

EXEMPLAR



WAYNE STATE
College of Engineering

TRANSFORMING OUR WORLD THROUGH CONNECTIVITY



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GREETINGS FROM THE DEAN



Dear alumni and friends,

We live in a time of unprecedented connectivity. Sensors and wireless communication technology are more sophisticated than ever, the internet's reach extends far beyond our computers and phones, and our infrastructure is on the cusp of a significant overhaul. The concept of a "smart city" is much more reality than theory.

As our hometown of Detroit reimagines itself as a re-emergent, high-tech global marketplace, it is incumbent upon us in the Wayne State University College of Engineering to deliver solutions that ensure convenience, safety and efficiency at every turn — not only for the Motor City but for people around the world.

People and things become more integrated every day, inspiring a new way of thinking. That is why I am delighted to present this edition of Exemplar, as I believe it showcases our innovative and proactive approach to connectivity and mobility. As you will see, our work intersects transportation, health care, water, energy and many other sectors. The value of this integrative field will also result in the hiring of six new faculty across multiple engineering departments in the coming months.

But while we invest resources in this nascent domain, by no means have we abandoned the core competencies that have made us a key educational and research institution for nearly 85 years. We continue to impact in areas of advanced manufacturing, bioengineering, data analytics and so much more.

Our enrollment has more than doubled since 2010, including a 7 percent increase this year at the undergraduate level and a 9 percent upturn for female students. The entrepreneurial spirit of our college is well nurtured by the James and Patricia Anderson Engineering Ventures Institute, which provides critical assets and guidance to faculty and staff looking to take their innovations to the next level. We continue to find new ways to impact our community, from the 3,000 boys and girls who participated in various camps to the middle and high school students who visited campus for events like HackWSU and FutureSWE.

I hope you enjoy this edition of Exemplar and I encourage you to come visit us here in Midtown Detroit. We are proud of the resilience of our city, the drive of our students, the leadership of our faculty and the strength of our university.

Sincerely,

A handwritten signature in black ink, appearing to read 'Farshad Fotouhi'. The signature is fluid and cursive, written over a white background.

Dean Farshad Fotouhi



THE CONCEPT OF SMART AND CONNECTED COMMUNITIES IS INSPIRING NEW IDEAS IN THE WAYNE STATE UNIVERSITY COLLEGE OF ENGINEERING.

Unprecedented levels of connectivity will result in the integration of information, communication and technology across numerous foundational areas such as transportation, energy and sustainability, industrial automation, advanced manufacturing, health care, and public safety.

Gartner Inc. estimates that 9.7 billion connected items will be used in smart cities by 2020, with smart homes and commercial buildings accounting for 81 percent of these products. Meanwhile, the United States is positioning itself to lead an effort that will deploy 21 million self-driving cars around the world by 2035, according to IHS Automotive.

Wayne State faculty members are rethinking engineering research and education to bring people, things and data together into the next generation of technology. They are experts in key elements of connectivity, including sensing, computing and networking, control and robotics, smart transportation, connected health, security, and data science.

The university's proficiency in the connectivity domain makes it well positioned to collaborate with industry and government as faculty and students work on solutions to deliver convenience, safety and efficiency in a more connected world.

