2009. A distinguished alumnus of the department, Dr. White teaches engineering economics, facility logistics, leadership principles and practices, and queueing systems.

Education:  
Ph.D. (The Ohio State University)  
M.S. Industrial Systems Engineering (Virginia Tech)  
B.S. Industrial Engineering (University of Arkansas)

*Dr. White also holds honorary doctorates from the Katholieke Universiteit of Leuven in Belgium and George Washington University.*



**Shengfan Zhang, Ph.D.**  
Assistant Professor

Dr. Zhang's research interests are mathematical modeling of stochastic systems with an emphasis on statistical and decision analysis as applied to healthcare, manufacturing, and service environments. One of her research goals is to develop methods for addressing the complexity of breast cancer modeling in diverse populations in order to create more personalized screening and treatment strategies. Dr. Zhang teaches courses in advanced stochastic processes, decision modeling in healthcare, and quality engineering and management. She joined the faculty in 2011.

Education:  
Ph.D. Industrial Engineering (North Carolina State University)  
M.I.E. Industrial Engineering (North Carolina State University)  
B.M. Management Science (Fudan University)

*The University of Arkansas was ranked 19th among U.S. institutions for its contributions to operations research practice literature in the 11th Rothkopf Rankings, which were published May 25 in the journal Interfaces.*

# Fellows of the Industrial Engineering Department

The title Fellow is used to describe the highest level of membership in most professional societies. Requirements to achieve the level of Fellow vary among organizations. Fellows are typically nominated by other Fellows and have demonstrated exceptional achievement in their field and devoted service to the organization. The Industrial Engineering Department proudly recognizes faculty who have achieved this prestigious status.

## **American Society for Engineering Education**

Kim Needy  
John White

## **American Society for Engineering Management**

Kim Needy  
Heather Nachtmann

## **Institute for Operations Research and the Management Sciences**

John White  
Greg Parnell

## **Institute of Industrial & Systems Engineers**

Richard Cassady  
John English  
Joseph Geunes  
Heather Nachtmann  
Kim Needy  
Edward A. Pohl  
Manuel Rossetti  
John White

## **International Council on Systems Engineering**

Greg Parnell

## **Lean Systems Society**

Greg Parnell

## **Member of the National Academy of Engineering**

John White

## **Military Operations Research Society**

Greg Parnell

## **Society for Decision Professionals**

Greg Parnell

## **Society of Reliability Engineers**

Richard Cassady  
Edward A. Pohl

# Department Overview

The department welcomed two new faculty members, Dr. Joseph Geunes and Dr. Wanpracha 'Art' Chaovalitwongse, beginning fall 2016. Dr. Geunes will hold the John and Mary Lib White Systems Integration Chair. His research interests are in the area of production and logistics planning, supply chain management, and operations research. He received his Ph.D. from Penn State, and was designated as a Fellow of the Institute of Industrial Engineers in 2015. He is a textbook author and editor and is currently a Department Editor for *IIE Transactions* and Area Editor for *Omega*.

Dr. Chaovalitwongse will hold the 21st Century Research Leadership Chair and will serve as Co-Director for the Institute for Advanced Data Analytics at the University of Arkansas. The institute will serve as a bridge between the U of A and various industries for developing practical, implementable solutions to industry issues and problems as well as a source of continuing education in data analytics. Dr. Chaovalitwongse received his M.S. and Ph.D. degrees in Industrial & Systems Engineering from the University of Florida in 2000 and 2003. He holds three patents, is a recipient of the 2006 NSF Faculty Early Career Development Program (CAREER) Award and serves as the President of the Association of Thai Professionals in America and Canada (ATPAC).

Dr. Chase Rainwater is serving as Co-Director for the Arkansas Security Research and Education (ASCENT) institute is a multi-disciplinary organization led by faculty from the College of Engineering and the Division of Agriculture. The center was established because of a growing need to solve modern security challenges in the areas of cyber, transportation, critical infrastructure, and food/water. ASCENT will strive to develop tools for securing these challenges that comprise our transportation system and the data created and used to ensure system reliability. The department is also home to two additional research centers, the Center for Innovation in Healthcare Logistics (CIHL) and the Center for Excellence in Logistics and Distribution (CELDi).

In addition, the department shares a research center with the Civil Engineering Department, the Maritime Transportation Research and Education Center (MarTREC). Dr. Heather Nachtmann serves as Director of MarTREC, a U.S. Department of Transportation

Tier 1 University Transportation Center. The Center received an additional \$923,700 in 2015, increasing the total award to \$4,209,600. The consortium consists of the University of Arkansas (lead institution), Jackson State University, Louisiana State University, and University of New Orleans. MarTREC's research focus areas are Maritime and Multimodal Logistics Management, Building Resilient and Sustainable Multimodal Infrastructure, and Livability and Emergency Management of Coastal and River Valley Communities.

Dr. Ashlea Milburn was the recipient a \$500K grant from the NSF CAREER Program. The grant will support the development of decision-support models to identify scenarios in which the integration of information posted to social-media could improve emergency response. Dr. Milburn is an alumna of our department (BSIE) and earned a doctorate in industrial and systems engineering from Georgia Institute of Technology, after earning a master's degree from Virginia Tech.

During the academic year 2015-2016 our BSIE program reported more than 300 full-time students (sophomore - senior). There were 55 graduate students on-campus (21 MSIE, 34 PhD). The Master of Science in Operations Management (MSOM) program is primarily delivered through distance learning mode and targets students in professional practice. The MSOM program reported 842 unique students enrolled with 3344 enrollments.



# Undergraduate Overview

The objectives of the undergraduate program in the Department of Industrial Engineering at the University of Arkansas are to produce graduates who, within just a few years of graduation, can: (1) successfully apply core industrial engineering knowledge and skills for industrial or public sector organizations, (2) successfully pursue advanced professional degrees, graduate studies in industrial engineering, professional training, or engineering certification, and (3) demonstrate professional and intellectual growth as managers and leaders in industrial engineering, society, and their communities.

Our curriculum includes not only industrial engineering courses, but also courses in engineering science, computer science, mathematics, physical science, english, economics and other social sciences, humanities, and fine arts. Richard Cassady, Professor of Industrial Engineering, serves as the Chair of Undergraduate Studies.

Students enter our program as sophomores, since all first-year College of Engineering students participate in the Freshman Engineering Program. Directed by Richard Cassady, the Freshman Engineering Program includes two semesters of academic coursework, peer mentoring, professional development, academic advising, and academic assistance programs. Since the Freshman Engineering Program was implemented in 2007, second-year retention (in engineering) of first-year engineering students has increased from approximately 60% to approximately 70%. Roughly 13% of retained Freshman Engineering Program students choose industrial engineering for their sophomore year.

More information on the undergraduate program can be found at <http://industrial-engineering.uark.edu/academics/undergraduate-program/index.php>.

## Industrial Engineering Capstone Experience

Recently the undergraduate senior design course was restructured and renamed. The Industrial Engineering Capstone Experience was extended to a two-semester course. The course will put students in teams of 4-5,



*Award Winning Senior Design Teams at West Point with Dr. Greg Parnell*

and match them with an industrial partner in mid-October. Each team is led by a student project manager and advised by a member of the industrial engineering faculty. The industry partner provides the team with a point of contact and meets with the team (in-person or virtually) at least once per week to help the team identify and meet stakeholders, obtain data, assess the validity of their industrial engineering analysis, and review draft versions of course milestones and project results.

During the second eight weeks of the fall semester, each team gets to know their industry partner by conducting stakeholder analysis and background research on their sponsor and the issues that are of interest to the sponsor. This background research includes reviews of published work on how other organizations have addressed similar issues. The goal for this preliminary analysis is to require teams to utilize a variety of industrial engineering tools including extensive data analysis and visualization. By the end of the fall semester, each team defines meaningful objectives for their work with their sponsor. They also define

the performance measures that they will use to measure their success in achieving these objectives, as well as the results they will provide to the sponsor upon completion of their project. The intent is that these results will facilitate the implementation of recommendations and ongoing decision support.

During the spring semester, each team completes the tasks required to achieve their project objectives. Completing these tasks require teams to apply a wide variety of industrial engineering tools including data analysis, mathematical and/or computer modeling, and cost and/or financial analysis. Each team uses their performance measures to assess their success in achieving their project objectives. They also create their project deliverables as well as the documentation necessary for their sponsor to properly utilize these results. The experience concludes with an all-day Industrial Engineering Capstone Symposium. At the symposium, student teams participate in an interactive poster session and deliver detailed technical presentations about their projects.

### Senior Design Capstone Conference

Each year engineering students from around the country gather at the U.S. Military Academy in West Point, New York to test their engineering skills against the best undergraduate system engineers in the nation at the prestigious General Donald R. Keith Memorial Capstone Conference. Two teams of University of Arkansas industrial engineering students were among the more than 60 teams competing at this year's conference held April 2016.

The conference is a student-focused forum for applied research in Systems Engineering, Industrial Engineering, Engineering Management, and Operations Research. Six schools provided teams in eight tracks. Each track had three judges from industry, government and academia.

Taking home first place were seniors Tyler Beneke, Tori McDaniel, Alexa Koenigseder and Lacey Burnett. In their project with the Veterans Healthcare System of the Ozarks, they worked with the Inventory

Management team to create a new standardized item location system and count, error tracking and reporting tool. They represented the University of Arkansas in the Process Modeling and Analysis track at the conference. "Competing against five other teams was a fabulous and humbling experience," said senior Tyler Beneke.