FACULTY EXPERTS



LEELA ARAVA

*Assistant Professor,
Mechanical Engineering*



FENG LIN

*Professor, Electrical and
Computer Engineering*



CAISHENG WANG

*Associate Professor,
Electrical and Computer
Engineering*



AMAR BASU

*Associate Professor,
Electrical and Computer
Engineering*



CAROL MILLER

*Professor, Civil
and Environmental
Engineering*



LE YI WANG

*Professor, Electrical and
Computer Engineering*



MARK CHENG

*Associate Professor, Electrical
and Computer Engineering*



ABHILASH PANDYA

*Associate Professor,
Electrical and Computer
Engineering*



LIHAO XU

*Associate Professor,
Computer Science*



MING DONG

*Associate Professor,
Computer Science*



STEPHEN REMIAS

*Assistant Professor,
Civil and Environmental
Engineering*



YONG XU

*Professor, Electrical and
Computer Engineering*



NATHAN FISHER

*Associate Professor,
Computer Science*



ROBERT REYNOLDS

*Professor, Computer
Science*



FENGWEI ZHANG

*Assistant Professor,
Computer Science*



NARENDRA GOEL

Professor, Computer Science



ABUSAYEED SAIFULLAH

*Associate Professor,
Computer Science*



YONGLI ZHANG

*Assistant Professor, Civil
and Environmental
Engineering*



DANIEL GROSU

*Associate Professor,
Computer Science*



NABIL SARHAN

*Associate Professor,
Electrical and
Computer Engineering*



ZICHUN ZHONG

*Assistant Professor,
Computer Science*



JING HUA

Professor, Computer Science



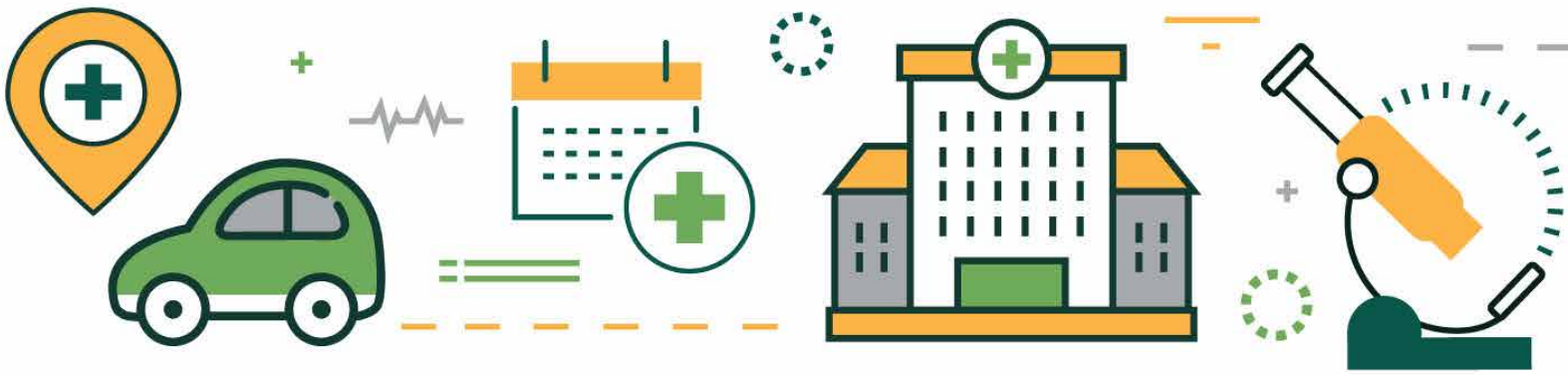
WEISONG SHI

*Professor,
Computer Science*



DONGXIAO ZHU

*Associate Professor,
Computer Science*



COMPUTER SCIENCE ASSOCIATE PROFESSOR MAKING AN IMPACT IN CONNECTED HEALTH



Wayne State University is a national leader in health disparities research and advocacy, with a mission to achieve health equity across diverse populations. Interdisciplinary research and collaborative partnerships ensure that Wayne State will make a measurable impact in communities not only in Detroit but around the world.

Among those in the College of Engineering focusing on health care challenges is Ming Dong, associate professor of computer science, who has contributed his expertise in connected health and informatics to three projects that totaled \$375,000 in funding over the last year.

In September 2016, Wayne State received notice of a nearly \$200,000 grant from the National Science Foundation that aims to address childhood obesity disparities, one of many challenges facing urban communities due to the increasing complexity of urban life, declining urban services, and growing health and economic disparities.

The grant, “Promoting a Healthier Urban Community: Prioritization of Risk Factors for the Prevention and Treatment of Pediatric Obesity,” aims to develop an innovative, data-driven health informatics system to promote comprehensive, efficient

and personalized obesity-related care for preschoolers living in urban communities.

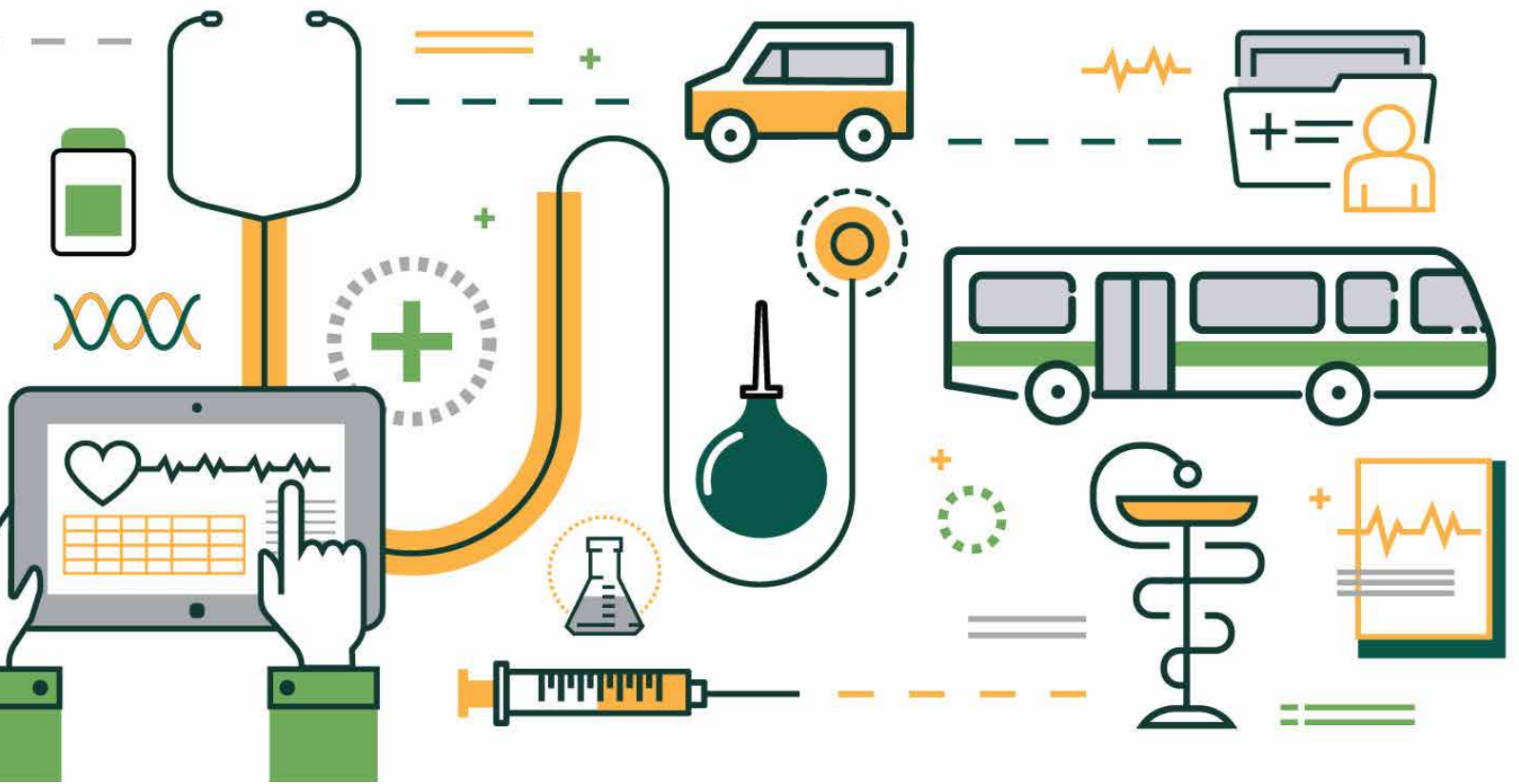
Dong believes the project has the potential to promote a healthier urban community.

“The Preschool Risk for Obesity Portal, or PROP, that we are developing will offer an innovative, multilevel, mixed-effects machine-learning method and scalable algorithms that can precisely identify and prioritize a preschooler’s personalized risk factors for obesity,” said Dong. “The data and tool-rich online system that we are designing offers novel algorithms for information extraction and understanding from multiscale, correlated and heterogeneous datasets.”

The system will offer an improved method to prevent and treat pediatric obesity through better data integration from multiple community sources and systems.

Dong is collaborating with Dongxiao Zhu, associate professor of computer science at Wayne State, and Elizabeth Towner, assistant professor of family medicine and public health sciences at Wayne State.

Dong and Towner also joined forces on a research team led by Rayman Mohamed, associate professor of urban studies and planning in the College of Liberal Arts and Sciences, on a project that received nearly \$100,000 from the Michigan Health



Endowment Fund in June 2017. The project, “BusMe: An e-health Platform to Reduce Pediatric Health Disparities by Improving Public Transportation Access in Detroit,” seeks to lessen disparities, particularly in children who miss medical appointments due to lack of personal transportation or access to information on public transportation in Detroit.

The shift to a technology-based culture further increases barriers for low-income families, as they are less likely to have access to public transportation schedules. Strategies to improve public transportation access to medical visits for children from low-income backgrounds are critical.

BusMe is an innovative software program that provides and texts information to parents about the most efficient bus routes from a family’s home to its child’s health care provider.

A third project won \$75,000 in the Epilepsy Therapy Project’s sixth annual Shark Tank Competition, held at the 2017 Antiepileptic Drug and Device Trials Conference in May. Dong was the co-principal investigator working with Maysaa Basha, associate professor of neurology in the School of Medicine and a neurologist at the WSU Adult Epilepsy Comprehensive Center, on a non-invasive seizure detection system in which sounds alert caregivers and loved ones that a patient is having a seizure.

“Our project can have immediate and direct impact on the quality of life for patients with epilepsy and their caregivers,” said Basha, who noted that the next steps in the project would include software development and clinical testing.

The project, “The Sound of Seizures: Audio-triggered seizure detection,” proposes a method of identifying and capturing seizure-specific sounds — such as ictal cries or grunting — in a monitoring unit. The goal is to reduce the risk for respiratory distress, physical injury or sudden death in epilepsy patients who experience frequent generalized tonic-clonic seizures.

“It is exciting to see that advanced acoustic signal processing and analysis technologies could be used to help with seizure detection and related patient care,” Dong said. “This is yet another step forward in smart and connected health research conducted in my lab, in which data-driven computing techniques are applied to address problems in the medical and health domains.”