The other team of seniors, Zach Watts, Michael Herm, Curtis Casey and Blake McMillon, placed second in the Systems Optimization track. Their project involved improving truck routing for a Fortune 500 transportation company. The team created a Visual Basic application that generated a solution for the vehicle routing problem. Using data provided by the sponsor company, their program generated several improvements to the existing routing process that the company could potentially implement, resulting in significant cost savings.

Through this and other relationships with various companies, industrial engineering students are now able to gain experience through internships, co-ops, and, most recently, international senior design projects.

### Honors Experience

The honors experience in our department is designed for students who are also enrolled in the University of Arkansas Honors College. The experience includes a minimum of 12 credit hours of honors courses, as well as an undergraduate research project that culminates with a thesis. In 2015-2016, twelve undergraduate students completed the Honors College experience in our department.

### Undergrad Highlights

- Our chapter of the Society of Women Engineers (SWE) hosted the 2016 SWE Region C Conference. Undergraduate student Tyler Beneke served as the chapter president. Her leadership and service to the profession brings very positive visibility to the department and college.
- Keegan Henderson placed second in a research paper competition

at the Institute for Industrial Engineers South Central Regional Conference in February 2016. Additionally, he received the departmental Undergraduate Research Award in April 2016.

- Emily Matlock received the Benjamin A. Gilman International Scholarship which supports study or internship abroad and is sponsored by the U.S. Department of State. Emily was also selected by the U of A Freshman Engineering Program as the 2016 Freshman of the Year.
- Arturo Nuñez Uribe received the 2016-2017 Myrtle & Earl Walker Scholarship from the Society of Manufacturing Engineers Education Foundation. Arturo also completed an internship with BMW in Spartanburg, South Carolina.
- Andres Herrera and Daniel Fritsche were selected as Seniors of Significance by the Arkansas Alumni Association.

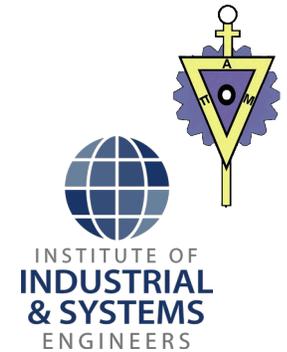
Andres has served as the Recruitment Chair for the Society of Hispanic Professional Engineers, was an active member in the Panamanian Student Organization, and served as a Mentor for the PAPSS program which helps other Panamanian students with their transition to the University.

Daniel was also among the 2016 Class of Razorback Classics. The Razorback Classics are the top eleven graduating seniors at the University of Arkansas as selected by the Arkansas Alumni Association. In addition Daniel received the 2016 Outstanding Senior Award at the Annual Industrial Engineering Student Awards Banquet in April.

- Other awards presented at the Annual Student Award Banquet included the Sophomore Scholar Award, presented to Anna Hudgeons. Senior Alexa Koenigseder received the John L. Imhoff Distinguished Service Award.

The department continues to report successes within professional societies. In 2015, the Alpha Pi Mu student chapter (faculty advisor Dr. Kelly Sullivan) received the 4th Place Outstanding Chapter Award from the

executive council of the national organization. In 2015, our student chapter of the Institute of Industrial and System Engineers (faculty advisor Dr. Chase Rainwater) received the Frank F. Groseclose Silver Award and the Gold Chapter Award. In addition they were listed as one of the top chapters with 50 or more members.



Student	Honors Thesis Title	Advisor
Daysi Guerra Garcia	Modeling Information Reliability and Maintenance: A Systematic Literature Review	E. Pohl
Jaymin Patel	College Football Rankings: Maximum Flow Model	Sullivan
John Bonfanti	Improving Reliability of Medical Device Tracking Using Unique Device Identification	E. Pohl
Daniel Fritsche	Developing a Logistics Risk Assessment Tool	Zhang
Jessica Hacker	Statistical Learning Tools with Food Science	Rainwater
Jeffrey Hazel	Modeling Supply Chain Resiliency	Parnell
Keegan Henderson	Baseball Portfolio Optimization	E. Pohl
Travis Peter	Modeling the Impact of RFID Technology on the Healthcare Supply Chain	E. Pohl
Colin Small	Using Value-Focused Thinking for Engineered Resilient Systems	Parnell
Tyler Spain	Developing a Risk Analysis Model to Improve Study Abroad Awareness	Needy
Brian Trussell	Predicting Nonadherence Behavior Towards Mammography Screening Guidelines	Zhang
Zephany Wade	Engineered Resilient Systems Model Applied to Network Design	Parnell

*Twelve students completed the Honors College Experience 2015-2016*

Members of the class of 2015 were hired by...

United States Air Force  
Windstream Communications  
Rockline Industries Harrison Energy Parnters  
University of Arkansas FedEx Boeing ABF  
Dassault Falcon J.B. Hunt Texas Instruments  
Lockheed Martin Walmart Phillips 66  
Epic NALCO Marshalltown Dell  
Georgia Pacific SPP Pumps Viridian  
Amazon LaCroix Optics John Deere  
Sam's Club American Tubing Nestle Purina Petcare  
Butterball Unilever Arkansas Electric Cooperative  
Applied Predictive Technologies Green Mountain Technology  
QPS Engineering Northrup Grumman  
Cerner United States Postal Service Emerson  
Tesla Motors Somerset Logistics  
St. Jude Medical

# Graduate Overview

Graduate course offerings of the Department, as well as research opportunities for Industrial Engineering graduate students, continue to grow and diversify. A sampling of our graduate students' published work, highlighted in this section, illustrates the range of research interests being pursued under the guidance of our faculty. Also featured in this section is our professional graduate program in Operations Management.

For students pursuing graduate studies in the field of industrial engineering, we offer several options with respect to degree, area of specialization, and full-time or part-time studies.

Graduate degrees for on-campus students are offered in two areas:

- Master of Science in Industrial Engineering (MSIE)
- Doctor of Philosophy in Engineering (PhD)

In addition to traditional degree options, the Department offers a Master of Science in Operations Management (MSOM).

Our faculty's wide range of expertise provides opportunities for study in a variety of areas such as:

- Transportation, Logistics & Distribution
- Healthcare Systems Engineering
- Reliability, Maintainability & Quality Engineering
- Engineering Management
- Manufacturing & Automation

These areas continue to be supported by research centers and laboratories such as:

- Center for Excellence in Logistics and Distribution
- Mack Blackwell Rural Transportation Center
- Center for Innovation in Healthcare Logistics
- ReliaSoft Risk, Reliability and Maintainability Research Alliance

Justin Chimka, Associate Professor of Industrial Engineering serves as Graduate Coordinator for degree programs in Industrial Engineering. Dr. Greg Parnell serves as Director for the Master of Science in Operations Management program. More information can be found at <http://industrial-engineering.uark.edu>



*Faculty and students at the 2016 Institute of Industrial & Systems Engineers Annual Conference and Expo in Anaheim, California*

## Highlights

Fall enrollment in the Department's doctoral program increased by more than 50% from 2009 to 2015. Fall 2015 PhD enrollment in Industrial Engineering was third largest in the College of Engineering, and our Department had the greatest number of female doctoral students in the College.

Our graduate students have gained national recognition through awards, honors and publications.

- Emre Kirac and Mahboubeh Madadi, received second place in the Interactive Sessions Competition at the annual conference of the Institute for Operations Research and Management Sciences (INFORMS).
- Mina Hadianniasar, was selected as a finalist in the Case and Teaching Material Competition at the annual conference of the Institute for Operations Research and Management Sciences (INFORMS).
- Furkan Oztanriseven and Mehmet Serdar Kilinc, received second place in the student paper competition at the annual conference of the American Society for Engineering Management (ASEM).

- Rufaidah AlMaian received the Best Dissertation Award at the 2015 American Society for Engineering Management Conference (ASEM). Recent alumnus, Jingjing Tong was named runner up in the same category.
- Five graduate students received recognition at the Industrial and Systems Engineering Research Conference (ISERC). Liliana Delgado Hidalgo, doctoral student, received the John L. Imhoff Scholarship.
- Best Paper Award in the Facility Logistics Track at the Institute of Industrial & Systems Engineers Annual Conference and Expo (IISE) in May of 2016, went to Hu Eon Lee for his paper The Dynamic Block Stacking Problem with Random Demand.

Alireza Zadeh received the 2016 NSF Student Travel Grant Award.

Doctoral student, Payam Parsa, received 3rd Place in the Doctoral Colloquium Poster Presentations for his poster: Quantifying the Benefits of Continuous Replenishment Program for Partner Selection. Payam was also the recipient of the Electrification and Controls Manufacturers Association Honors Scholarship from the Materials Handling Education Foundation to support his work in supply chain and logistics, data analytics, applied optimization and simulation, cost modeling and decision making. At the Fall 2015 CELDi Industrial Advisory Board Meeting and Research Symposium held in Chicago, Payam was awarded the Outstanding Graduate Student Achievement Award.



- Amir ali Ghaharikermani, PhD student advised by Ed Pohl, took second place in the Three Minute Thesis competition which was founded by the University of Queensland in 2008. The event was the capstone to Graduate Education Week held at the University of Arkansas.
- Other departmental awards included the 2016 Outstanding Graduate Student to Emre Kirac along with the Outstanding Teaching Assistant Award. Emre is advised by Ashlea Milburn.



The 2016 Graduate Research Award went to Thomas Talafuse. Tom also received the 2016 Quality and Productivity Research Student Scholarship from the American Statistical Association. He is advised by Ed Pohl.