A proprietary signal-processing software can be used to create an electronic signature for each sound type, which can be embedded into a smartphone app that triggers a notification alert for caregivers when a seizure occurs.

The goals of this system are to provide early care, limit injuries caused by seizures and help patients live more independently.

For more on Wayne State’s global impact in health disparities and other fields, visit wayne.edu/action.



LEFT TO RIGHT: Weisong Shi, professor of computer science; Brandon Weidner, paramedic; Dr. Robert Dunne, EMS director at St. John Hospital and Medical Center; Xiaopei Wu, postdoctoral fellow

STREMS: A REAL-TIME SOLUTION TO CHALLENGES IN PRE-HOSPITAL MEDICAL CARE

Emergency medical service (EMS) systems are critical public services that provide a level of out-of-hospital care that can often mean the difference between life and death for a patient. Over time, the role of EMS has evolved from basic life support and patient stabilization to a more robust level of care including drug administration and complex medical procedures.

However, despite this evolution of pre-hospital care, the development of resources that could enhance care quality, patient satisfaction and outcomes has not kept pace.

“Currently, the EMS system is undergoing transformation into a system more integrated with health care as a whole,” said Xiaopei Wu, a postdoctoral fellow working with Professor Weisong Shi. “Unfortunately, the technologies and techniques widely used by most EMS agencies might delay such transformation, as they still depend on the traditional and less-efficient EMS solutions used in the 1990s.”

This need for advancement inspired Wu and a research team in the Wayne State

Department of Computer Science to develop STREMS, a smart, real-time, pre-hospital EMS communication system.

The team identified limitations in the EMS structure, including an antiquated radio system and a shortage of advanced life support ambulance units. STREMS leverages integrated wearable sensing as well as video technology to enhance the level of care as well as communication with emergency rooms.

According to Wu, STREMS is designed to support multidimensional data monitoring for an ambulance operating at a basic life support level. A cloud-based data sharing platform enables automated streaming of all gathered information, including vital signs, EKG, and information about an accident scene, to provide a more complete picture about an incoming patient.

“This can significantly decrease the handoff time and improve the efficiency at the hospital,” said Wu.

STREMS also supports video-based EMS telemedicine that can build live video conversations between EMS providers

and ER physicians for consultation on early medical examinations and treatment options.

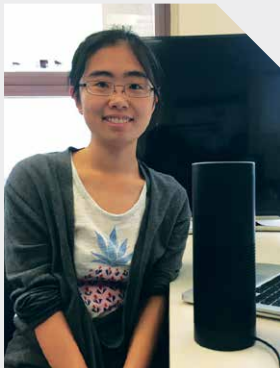


Partnering with the Detroit Fire Department — which has 25 ambulances, including nine equipped for advanced life support — the team implemented STREMS as an Android mobile app and conducted feasibility testing. The system delivered 100 percent of emergency data to the hospital in real time but presented challenges in video transmission in the downtown areas and at speeds of more than 40 miles per hour.

With encouraging results, Wu and her team have an optimistic view toward the development of real-time solutions for more efficient and connected medical care.



INTRODUCING SOFIE: A SMART OPERATING SYSTEM FOR INTERNET OF EVERYTHING



The rise of the Internet of Everything (IoE) is rapidly changing computing, and as the connected things in our world become more of necessities than luxuries, the process of simplifying how people can manage this level of connectivity is important.

Conventional operating systems may not be sufficient to manage the large number of “things” embedded in future smart homes. A research

team including two Ph.D. students working in the lab of Weisong Shi, professor of computer science, is developing a project called Sofie, an acronym for smart operating system for the Internet of Everything.

Lanyu Xu, a graduate research assistant in computer science, believes that Sofie is better suited for the dynamic architecture of the IoE system. Unlike personal computers, smartphones, and cloud-based systems — which often operate in a fixed environment and use data passively — Sofie is both data-oriented and things-oriented.

“Sofie is sitting between devices and services – as both a service provider of the upper layer and a hardware manager for underlying devices – to provide high-quality data through well-performed things,” said Xu.

Sofie is capable of managing the configuration and maintenance of smart devices, including registration and requests to replace ill-performing devices. It can receive a “heartbeat” at regular intervals to ensure that devices are properly connected, and can initiate processes to remedy operational issues.

It also ensures data quality, storage and access. Sofie can use historical records to detect abnormal data and ensure system security. It records device information and event history, and stores file paths — information which is particularly useful for systems that include cameras.

The research team built Sofie on top of the architecture of Home Assistant and demonstrated how Sofie would function in a smart home environment. The system employs a multi-layer design that includes a communications adapter responsible for sending commands to devices and collecting raw data; an event hub, which captures system events and sends instructions to lower levels based on machine learning through communication with the Self-Learning Engine; and a name management layer that helps keep the system devices organized.

“The design of Sofie is quite flexible to accommodate multiple functionality,” said Xu, who also noted that the system will also have audio-based functions similar to products like Amazon Echo.

As IoE becomes more pervasive and edge computing presents greater challenges, concepts such as Sofie could represent a significant transformation from traditional operating systems.



WAYNE STATE RESEARCH TEAM AWARDED FOR STUDY ON VEHICLE PLATOON CONTROL

Recognizing that highway autonomous vehicle control is a critical component of developing smart transportation systems, a research team led by Le Yi Wang, professor of electrical and computer engineering, examined some of the challenges associated with longitudinal platoon formation.

“Platoon formation has been identified as one promising strategy for enhanced safety, improved highway utility, increased fuel economy, and reduced emission toward autonomous or semiautonomous vehicle control,” said Wang. “The goal of longitudinal platoon control is to ensure that all the vehicles move in the same lane at the same speed with desired inter-vehicle distances.”

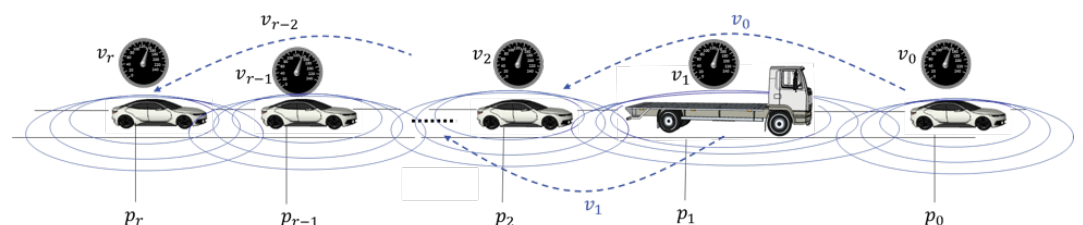
According to Wang, the primary challenges of platoon control include robustness against variations in road conditions, reliability under sensor and communication errors and interruptions, safety and smooth operation when vehicles merge into and depart from a platoon, and team coordination for optimal highway resource usage and fuel economy.

Wang’s collaborators include George Yin, professor of mathematics; Abhilash Pandya, associate professor of electrical and computer engineering; former WSU faculty member Hongwei Zhang; and Ali Syed who is a General Motors team leader on autonomous vehicles and completing his Ph.D. in electrical and computer engineering.

In a project titled “Control of Vehicle Platoons for Highway Safety and Efficient Utility: Consensus with Communications and Vehicle Dynamics,” Wang’s team presented a new method for coordinated control of platoons by using integrated network consensus decisions and vehicle control. The group used unique algorithms to establish a vehicle pattern and achieve global coordination of the entire platoon. The project was recognized with the 2016 Best Paper award from the *Journal of Systems Science and Complexity*.

The team has targeted advanced modeling, control, and communications techniques with their applications to platoon coordination in a joint research effort with other universities and with grant support from various organizations.

They received a cyber-physical systems grant from the National Science Foundation, a joint research grant with Tsinghua University in China on autonomous vehicles, and related grants on unmanned aerial vehicles from the Air Force office of Scientific Research and unmanned ground vehicles from the Army Research Office.





After nearly eight years of hard work, Professor of Electrical and Computer Engineering Nabil J. Sarhan had his patent approved for an automated video surveillance system to keep people safer.

“My main motivation is that I want to make a difference in people’s lives,” said Sarhan. “Science is very important in making changes, and this is the kind of science we do at Wayne State.”

Most large-scale security systems have multiple, constantly changing displays monitored by humans. It is possible to miss a crime due to distraction or the wrong display being shown on a camera. Sarhan’s system, which he and his team are now deploying in the College of Engineering, is monitored entirely by computers.