More information about our graduate programs can be found here: <http://industrial-engineering.uark.edu/academics/index.php>

# M.S.O.M. Program Overview

The Master of Science in Operations Management graduate degree program continues to thrive. This applied management program for working professionals attracts managers and professionals in various business sectors, industries, military branches of service and government offices. In the 2015-2016 academic year, there were 842 unique students enrolled in the program and a total of 3,344 course enrollments for the year. The MSOM program continues to be the University's largest graduate program with 236 students completing their degree in the 2015 calendar year.

The program is offered at the University of Arkansas's flagship Fayetteville campus, at live Graduate Resident Centers, and via distance learning online. The program is hosted on three active duty bases including Little Rock Air Force Base at Jacksonville, Arkansas; Naval Support Activity Mid-South at Millington, Tennessee; and the Air Force Special Operations Hurlburt Field base at Fort Walton Beach, Florida. These sites and the option of online classes allow the program to reach a diverse student population among career fields and undergraduate majors.

The MSOM program offers students flexibility by operating in 8-week terms, remaining low cost, and having an online option for all program courses. This flexibility accommodates students employed full-time by Fortune 500 companies such as Walmart, Sam's Club, Tyson Foods, J.B. Hunt Transport, Fed Ex, Lockheed-Martin, and Pratt & Whitney. We are also proud to be affiliated with the military and have many current military members and veterans from all branches of service stationed at our host bases and throughout the world.

Operations Management coursework emphasizes practical knowledge in areas such as project management, economic decision-making, supply chain management, human behavior analysis, quality management, and operations research, as well as many other areas of importance to today's manager. Program content focuses squarely on the concepts, methods,



*Dr. Pat Koski with students and staff at the Millington, TN graduation ceremony*

and tools that are essential to the successful management of work processes, projects, and people in a wide spectrum of organizations. The curriculum has an Industrial Engineering perspective on the science of management and equips graduates to carry out their managerial responsibilities more efficiently and more effectively. Students are able to select from 27 graduate courses to make up the ten required to complete the degree.

The curriculum is presented by outstanding faculty members who are drawn from the University's IE Department and from businesses throughout the country. There are five IE faculty members actively involved with two additional IE faculty taking this year off and 65 adjunct faculty members who teach in the program. The program recruits business professionals who are academically qualified and have accrued extensive managerial industry experience in the specific subject that they teach. Additionally, in 2015, the program added the first full-time operations management instructors to assist with program administration as well as carry a full teaching load.

In 2014, the MSOM program increased admission and graduation requirements. For admission consideration, students who are not native



*Faculty and staff at the May 2016 Graduation Reception*

speakers of English and who do not have a conferred master's degree from an accredited U.S. college or university must submit a 550 paper-based score or an 80 internet-based score on the Test of English as a Foreign Language (TOEFL). Before taking any graduate classes in the Operations Management program, such students must also demonstrate proficiency on one of the following test of written English: TOEFL IBT (26), ELPT (75) or GRE/GMAT (4.0). The MSOM program also aligned the graduation GPA requirement with the Industrial Engineering Department. The requirement was increased from the Graduate School requirement of 2.85 to the Industrial Engineering requirement of 3.0.



A strength of the program are the dedicated instructors. San Francisco Bay Area Adjunct Professor Carrie Beam received the 2016 Faculty of the Year Award. Beam is the owner of Beam Consulting, a firm supporting market research. She teaches several MSOM courses and was instrumental in the development of the new Data Analytics course.

In a close tie, Jim Burgin also received a 2016 Faculty of the Year Award. Jim is a Fayetteville Adjunct Instructor for the MSOM program. Jim always receives positive feedback from his students and is a caring, enthusiastic instructor.



Another strength of the program is a core value of continuous improvement. The motto, "we practice what we teach" guides the program goal to always improve. In 2014-2015, the program began offering advanced project management and began development of updated courses in change management, homeland security systems and lean systems to meet both student and industry needs, and in 2015-2016 a course in Data Analytics was added.

In particular, the spring 2016 Homeland Security course featured a distinguished speaker series which proved to be quite popular. Notable speakers included the following:

- Ken Sensor, Vice President for Global Security, Wal-Mart Stores, Inc.
- Kelly Hoggan, Assistant Administrator, Department of Homeland Security
- Governor Asa Hutchinson, former Undersecretary of the Department of Homeland Security
- Dr. Greg Parnell, Research Professor and Director of MSOM
- David Maxwell, Director of the Arkansas Department of Emergency Management and State Homeland Security Advisory

More information about the Operations Management program can be found here: <http://operations-management.uark.edu>.

# Laboratories Overview

The Industrial Engineering Department has three physical computer laboratories for student use. These are the Foust Lab (BELL 4127-4128), Stephens Lab (BELL 4134A), and a general access computer lab shared with Civil Engineering (BELL 4133). All are equipped with the latest hardware, software and specialized programs. Designated lab space is described in detail below.

## David D. and Nancy J. Foust Computation Laboratory

The Foust Computation Laboratory is INEG's premier computing and teaching lab, providing general computing access for all Industrial Engineering students and supports the computing needs associated with course work. Included in the lab are a project area with whiteboards to encourage student discussions, and a separate conference area with a large LCD TV, DVD and VCR. Occupying approximately 2,100 square feet, the computer lab area can accommodate 44 students. It also functions as a general PC lab outside of class hours.



The Industrial Engineering department is committed to providing the latest in computer technology, software capability, and technical expertise to enhance the educational experience for all students. The Foust Computation Lab is open 24 hours a day throughout the semester to all faculty, staff, and students enrolled in INEG classes.

## Larry and Gwen Stephens Undergraduate Research Laboratory

The Larry and Gwen Stephens Undergraduate Research Lab provides state-of-the-art facilities including the latest computer hardware and software designed for industrial engineering projects.



The lab provides individual work space for up to 15 undergraduate students. To be eligible for a space in this lab, a student must be engaged in research with an Industrial Engineering faculty member.

## The AT&T Manufacturing Automation Laboratory

The Manufacturing Automation Lab allows students to gain hands-on experience with technologies that boost manufacturers' efficiency and agility. This includes both robotics and additive manufacturing.

The lab hosts two traditional robotic work cells. The vision-equipped Adept Cobra is a 4-axis SCARA geometry that is ideal for high-speed pick-and-place operations. The other work cell features an Adept Viper 6-axis articulated arm mounted on a 2-axis Adept Python Cartesian robot. This is a common arrangement in industry for manufacturing tasks such as robotic welding and machine loading/unloading.



Additionally, the lab stays particularly active in the realm of Additive Manufacturing. The Stratasys uPrint is an industrial-grade fused deposition modeling (FDM) 3D printer. Further enhancing exposure to this type of manufacturing is the lab's MakerGear M2 desktop 3D printers, Simplify3D printing software, and Autodesk Inventor CAD software to provide low-cost, hands-on 3D printing experience for students.

### The Bill and Margaret Harrison Family Video Conferencing Facility

The Bill and Margaret Harrison Family Video Conferencing Facility was made possible by a contribution from alumni William and Margaret Harrison of Little Rock.

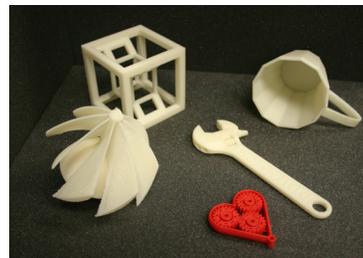
The lab also features two collaborative robots: Baxter from Rethink Robotics and a UR-10 from Universal robots. Both are intrinsically safe and possess human-friendly task specification, allowing humans to enter the work envelope and interact with the robots.



With two seven-axis arms, integrated machine vision, and an interactive display, Baxter can handle complex perception and manipulation tasks. The UR-10 is a traditional 6-axis articulated geometry. Together they represent the next generation of industrial robotics.



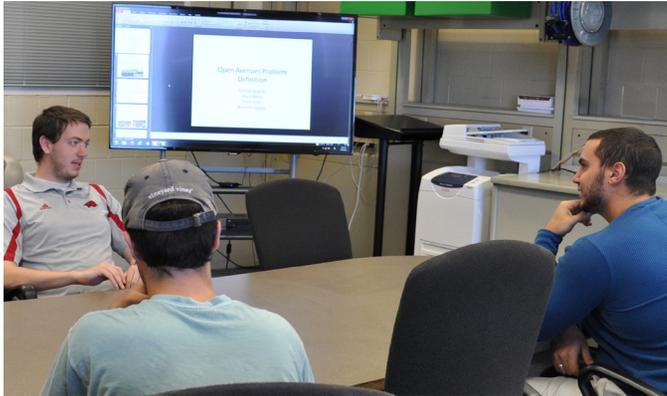
The Turtlebot mobile robot from Clearpath Robotics is the lab's fully autonomous robot that gives student experience with the simultaneous localization and mapping (SLAM) technologies used in both industrial mobile robotics and autonomous vehicles.



The paramount feature in the facility is the state-of-the-art software and equipment. The facility is equipped with the LifeSize 220 Express, described as the most full-featured video conferencing system available.

The system allows remote video and audio communication between up to eight parties concurrently, and users can share content, control cameras, change layouts and add participants with ease. It includes an application for smart phones, tablets and computers and has the ability to record meetings and stream viewing.

## Senior Design Lab



A dedicated space was developed during the fall 2013 term to be used primarily for students in Industrial Engineering Capstone Experience. The space is equipped with a conference area, mobile media cart with a 60" television monitor and computer. This enables students to meet with industry partners, review draft versions of course milestones and make presentations of project results.