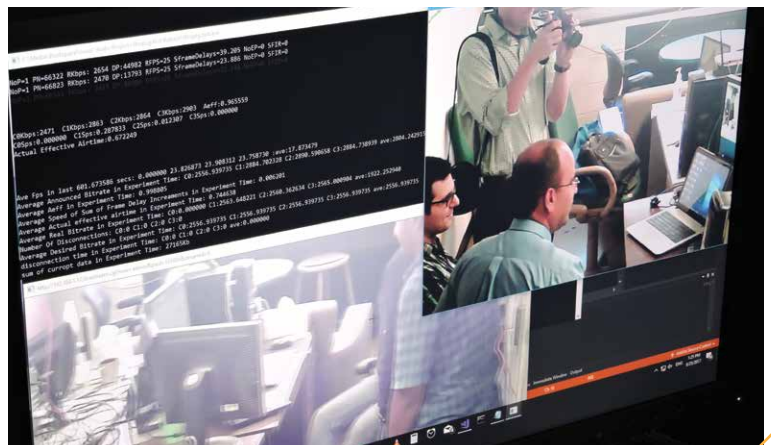
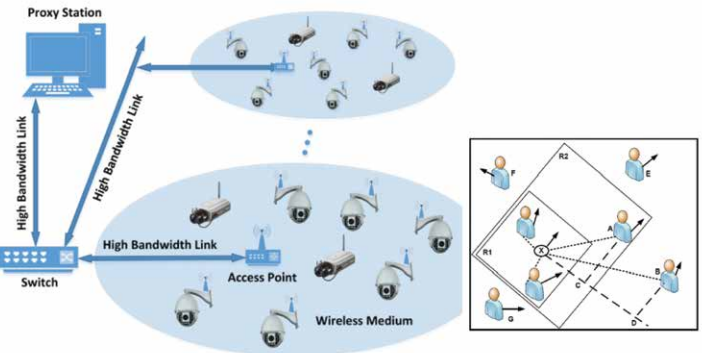
According to Sarhan, who in the project’s early stages received a \$290,000 National Science Foundation grant, many video surveillance systems are used to deter criminals and to view evidence after a crime. Sarhan’s patent works live; the system is constantly scanning for potential threats while allocating resources in such a way that optimizes the overall threat-detection accuracy.

The surveillance system uses technologies such as facial and license plate recognition to recognize threats using high-quality video that the computer will analyze. The system also allows for certain areas observed by the cameras to be placed at a higher level of importance. Major benefits include an increase in system coverage with a dramatically reduced cost due to lower bandwidth and energy needs.

“There are so many considerations that we take and then solve mathematically to get the video recordings in the best way possible,” said Sarhan. “It’s unique.”

Sarhan’s strategy for making security systems more efficient stemmed from his research in designing multimedia systems. He specializes in multimedia, computer systems and networks, and computer architecture.

“We’re applying a lot of similar principles to internet video streaming as we are to this security system, such as the idea of being smarter about how we use our resources,” Sarhan said. “To be using this knowledge for security systems, however, feels like a more worthwhile pursuit.”





**WAYNE STATE
ENGINEERING TEAM
TAKES GRAND PRIZE
AT ERIE HACK**



A research team mentored by Leela Arava, assistant professor of mechanical engineering at Wayne State, was the grand prize winner of Erie Hack, a data and engineering competition and accelerator program in which coders, developers, engineers and water experts create solutions to challenges facing the Lake Erie watershed.

With its “Micro Buoy” concept, the group won a \$40,000 cash prize and another \$10,000 worth of support services from the Cleveland Water Alliance at the Water Technology Innovation Summit in May.

“Micro Buoy is an aquatic sensor technology that helps assess water quality in real time using a combination of nanotechnology-based sensors, microbatteries and wireless communication,” said Arava, the principal investigator of technology for the team. “The challenge lies in incorporating all these intricate mechanisms into a working prototype.”

Erie Hack, sponsored by the Cleveland Water Alliance, is a months-long water innovation accelerator and competition focused on creating publicly accessible technology to elevate the value of clean water and foster the potential to invigorate environmental and economic vitality in the Great Lakes region.

The program provides participants ranging from high school students to professionals the opportunity to combine their own expertise with mentoring in order to construct data-driven solutions and pitch them to a panel of environmental, entrepreneurial and technological experts.

“Erie Hack is a great platform to disseminate laboratory research and meet with people of diverse research, technological and entrepreneurial background,” said Arava. “We are pleased to have had the opportunity to participate and showcase our skills.”

“We had been looking for an opportunity to transform years of our extensive research on nanomaterials and microbatteries into viable technology that can address critical water-related issues,” said Nirul Masurkar, a mechanical engineering graduate student at Wayne State and captain of the Micro Buoy team. Other members included Udaypraveen Tiruvalluri, Chad Gainor and Andrew Nassif.

The team advanced to Cleveland after winning the semifinal competition in April at TechTown Detroit. The local effort was designed and coordinated by TechTown in partnership with the Healthy Urban Waters program in Wayne State’s Department of Civil and Environmental Engineering, led by Professor Carol Miller.

Micro Buoy was one of four teams awarded in the Cleveland finals. Groups from the University of Buffalo, University of Akron and University of Michigan finished second through fourth, respectively.

For more information on Erie Hack, visit eriehack.io.