## ReliaSoft Alliance Laboratory

ReliaSoft Corporation donated software to the University of Arkansas to form and support the ReliaSoft Risk, Reliability, and Maintainability Research Alliance. The software provides engineering students with state of the art tools to help identify potential risks and calculate the severity of disruptions within a manufacturing or transportation environment.



## Multi-purpose Teaching Lab



This lab supports two undergraduate courses, INEG 3713 Methods and Standards and INEG 4723 Ergonomics. The space is used to hold lab meetings for these two courses where students conduct experiments related to cognitive ergonomic concepts, hand tool design, anthropometric measurement, time studies, work sampling, and worksite analysis and design.

More information on the Industrial Engineering Labs can be found at: <http://industrial-engineering.uark.edu/Research/Labs/index.php>

# Featured Research

## Data: A New Weapon Against Breast Cancer

**B**reast cancer trails only melanoma as the most common cancer, and it has one of the highest cancer-related death rates. Early detection and proper treatment are proven to increase the chances of survival, yet experts disagree on age and frequency standards for cancer screening. That conflicting guidance can be confusing for patients — and could lead to some women skipping screening altogether.

Professor Shengfan Zhang is using data mining along with statistical and computational modeling techniques to solve this puzzle. By plugging survey data into formulas, Zhang is able to identify the best general approach to breast cancer screening. Her ultimate goal is more ambitious: To create a personalized system of breast cancer screening, one in which a doctor and patient sit down together and work out a customized plan based on the patient's risk factors, preferences and the approach the data say works best.

“Right now, there’s only one protocol for everyone,” she said. “But we know that this doesn’t work. One size does not fit all. A physician should work with a patient to come up with the best option.”

### The Problem with Mammograms

The importance of screening is found in the numbers. One in seven women will develop invasive breast cancer in her lifetime. Currently, the only effective way to screen for breast cancer is to get a mammogram, but there are several factors that make mammograms less than perfect. And the questions of when and how often are still being debated.

Frequency matters. Mammograms expose patients to X-ray radiation, which is in itself a risk factor for cancer. Zhang cites research concluding that each exposure to radiation increases a patient's cancer risk by about 1 percent, and the cumulative increase in risk over a decade of screening

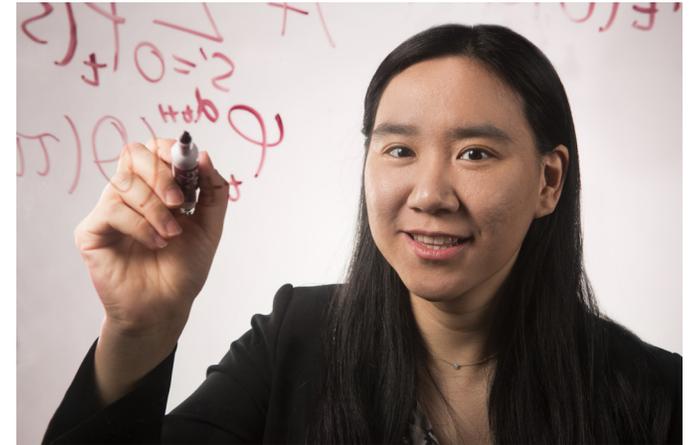
is 5 percent for each breast.

Mammograms don't give clear results; they produce images that must be interpreted by clinicians.

Sometimes the interpreter can miss a malignancy, resulting in something called a false negative. The danger of this is obvious — the treatment that is so vital to a woman's survival does not happen. Another danger is called interval cancer, or cancers that appear between screenings and grow undetected for months before another test is administered.

Less obvious are the risks associated with false positives and over diagnosis. In the case of a false positive, the woman is told she has a possible tumor that turns out to be nothing. Over diagnosis occurs when cancer is detected and treated, but the treatment is unnecessary, because the cancer would not have been a risk to the woman's health. In both these cases, the patient undergoes treatments that cause stress and physical side effects and don't result in any benefit.

For these reasons, experts disagree on when and how often women should get mammograms. The American Cancer Society recommends yearly screening starting at age 40. On the other hand, the U.S. Preventative Services Task Force recommends screening every two years starting at age 50.



Professor Shengfan Zhang

## The Question

Zhang and her then graduate student, Mahboubeh Madadi, set out to identify which screening policy had the best balance of risks and benefits, but they also had to consider two other factors: Age and adherence to screening recommendations.

Age presents a paradox when it comes to cancer screening. While the risks of developing breast cancer increase with a patient's age, breast cancers are less aggressive in older women and tumors are more responsive to treatment. Because of this, survival rates for breast cancer actually increase with age. In addition, the accuracy of mammograms also increases with age, because tissue in the breasts becomes less dense.

Zhang and Madadi also considered the degree to which women were likely to follow the policy. While the American Cancer Society and the Preventative Services Task Force crafted their recommendations under the assumption that women would faithfully follow them, the reality is that most women do not. According to data from the Centers for Disease Control and Prevention, more than 75 percent of women older than 40 had five or fewer mammograms between 1996 and 2009 — considerably below the screening level recommended by the American Cancer Society.

Zhang and Madadi set out to answer a complicated question: Which screening policy would work best overall and for individual women, given that women skip screenings, the risks associated with mammography and the age-related variables in both breast cancer incidence and risk?

First, the researchers had to establish what they mean by “work best.”

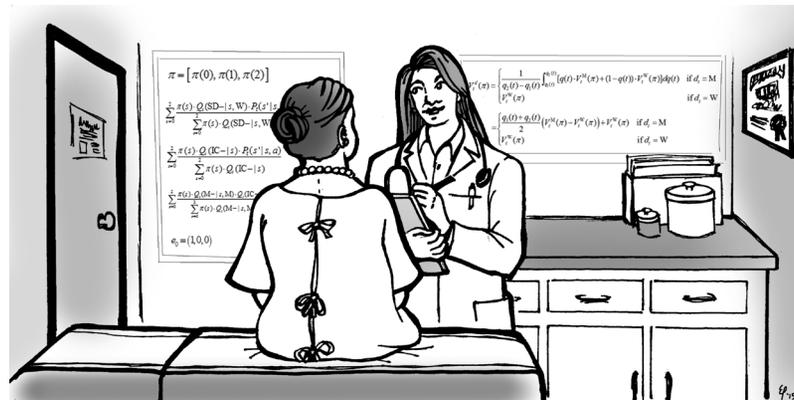
They decided to measure outcomes in two ways. They considered how a screening policy affected a patient's chance of dying from breast cancer. They also examined how the policy would affect quality of life by measuring a patient's remaining quality-adjusted life years.

## The Process

Zhang and Madadi used several different statistical and operation-research methods for their project. In an earlier study, they had predicted how adherent different groups of women would be to a screening policy. They considered many different factors, including age, race, education, insurance coverage, family history, body mass index, eating habits, exercise habits and the subjects' overall knowledge of breast cancer and mammography. The researchers determined the rate of adherence for women in different circumstances based on data collected by the Health Information National Trends Survey, which asked women if they planned to get a mammogram. With this data, Zhang and Madadi predicted the likelihood that the general population would follow a policy.

Next, they used a method called the partially observable Markov decision process to evaluate different policies for three different cases: The general population, an individual patient and an imaginary population that would follow each policy to the letter.

The type of Markov decision process used by Zhang and Madadi is called partially observable because the true health state of a patient is not fully discernable — a woman may have cancer but this is not known with certainty until the cancer is detected. In this case, the researchers had to consider three possible states at the same time: A woman could have early



stage cancer, advanced stage cancer or she could be cancer free. At any point in the process, a patient's state was a combination of the probability she had cancer and the probability she didn't.

"The partially observable Markov decision process is used in many different areas, from robot planning and control to infrastructure maintenance problems," Zhang said. "It is natural to apply this type of modeling to health care because of the uncertainty in disease and human behavior and the partially observable nature of the patient's true condition."

When a woman is due for a screening, she has the choice to undergo screening or skip the procedure. The decision she makes can lead to several different consequences. She could continue to have no symptoms, she could detect symptoms before her next screening, she could get a false negative result and then develop symptoms, or she could get a false positive result, which would lead to further testing that shows no sign of cancer.

If a patient gets a screening with true positive results, she moves out of the screening decision process and into treatment. By modeling the interaction between these states and actions for different groups of women, the researchers developed a realistic idea of which policy would lead to lower mortality and the best quality of life.

The results of their research suggest that adherence plays a big part in how well a screening policy works. Zhang and Madadi found that on average, women who follow screening policy recommendations have higher quality of life and lower mortality risk. But they found a big difference between the imaginary group that followed the policy exactly and the more realistic group that sometimes skipped screenings. For the perfect group, the U.S. Preventative Services Task Force policy resulted in the higher quality-adjusted life years, suggesting that having a mammogram every other year is a good way to balance the benefits and risks of screening.

However, the realistic group and the individual cases fared better on the American Cancer Society policy, which recommends screening every year. Zhang explained that according to these results, screening policies should be

more like speed limits, which are often set low with the expectation that many drivers will exceed them. Perhaps policy makers should account for the fact that patients will not follow their guidelines and set them a higher than necessary to make up for that.

### The Next Steps

Zhang plans to refine and build on this research in the future. She wants to revise her formulas to account for the fact that negative experiences with screening — like a false positive — could affect the way the patient follows a screening regimen in the future. She would also like to incorporate patients' attitudes toward risk into her model. Risk-averse patients would be less likely to deviate from a policy, while risk-seeking individuals might be more comfortable taking chances with their screening schedules.

Zhang is currently working with Madadi to address over diagnosis, which is considered by some to be the most important disadvantage of cancer screening. The goal of their research is to refine the screening program to reduce incidents of over diagnosis. In addition, another graduate student, Fan Wang, is looking at a decision process that accounts for the different risks associated with false positive and false negative results.

"I am interested in conducting research that will have a significant impact," explained Zhang, whose personal experience with family health issues motivated her to focus on health-care research. "In the field of medical decision-making, I can use my expertise to help patients and physicians make efficient and effective decisions that will lead to better health. In addition, I believe data-driven decision modeling can provide insights to health-care policy makers."

The research has been published in *Breast Cancer Research and Treatment* and the *European Journal of Operational Research*.

Mahboubeh Madadi is now collaborating as a faculty member at Louisiana Tech University.

# Arkansas Security Research and Education Institute

The Arkansas Security Research and Education (ASCENT) institute is a multi-disciplinary organization led by faculty from the College of Engineering and the Division of Agriculture. The center was established because of a growing need to solve modern security challenges in the areas of cyber, transportation, critical infrastructure, and food/water. The Department of Industrial Engineering is represented by Co-Director, Chase Rainwater, Associate Professor. Rainwater oversees activities related to cyber and transportation security. In the area of transportation security research, ASCENT strives to develop tools for securing transportation infrastructure, the goods and vehicles that comprise our transportation system and the data created and used to ensure system reliability, real-time information response and logistics efficiency. Specific areas of research include:

**Improving system resilience** - using data and optimization to prioritize high-risk/high-consequence assets for fortification.

**Asset shrinkage** - developing software and technology to prevent, mitigate and respond to the loss of products between the point of manufacturing and the point of sale

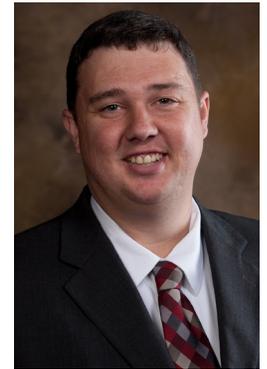
**Network design** - locating distribution centers, relay points and transportation

hubs within a network in order to maximize your chance for sustained transportation throughput under uncertainty associated with bad actor attacks and natural disasters

**Securing collaborative logistics systems** - benefits can be obtained from manufacturers, transportation providers and retailers collaborating on the efficient usage of their pooled resources. This arrangement

raises the need to share customer information across different computing systems. Protocols and procedures that retain the privacy and security of customers are vital and require comprehensive development of software, hardware and data management platforms.

**Protecting enterprise information systems** - transportation providers store the whereabouts of millions of dollars of goods. Put plainly, they hold the blueprint for when and where valuable goods can be stolen before they reach their destination. Research is ongoing into the regulatory considerations and authentication protocols necessary to reduce the threat of information breaches along the transportation supply chain.



Dr. Chase Rainwater



Outside of transportation, ASCENT hopes to engage expertise from industrial engineering research in the areas of cyber and food security. Areas being targeted for collaboration include:

**Genomic sequence data and security** – generation of large sets of sequence data from whole genome sequencing of foodborne pathogens, management, and protection of data.

**Food and water systems analysis** – systematic pathway modelling assessment of all inputs/outputs and identification of critical steps for foodborne pathogen risk.

**Traceability development, analysis and security** – balance security with development of tools for the ability to track foodborne pathogens through a food production system from farm to consumer.

**Database security** – identify attacks early and accurately; recover quickly to avoid further damage

**Computer network security** – dynamic network interdiction; network filter and sensor allocation optimization.

**Insider threat mitigation** – balance security with access to sensitive data among employees to avoid and detect insider attacks

The first year of the institute has been focused on the establishment of partnerships with industry professionals to ensure that the security research retains significant and practical impacts. Moving forward, ASCENT will also develop and support educational initiatives for university students and the security community to increase visibility for state-of-the-art security issues and technologies in all thrust areas. At its core, ASCENT will serve as the Arkansas' source for communication and awareness of security threats, solutions, and needs. The Department of Industrial Engineering's expertise in operations research and decision support tool design make it a key player in ASCENT's initiatives. ASCENT is excited to leverage the years of experience that department has with the transportation logistics sector to accelerate new work in the security domain.

More information on Ascent can be found here: <https://ascent.uark.edu>

# Institute for Advanced Data Analytics

*University of Arkansas to Launch New Data Analytics Institute*

The University of Arkansas has established a new industry research partnership called the Institute for Advanced Data Analytics (IADA). The vision is to be the premier academic institute for analytics research, innovation and practice by helping enterprises meet their needs for talent, tools, education, and solutions in the analytics space. The institute is designed to be a cross college, interdisciplinary initiative that unites the U of A faculty who have deep strengths in analytics, operations research, statistics, information systems, and related disciplines and to create a powerful, productive partnership with local and national industry with the goal of accelerating research on analytics.

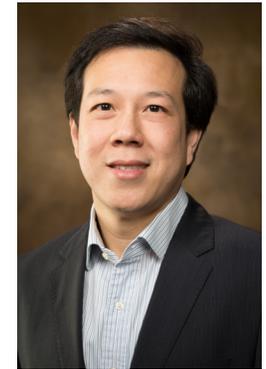
As a first step in moving this initiative, the University has given support to recruit W. Art Chaovalitwongse, whose primary appointment is in the Industrial Engineering Department, to serve as a Co-Director of the institute. The other two Co-Directors are Dr. David Douglas from the Sam M. Walton College of Business and Dr. Mark Arnold from the Fulbright College of Arts and Sciences.

The institute will serve as a bridge between the U of A and various industries for developing practical, implementable solutions to industry issues and problems as well as a source of continuing education in data analytics. Such a partnership is designed to bring together academic researchers and practitioners to catalyze fresh insight into advanced analytical methods to help enterprises make better decisions. Scheduling, marketing, inventory management, and product development are obvious practical decision making problems that can benefit from advanced data analytics. As part of the Institute, U of A researchers will continue to work on noteworthy, grounded research while they will have access to resources to engage in more high-risk, high-impact problems of interest to industry.



The University of Arkansas has a strong record of high value win/win results working with numerous Fortune 500 companies in Northwest Arkansas and world-wide. The institute is uniquely positioned to partner with industry across multiple domains including education, food, retail and transportation to mention a few. Negotiations are under way with several local firms to become executive level and advisory level members on the advisory board

of the institute. The board will be the key avenue for developing a win/win synergy between the institute and industry. This approach to industry research can spark rapid development and deployment of new ideas. This is an important initiative for the state of Arkansas as it consolidates the benefits of academic research with the economic power of the industry in Arkansas.



Dr. W. Art Chaovalitwongse

The institute will partner with a cross-college interdisciplinary graduate degree program in Statistics and Analytics. The program offers seven areas of focus with emphasis on problem-based learning: Statistics; Business Analytics; Operations Analytics; Computational Analytics; Biological Analytics; Educational Statistics & Psychometrics; and Quantitative Social Sciences. It will also partner with the Sam M. Walton College of Business on the new Healthcare Executive MBA (EMBA) with the University of Arkansas Medical Sciences (UAMS). Upcoming events include an annual Data Analytics Summit, a business case study competition and a series of high-profile seminars and scientific conferences.

# Current Grants

**O**ur faculty members had active research grants exceeding \$9.8M, including 11 new awards (\$1.6M). During 2015-2016, the following research grants were active.

*Project PIs are indicated in bold face type.*

**Chimka, Justin**, U.S. Department of Transportation, \$93,132, "Economic Impacts of Lock Usage and Unavailability," 2014-2016

Gattis, Jim, and **Justin Chimka**, Arkansas State Highway & Transportation, \$202,554, "Safety Performance Functions for Arkansas," 2014-2016

Gattis, Jim, Joon Jin Song, and **Justin Chimka**, Arkansas State Police, \$257,622, "Seat Belt, Motorcycle Helmet, & Child Restraint Survey," 2011-2016

**Gattis, Carol**, Bryan Hill, Ed Clausen, and Janet Woodland, Arkansas Department of Education, \$453,772, "UA Engineering & Mathematics Partnership - Yr2," 2015-2016

**Gattis, Carol**, Bryan Hill, and Ed Clausen, Department of Education, \$595,713, "University of Arkansas Science and Engineering Partnership," 2015-2016

**Milburn, Ashlea**, Medline/CELDi, \$60,000 "Medline," 2014-2015

**Milburn, Ashlea**, National Science Foundation, \$200,000, "Non-Traditional Designs for Order Picking Warehouses," 2012-2016

**Milburn, Ashlea**, National Science Foundation, \$500,000, "CAREER: Information Accuracy and the Use of Social Data in Planning for Disaster Response," 2016-2021

**Nachtmann, Heather**, and Kevin Hall, U.S. Department of Transportation, \$4,200,000, Department of Transportation, "Tier 1 Maritime Transportation Research and Education Center," 2013-2018

**Nachtmann, Heather**, and Kevin Hall, U.S. Department of Transportation, \$733,621, Department of Transportation, "Administration NTRT13," 2013-2017

Hall, Kevin, and **Heather Nachtmann**, U.S. Department of Transportation, \$90,983, "Region 6 UTC—with OkTC," 2013-2017

**Nachtmann, Heather**, Arkansas State Highway & Transportation Department, \$45,000, "Reg Economic Impact Study for McClellan Kerry AR River Navigation System," 2014-2015