ITSWAYNE: A LIVING LAB TO DEFINE THE FUTURE OF TRANSPORTATION



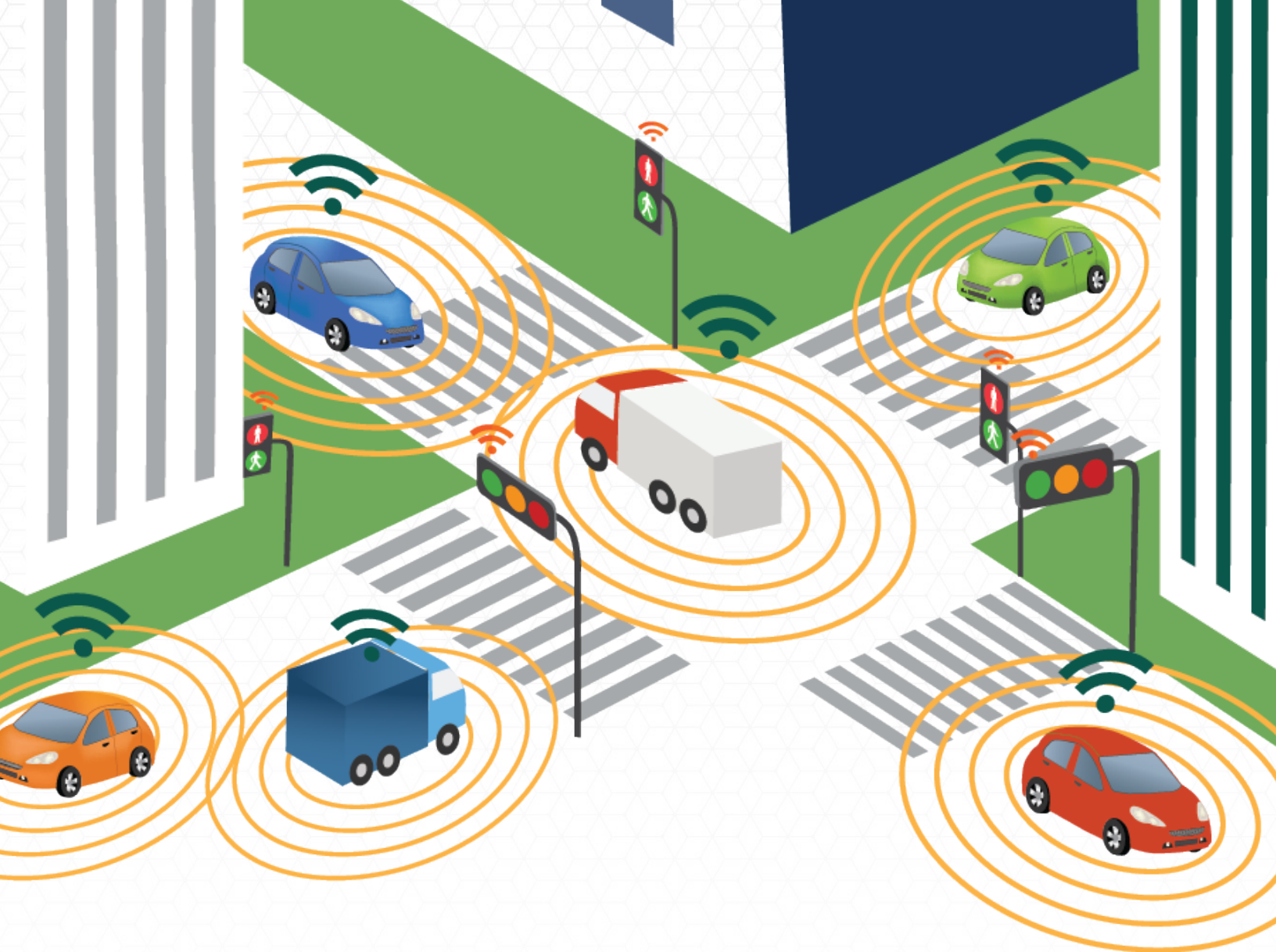
The emergence of connected and autonomous vehicles will not only come from the evolution of traditional transportation means, but from innovation in systems and infrastructure. As cars get smarter, so must the roadways on which they travel.

Funded by a 2015 Wayne State seed grant, Stephen Remias is leading a project called ITSWayne, which will allow his research team to collect data crucial to intelligent transportation systems (ITS). His vision is to create a testbed on campus that will use existing traffic detection methods to develop new technology for traffic engineering, performance measurement, network communications and public safety applications.

“This testbed will serve as a living lab for the students and faculty at Wayne State University, as well as researchers and engineers in the region,” said Remias, an assistant professor of civil and environmental engineering who worked with computer science faculty members Hongwei Zhang and Jing Hua to take a systematic approach to understanding the synergy between ITS and connected vehicles.

The research team is partnering with transportation engineers from the City of Detroit to begin this lab at the intersection of Warren Avenue and Anthony Wayne Drive, mere steps from Wayne State’s engineering building. They will deploy a variety of real-time traffic technology elements including cameras, magnetometers, microradar detectors, and LiDAR technology.

Development and testing of new detection products, wireless networks for automated transportation and communication between vehicles and



pedestrians, and a 4D vision system for smart transportation and public safety are among the many potential ways the testbed can be utilized.