**Nachtmann, Heather**, and Justin Chimka, US Department of Transportation, \$212,944, "Supporting Secure & resilient Inland Waterways," 2014-2017

**Needy, Kim**, Ken Walsh and Thais Alves (San Diego State University), Construction Industry Institute, \$314,764 total of which, \$92,298 is the Arkansas portion, "Achieving Zero Rework through Effective Supplier Quality Practices," 2012-2016

**Needy, Kim**, and Robert Ries (University of Florida), Construction Industry Institute, \$603,988 total of which \$254,441 is the Arkansas portion, "Creating Standards for Industry-wide Quality Metrics," 2013-2020

**Parnell, Gregory**, National Science Foundation/CELDi, \$110,773, "Center for Army Analysis," 2013-2015

**Parnell, Gregory**, and Ed Pohl, National Science Foundation, \$139,613, "I/UCRC for Excellence in Logistics and Distribution, Phase III, 2016-2017

**Pierson, Harry**, Department of Defense, \$45,431, "AFRL Digital Design Integrity," 2014-2015

**Pohl, Edward** and Richard Cassady, National Science Foundation/CELDi, \$20,000, "Research Experiences for Teachers," 2013-2014

**Pohl, Edward**, and Kelly Sullivan, Department of Defense, \$98,574, "Optimal Allocation of Test Resources in a Reliability Growth Environment," 2015

**Rainwater, Chase**, National Science Foundation, \$60,292, "Physical Internet for a Sustainable Logistics Future," 2013-2015

**Rainwater, Chase**, and Harry Pierson, Walmart, \$4,941, "Mobile Robotics in Retail -iSparky: Proof of Concept Phase, 2015-2016

**Rainwater, Chase**, and Heather Nachtmann, US Department of Transportation, \$203,879, "Optimal Dredge Fleet Scheduling within Environmental Work Windows," 2014-2016

**Rainwater, Chase**, and Shengfan Zhang, ABF/CELDi, \$60,000, "A Decision Tool for Identifying Critical Nodes in an LTL Network," 2014-2015

**Rainwater, Chase**, National Science Foundation, \$147,575, "Dynamic Resource Allocation for Law Enforcement Operations," 2013-2016

**Rossetti, Manuel**, National Science Foundation, \$189,800, "I/UCRC for Excellence in Logistic & Distribution, Phase III," 2012-2017

**Rossetti, Manuel**, and Harry Pierson, National Science Foundation, Red River Army Depot, \$60,000, "Phase III Red River Depot," 2014-2015

**Rossetti, Manuel**, National Science Foundation, I/UCRC Defense Logistics Agency, \$60,000, "Improve DLA Management Processes," 2014-2015

**Rossetti, Manuel**, National Science Foundation, I/UCRC Defense Logistics Agency, \$60,000, "DLA 2015-2016," 2015-2016

**Rossetti, Manuel**, Ed Pohl, and Shengfan Zhang, Covidien, \$60,000, "CELDi - A Decision Support Tool for Continuous Replenishment Program Analysis," 2015-2016

**Rossetti, Manuel**, and Shengfan Zhang, Medtronic, \$60,000, "Multi-Stop and Load Building Optimization Models," 2016

**Rossetti, Manuel**, Kim Needy, Carol Gattis, and Ed Clausen, National Science Foundation, \$597,316, "Student Integrated Intern Research Experience (SIIRE) a Pathway to Graduate Studies," 2012-2017

**Sullivan, Kelly**, U.S. Department of Health & Human/CELDi, \$36,363, "Assessing Distribution System Performance & Design Alternatives," 2014-2015

**Sullivan, Kelly**, US Department of Transportation, \$154,383, "Efficient Dredging Strategies for Improving Transportation Infrastructure," 2014-2016

**Zhang, Shengfan**, and Ed Pohl, U of A Medical Sciences, \$60,000, "Initiation of Telemedicine-Based Collaborative Care at the Psychiatric Research Institute," 2014-2015

**Zhang, Shengfan**, Arkansas Department of Higher Education, \$2,750, "A Decision Support Tool for Open-Access Scheduling to Reduce Patient No Shows," 2015

**Zhang, Shengfan**, and Chase Rainwater, CELDi CDP, \$46,115, "Development of Logistics Risk Assessment Tool," 2015-2016

**Zhang, Shengfan**, and Heather Nachtmann, US Department of Transportation, \$221,745, "Dynamic Decision Modeling for Inland Waterway Disruptions," 2014-2016

# New Faculty

## Joseph Geunes, Ph.D.

Professor, John and Mary Lib White  
Systems Integration Chair

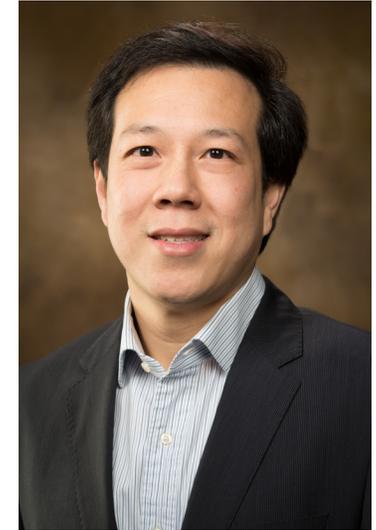
Joseph Geunes is an active researcher in the area of production and logistics planning, supply chain management, and operations research. He received his Ph.D. in 1999 from Penn State, and was designated as a Fellow of the Institute of Industrial & System Engineers in 2015. He has co-authored more than 55 scholarly articles published in peer-reviewed journals including *Operations Research*, *Mathematical Programming*, *Manufacturing & Service Operations Management (M&SOM)*, *Naval Research Logistics*, and *IIE Transactions*. In addition, he has co-edited four books, authored two books, and is currently a Department Editor for *IIE Transactions* and Area Editor for *Omega*.



## W. Art Chaovalitwongse, Ph.D.

Professor, 21st Century Research  
Leadership Chair

Wanpracha Art Chaovalitwongse received his M.S. and Ph.D. in Industrial & Systems Engineering from the University of Florida in 2000 and 2003 and B.E. in Telecommunication Engineering from King Mongkut Institute of Technology at Ladkrabang, Bangkok, Thailand. His research group conducts extensive Analytics research, ranging from basic computational science/statistics, applied mathematical modeling, and translational research at the interface of engineering, medicine, and other emerging disciplines. He holds three patents of novel optimization techniques adopted in the development of seizure prediction system. He is a recipient of the 2006 NSF CAREER Award and serves as the President of the Association of Thai Professionals in America and Canada (ATPAC).



# Faculty & Staff Achievements and Service

Richard Cassady, professor of industrial engineering and Director of the Freshman Engineering Program in the College of Engineering, was recently awarded the Albert G. Holzman Distinguished Educator Award by the Institute for Industrial and Systems Engineering at the annual conference in Anaheim, California. The award recognizes educators who contribute significantly to the profession through teaching, research and publication, extension, innovation or administration. Additionally, he received the Annual Alan O. Plait Tutorial Excellence Award at the Annual Reliability and Maintainability Symposium in January 2016.



was among the top 15 funded researchers in the university; and she ranks among the nation's top industrial engineering faculty members in terms of external research funding support. Her extraordinary service to the profession includes service to ASEE and ASEM, as well as IISE. Nachtmann was also elected by the American Society for Engineering Management to a four year position which rotates from secretary, president-elect, president to past-president. Additionally she was recognized as the Department's Outstanding Researcher for 2015-2016.



Ashlea Bennett Milburn, assistant professor, received the IISE Teaching Excellence Award in Transportation and Logistics, at the IISE conference in May 2016. Furthermore, she is recipient of an NSF CAREER award grant of \$500,000, for her research to develop decision-support models that identify scenarios in which the integration of information posted to social-media could improve emergency response. The students

also selected her to receive both the Outstanding Teacher Award and the Outstanding Faculty Advisor Award at the Annual Student Awards Banquet in spring 2016. The Arkansas Academy of Industrial Engineering, our alumni group, selected Milburn as the Faculty Member of the Year in spring 2016. She was also the recipient of the Outstanding Teacher Award from the Department.

Heather Nachtmann, professor and Associate Dean for Research, was recognized with the title of fellow at the Institute for Industrial and Systems Engineering Annual Conference and Expo (IISE), in May 2016. She was also selected as SEC Academic Leadership Development Fellow in September 2015. For the past two years, she



Harry Pierson, assistant professor, was among seven United States representatives recently invited to present research at the 11th Sino-American Technology & Engineering Conference on Smart Robotics, in city of Shenyang, Liaoning province, on May 16. Pierson was also the recipient of the student-sponsored "Backbreaker" Award from the students at the Annual Student Awards Banquet in spring 2016.

Ed Pohl, head of the industrial engineering department, was elected to a three-year term serving as the south central regional director for the American Society for Engineering Management. He was also recognized as a Fellow by the Society of Reliability Engineers. Fellow status is the highest honor of the society and recipients must have contributed to and attained distinction in reliability-related disciplines.



He was awarded Diplomate Status in the Society for Health Systems in February 2016. Diplomate status in the society is awarded to recognize professional members for their contributions to the Society for Health Systems and to the healthcare industry.

Pohl was also the recipient of the 2016 John L. Imhoff Global Excellence Award. The award was presented at the American Society for Engineering

Education (ASEE) Annual Conference and Exposition in New Orleans, Louisiana.



Letitia M. Pohl, clinical assistant professor of industrial engineering, was awarded a Certificate of Merit for Faculty Academic Advising from the National Academic Advising Association, or NACADA. Established in 1983, the NACADA Annual Awards Program for Academic Advising honors individuals and institutions making significant contributions to the improvement of academic advising. In addition to this honor, Pohl was

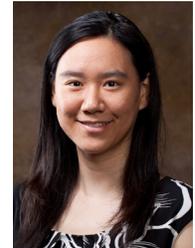
also recently one of two recipients of the 2016-2017 Outstanding Advisor Award from the University of Arkansas Academic Advising Council. In addition to advising all undergraduate industrial engineering majors, she teaches five courses throughout the academic year and serves as the Accreditation Board for Engineering and Technology (ABET) coordinator for the Department of Industrial Engineering.

Kelly Sullivan, assistant professor of industrial engineering, has been selected for the Glover-Klingman Prize for his paper "Exact algorithms for solving a Euclidean maximum flow network interdiction problem" published in the journal *Networks*. His research interests center on the design of critical systems whose disruption poses a threat to homeland security. His work focuses on advancing relevant knowledge in the areas of network optimization, interdiction, reliability, and integer programming.



John A. White Jr., Chancellor Emeritus and Distinguished Professor of industrial engineering, was honored with the Marvin H. Agee Distinguished Alumni Award from Virginia Polytechnic Institute and State University. The award is the highest honor bestowed by the department and is named in honor of the late Professor Agee. White is the thirteenth recipient of the award.

Shengfan Zhang, assistant professor, was the recipient of the Department's Outstanding Service to Students Award in the spring of 2016.



Staff members, Emily Nichols and Carrie Pennington were recognized at the annual Arkansas Academy of Industrial Engineering Banquet and Induction. Nichols received the AAIE Outstanding Administrative Staff Member of the Year, and Pennington was the recipient of the Outstanding Support Staff Member of the Year. Additionally, Pennington

was the University of Arkansas Employee of the Quarter in February 2016, College of Engineering Outstanding Staff Member of the Semester and Year, and a nominee for Arkansas State Employee Association Employee of the Year. This nomination resulted in her receiving the designation of Outstanding State Employee.



# Publications

In 2015 the faculty of the Department of Industrial Engineering at the University of Arkansas contributed one book, four book chapters, 22 refereed journal articles, 13 refereed conference proceeding and other refereed publications, 37 lectures and more than 70 contributed papers and presentations. The faculty authors are indicated in bold.

## Books

**Rossetti, M.D.**, *Simulation Modeling and Arena*, 2nd Edition: John Wiley & Sons, New York, NY 2015.

## Book Chapters

**Liao, H.T.** and Guo. H.R., "Reliability Modeling and Sequential Repairs for Systems Considering Aging and Repair Effects." Chapter 10, pg. 157-174, *Through-life Engineering Services: Motivation, Theory and Practice*, 3rd Edition, Edited by Redding, L. and Roy, R., Springer International Publishing, Antigua, United Kingdom, 2015.

**Nachtmann, Heather**, "Estimating Cash Flows." *The Economic Analysis of Industrial Projects*, 3rd Edition, Oxford University Press, New York, New York, 2015.

**Parnell, G.**, "Decision Analysis." *The Engineering Management Handbook*, 2nd Edition, Marino, D. N. & Farr, J. V., Editors, American Society of Engineering Management, forthcoming.

**Parnell, G.** and B. Ezell, "Organizational Decision Processes." *Improving Homeland Security Decisions*, A. Abbas, M. Tambe & D.von Winterfeldt, Editors, forthcoming.

## Refereed Journal Articles

K. Schneider, **C.R. Cassady**, "Comparison of Alternative Fleet-Level Selective Maintenance Models." *Reliability Engineering & System Safety*, Vol. 134 (2015): 178-187

**Chimka, J.**, "A note on the beta distribution of lot percent defective." *Economic Quality Control*, Vol. 30, No. 2 (2015):111-113

**Chimka, J.**, "Regression-based monitors of North American border-crossing activity." *International Journal of Society Systems Science*, Vol. 7, No. 4 (2015): 368-373

Cook and **J. Chimka**, "Gender and self-selection among engineering students." *International Journal of Quality Assurance in Engineering &*

*Technology Education*, Vol. 4, No. 1 (2015): 14-21

Do, **J. Chimka** and Fairey, "An improved disinfectant protocol for indirectly assessing organic precursor concentrations of THM and DHAN," *Environmental Science & Technology*, Vol. 49, No. 16 (2015): 14-21

Zhang, Y. and **H. T. Liao**, "Analysis of Destructive Degradation Tests for a Product with Random Degradation Initiation Time," *IEEE Transactions on Reliability*, Vol. 64, No.1 (2015): 516-527

Liu, D., W. Xie, **H.T. Liao**, and Y. Peng, "An Integrated Probabilistic Approach to Lithium-ion Battery Remaining Useful Life Estimation," *IEEE Transactions on Instrumentation & Measurement*, Vol. 64, No. 1 (2015): 660-670

Liu, D., J. Zhou, **H.T. Liao**, Y. Peng, and X. Peng, "A Health Indicator Extraction and Optimization Framework for Lithium-ion Battery Degradation Modeling and Prognostics," *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, Vol. 45, No. 6 (2015): 915-928

Li, R., J. Wang, **H.T. Liao**, and N. Huang, "A New Method for Reliability Allocation of Avionics Connected via an Airborne Network," *Journal of Network and Computer Applications*, Vol. 48 (2015): 14-21

Kirac, E., **A.B. Milburn**, C.L. Wardell, "The traveling salesman problem with imperfect information with application in disaster relief tour planning," *IIE Transactions*, Vol. 47, No. 8 (2015): 783-799

**Nachtmann, Heather**, Terry Collins, Justin R. Chimka & Jingjing Tong, "Development of a balanced scorecard for flight line maintenance activities," *Journal of Quality in Maintenance Engineering*, Vol. 21, No. 4 (2015): 436-455

Tong, Jingjing, **Heather Nachtmann** and Edward A. Pohl, "Value-Focused Assessment of Cargo Value Decreasing Rate," *Engineering Management Journal*, Vol. 27 (2015): 73-85

Neuman, Y., T.C.L. Alves, K.D. Walsh, and **K. L. Needy**, "A quantitative analysis of supplier quality surveillance practices in EPC projects," *Journal of Construction Engineering and Management*, Vol. 141, No. 11 (Nov. 2015)

Claypool, E., B.A. Norman and **K.L. Needy**, "Design for supply chain: An analysis of key risk factors," *Industrial Engineering & Management*, Vol. 4, No. 1 (2015)

AlMaian, R.Y., **K.L. Needy**, K.D. Walsh and T.C.L. Alves, "Supplier quality management inside and outside the construction industry," *Engineering*

*Management Journal*, Vol. 27, No. 1 (2015): 11-22

Kannon, T.E., **S.G. Nurre**, B.J. Lunday, and R.R. Hill, "The aircraft routing problem with refueling," *Optimization Letters*, Vol. 9 (2015): 1609-1624

Hilliard, H., **G. Parnell** and Edward A. Pohl, "Evaluating the Effectiveness of the Global Nuclear Detection Architecture Using Multiobjective Decision Analysis," *Journal of Systems Engineering*, Vol. 18, No. 5 (2015): 441-452

Medal, H., **Edward A. Pohl**, and M. Rossetti, "Allocating Protection Resources to Facilities When the Effect of Protection is Uncertain," *IIE Transactions-Online*: 04 Sep 2015

Wu, D., **M. D. Rossetti** and J. Tepper, "Possibility of Inventory Pooling in China's Public Hospital and Appraisal about its Performance," *Applied Mathematical Modeling*, Vol. 39, No. 23-24 (2015): 7277-7290

**Sullivan, K.M.**, D.T. Abdul-Malak, J.P. Kharoufeh and R.O. Baldwin, "Optimally Locating Application Virtualization Resources on a Network," *Military Operations Research*, Vol. 20 (2015): 5-20

Madadi, M., **Shengfan Zhang** and L.M. Henderson, "Evaluation of Breast Cancer Mammography Screening Policies," *European Journal of Operational Research*, Vol. 247, No. 2 (2015): 630-640

### Refereed Conference Proceedings and Other Refereed Publications

Schneider, K. and **C.R. Cassady**, "An Introduction to Probabilistic Methods in Reliability and Maintainability," 61st Annual Reliability and Maintainability Symposium (RAMS), Palm Harbor, Florida, January, 2015.

Zhang, Y., **H.T. Liao** and Y. Hong, "Planning Accelerated Destructive Degradation Tests with Initiation Time," 61st Annual Reliability and Maintainability Symposium (RAMS), Palm Harbor, Florida, January, 2015.

Liu, X., R. Li, R. and **H.T. Liao**, "Maximizing the Lifetime of Heterogeneous Wireless Sensor Networks," 61st Annual Reliability and Maintainability Symposium (RAMS), Palm Harbor, Florida, January, 2015.

Jin, T.D., W. Xie, **H.T. Liao** and W. Otieno, "System Availability under Redundancy Sharing of Standby Components," 61st Annual Reliability and Maintainability Symposium (RAMS), Palm Harbor, Florida, January, 2015.

Delgado Hidalgo, Liliana, **Heather Nachtmann**, and Jingjing Tong, "Analytic Hierarchy Approach to Inland Waterway Cargo Prioritization and Terminal Allocation," American Society for Engineering Management Conference Proceedings, Indianapolis, Indiana, October, 2015.

Cilli, M., **G. Parnell**, R. Cloutier and T. Zighd, "A System Engineering Perspective on the Revised Defense Acquisition System," Systems Engineering, 2015.

**Parnell, G.**, R. Butler, S. Wichmann, M. Tedeschi and D. Merritt, "Air Force Cyberspace Investment Analysis," Decision Analysis, 2015

**Pohl, E.**, and T. Yeung, "An Introduction to Optimization Methods in Reliability and Maintainability," *IEEE Tutorial Notes*, 61st Reliability and Maintainability Symposium, Palm Harbor, FL, January 2015.

Cozier, A., K. Harned, M. Riley, B. Raabe, A. Sommers and **H. Pierson**, "Additive Manufacturing in the Design of an Engine Air Particle Separator," Proceedings of the ASME 2015 International Mechanical Engineering Congress, Houston, Texas, November 2015.

★ **Pohl, Letitia M.** and Shelly Walters, "Instructional Videos in an Online Engineering Economics Course," American Society for Engineering Education, Seattle, Washington, June, 2015.

**Rossetti, M. D.** and Ahn Pham, "Simulation Modeling of Customer Checkout Configurations," Proceedings of the 2015 Winter Simulation Conference, Institute of Electrical and Electronics Engineers, Inc., L. Yilmaz, W. K. V. Chan, I. Moon, T. M. K. Roeder, C. Macal, and M. Rossetti, eds., Piscataway, New Jersey, 2015.

Sheikhzadeh, A. and **M.D. Rossetti**, "Segmentation Methods for Large-Scale Multi-Echelon Service Parts Logistics Systems," Industrial and Systems Engineering Research Conference (ISERC) - S. Cetinkaya and J. K. Ryan, eds., Nashville, Tennessee, May 30-June 2, 2015.

★ Tutam, Mahmut and **John A. White**, "A Conventional Warehouse Design with Multiple Docks," Industrial and Systems Engineering Research Conference (ISERC), Nashville, Tennessee, May 30-June 2 2015.

Dollar, E., and **Shengfan Zhang**, "Exploring Hospitalization Characteristics for Heart Disease Patients With Diabetes," Industrial and Systems Engineering Research Conference (ISERC), Nashville, Tennessee, May 30 June 2, 2015.

★ Indicates Best Paper Award

# Alumni Highlights

The Department benefits from continued support and interaction with our distinguished alumni group the Arkansas Academy of Industrial Engineering (AAIE) whose leadership sponsors endeavors to aid in student academic success and enhance student preparedness such as the A4U program (Academy Focused on Recruitment/Retention/Readiness of Undergraduates), the Global Studies Endowment program, and Mock Interview initiative.

The Academy has an active membership of 184 alumni. Inductees are distinguished graduates and are selected for sustained and outstanding contributions to the industrial engineering profession.

## College of Engineering Annual Awards

The College of Engineering recognizes outstanding alumni annually. The awards honor College of Engineering graduates who have provided leadership in their communities and achieved distinction in their fields of endeavor. From the Department of Industrial Engineering the following awards were presented.

Receiving the Hall of Fame Award, was alumnus David Foust. Foust received his BSIE in 1964, after graduation, he accepted full time employment with Natural Gas Pipeline Company of America (NGPL). At NGPL he oversaw the installation of reciprocating engines, turbine engines, and underground storage of natural gas. He also spent two years with the US Army Corps of Engineers, which included a tour of duty in Vietnam.



He then joined General Electric in Somerset, Kentucky, where he worked in the lamp division and had assignments in thirteen glass and lamp plants, leading to plant superintendent.

In 1975, Bekaert Corporation recruited Foust to help locate and start operations in Van Buren, Arkansas. He was elected vice president and general manager, North America. After which he relocated from Van Buren to Atlanta, Georgia where he established the Bekaert USA headquarters and remained there until retirement in 1996.

The Distinguished Alumni Award was presented to David Humphrey, BSIE 1982 and MSIE 1983. Humphrey currently serves as the vice president of investor relations at ArcBest Corporation. He is one of the longest tenured IR executives in the transportation industry.



He began his career with ArcBest in the economic analysis department, and moved to investor relations in 1998.

Humphrey was a member of the ABF Freight System Malcolm Baldrige Submission Team in 1992, and is a member of the National Investor Relations Institute. In 2009, he received honorable mention for the Best Investor Relations Officer award from IR Magazine.

Kevin Oden, BSIE 2007 received the Early Career Alumni Award. Oden has been featured in Fortune 500, Harvard Business Review Today, and the 8th & Walton Sustainability Special Program. He co-founded a company, cycleWood Solutions, while working on his MBA. Today, he has formed ImPro Advisors to focus on value based consulting.



At the U of A, Oden serves on the College of Engineering Early Career Alumni Council, the Walton College's Alumni Board, and as a mentor for entrepreneurship classes.

## Other Awards of Note

- Bill Harrison (BSIE 1966) received the Andrew T. Boggs Service Award from ASHRAE. The award recognizes an Exceptional Service Award recipient for continuing unselfish, dedicated and distinguished service. Harrison was one of 94 recognized by ASHRAE for their contributions to the Society and the built-environment industry at the Society's 2015 Annual Conference.
- John L. Ballard, former associate dean in the College of Engineering at the University of Nebraska - Lincoln, and emeritus professor of industrial and management systems engineering at UNL, received the James O'Hanlon Academic Leader Award. The O'Hanlon honor recognizes a campus leader who has demonstrated exceptional abilities to lead, serve, inspire and collaborate on the academic goals of the university. It is named in honor of James O'Hanlon, who has effectively served University of Nebraska - Lincoln in multiple academic positions.
- Kevin McManus (BSIE 1990) was recognized with the title of fellow at the Institute of Industrial & Systems Engineers Annual Conference and Expo (IISE).
- Larry Stephens, Chairman of the Board of Mid-South Engineering in Hot Springs, was awarded Engineer of the Year by the Arkansas Society of Professional Engineers. Stephens graduated from the University of Arkansas Industrial Engineering Department in 1958. He went on to earn his PE designation and has distinguished himself in his career.
- Bryan Hill (BSIE 2003, MSIE 2007) received the UA Graduate School and International Education's Sponsored Student Programs Appreciation Award.

# Liaison Committee

The Arkansas Academy of Industrial Engineering (AAIE) was founded in 1986 to recognize the achievements of University of Arkansas Industrial Engineering graduates and to provide continuing guidance and support to the Department of Industrial Engineering. The Academy also provides its members with the opportunity to nurture the organization that played an important role in their professional growth and development. Academy members provide tremendous financial resources that endow many scholarships for the Industrial Engineering students.



The AAIE organizes a Liaison Committee that serves as our advisory board and meets annually to evaluate the department. The committee is comprised of accomplished professionals from academia, business and industry who bring both an applied perspective and an independent assessment to the industrial engineering program at the University of Arkansas.

It is the opinion of this year's Liaison Committee that overall, the Industrial Engineering Department continues to be extremely successful in delivering its mission. Across the board, student, faculty and staff successes over the past year are a testament to this. Departmental leadership remains strong and committed to continuous improvement.

Recent members of the Liaison Committee include:

- **G. Kent Burnett**, Senior Vice President of IT at Dillard's.
- **Ken Gaines**, President and CEO of The Steco Corporation in Little Rock, AR.
- **Mike Gross**, FACHE, Administrator at Mt. Carmel Community in Rogers, Arkansas.
- **Sunderesh S. Heragu**, Professor and Head of the School of Industrial Engineering and Management at Oklahoma State University
- **David Humphrey**, Vice President of Investor Relations for ArcBest Corporation in Fort Smith, AR.
- **Angela Kuli**, Owner, AHK Consulting
- **J. Cole Smith**, Professor and Chair of the Industrial Engineering department at Clemson University.
- **Gary Whicker**, Senior Vice President of Engineering and Enterprise Services at J.B. Hunt Transport Services, Inc.
- **Rick Wilkinson**, Vice President, Engineering & Logistics Services for the Dollar Tree | Family Dollar organization.



*Back: Ken Gaines, Rick Wilkinson, Angela Kuli, David Humphrey, Mike Gross,  
Front: Dr. J. Cole Smith, Dr. Sunderesh Heragu and Dr. Ed Pohl*

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Kim LaScola Needy ..... <a href="mailto:kneedy@uark.edu">kneedy@uark.edu</a> ..... (479) 575-7762	Shengfan Zhang ..... <a href="mailto:shengfan@uark.edu">shengfan@uark.edu</a> ..... (479) 575-3571



2

**ENDOWED PROFESSORSHIPS**

James M. Hefley and Marie G. Hefley Professorship in Logistics and Entrepreneurship

Twenty-First Century Professorship in Engineering

1950

The year the IE PROGRAM began at the U of A.

8 FACULTY FELLOWS

Institute of Industrial and Systems Engineers

2

**FACULTY FELLOWS**

American Society for Engineering Management

American Society for Engineering Education

Institute for Operations Research and Management Sciences

Society of Reliability Engineers

33%

of IE Faculty Members are Female

83%

Career Placement

18%

of IE students are minority

9

FACULTY FELLOWS in Societies

Alumni 2,018

Alumni who give 24%

**ENDOWED CHAIRS**

3

John and Mary Lib White Systems Integration Chair in Industrial Engineering

John L. Imhoff Chair in Industrial Engineering

21st Century Research Leadership Chair

**NATIONAL ACADEMY of ENGINEERING MEMBER**

1

John A. White was elected in 1987. Membership is one of the highest professional honors accorded an engineer.

**FACULTY FELLOW**

1

International Council on Systems Engineering

Society for Decision Professionals

Lean Systems Society

Military Operations Research Society



Enrollment



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