“*The goal of this living lab is to provide the research community with an environment to move the state of practice forward,” said Remias. “We expect that the new technologies can make our roads and transit systems safer, greener and more efficient.”*

Remias acknowledges that there are flaws in existing approaches, including an over-reliance on offline or simulation-based data as well as slow or segregated research endeavors. He envisions ITSWayne as a way to cultivate an interdisciplinary and adaptive environment to support changes in technology and interaction between students and researchers across multiple engineering and scientific communities.

This particular intersection, which is undergoing reconstruction this fall, was deemed ideal not only because of its proximity to campus but also due to the traffic levels — accommodating more than 25,000 vehicles per day — high pedestrian volumes and bike lanes.

Collaborating with the City of Detroit will not only ease the logistical challenges of this project, but will provide the city with greater operational resources, performance and safety measures and guidelines for future installations as the goal is to grow the project from a single intersection.

“ITSWayne is the beginning of a greater effort at Wayne State to develop a connected campus and, even further, a connected city,” said Remias.

As the testbed is developed, the team expects to earn additional funding to widen the scope of the project and fill a void in current research that will allow Wayne State to be a leader in smart transportation infrastructure.



WAYNE STATE RECEIVES \$1.2 MILLION NSF GRANT TO DEVELOP AUTONOMOUS BATTERY OPERATING SYSTEM



The future of innovation will rely on effective, integrative battery operating systems that provide sustained and reliable power. Emerging technologies such as electric-drive vehicles and stationary energy storage systems will require improved battery systems.

Software-controlled battery management systems will play a crucial role in enabling continued innovation, but currently these systems face design challenges. These include decreasing capacity of batteries over time due to aging and the need for future battery management systems to include autonomous reasoning capabilities to make economically sound decisions, such as scheduling battery charging times in a personalized fashion.

Researchers at Wayne State University led by Nathan Fisher, associate professor of computer science in the College of Engineering, received a \$1.2 million grant from the National Science Foundation to address these issues.

The project, “Autonomous Battery Operating System: An Adaptive and Comprehensive Approach to Efficient, Safe and Secure Battery System Management,” aims to inject intelligence capabilities into battery management system design with the development of the Autonomous Battery Operating System (ABOS).

“ABOS will enable more energy-efficient, long-lasting and secure battery-driven systems,” said Fisher. “An ABOS will learn and adapt to user-initiated charging/discharging patterns, determine how these patterns affect a battery’s health, and respond to potential faults or attacks.”

Fisher and his team of researchers will develop a simulated electrical vehicle and will interact with an actual battery system so that researchers can study the effectiveness of ABOS in a realistic environment to test its ability to control a physical battery system. The simulation environment will evaluate the effectiveness of ABOS in predicting battery state and in minimizing cost of operation and handling failures and threats.

Collaborators from Wayne State University’s Department of Computer Science include Weisong Shi, Ph.D., professor; Daniel Grosu, Ph.D., associate professor; and Fengwei Zhang, Ph.D. The number for this National Science Foundation grant is 1724227.

WAYNE STATE UNIVERSITY'S COLLEGE OF ENGINEERING LAUNCHES NEW GRADUATE CERTIFICATE PROGRAM IN CYBER-PHYSICAL SYSTEMS

Last month, the Wayne State University Board of Governors approved the establishment of a graduate certificate program in cyber-physical systems (CPS) in the College of Engineering, effective this fall.

As the world gets “smarter” and more connected, Wayne State is demonstrating a commitment to innovation in connectivity and influence in transforming how people interact with and manipulate the physical world. This certificate program is the first of its kind in Michigan, focusing on mechanisms known as CPS, which are designed as a seamless network of physical components (also known as the Internet of Things) and computational algorithms instead of as standalone devices.

Research from College of Engineering faculty and input from industry partners will provide a framework for the program that is expected to provide project-based training using CPS principles and techniques to solve real-world challenges. The program will weave core scientific and engineering concepts with diversification options to give students a foundation in CPS for a wide range of domains such as transportation, water and energy, industrial automation, advanced manufacturing, health care and public safety.

After taking a required introductory course, students will take two intermediate-level courses and one advanced course, choosing from six different program tracks: sensing, computing and networking, control and robotics, smart transportation, smart grid, and smart health.

Students must hold an M.S. or Ph.D. in engineering or a related field, or be admitted into a graduate program in the College of Engineering to pursue a CPS graduate certificate. The college expects graduate students from all engineering departments to enroll.

“Given the transdisciplinary nature of CPS and the broad impact of CPS applications, it is essential for having a CPS education program to provide comprehensive education of the involved scientific and engineering fundamentals and to offer choices of the scope, depth and types of learning activities,” said Weisong Shi, professor of computer science and director of the CPS program.



WAYNE STATE ENGINEERING FACULTY COLLABORATING WITH WASHTENAW COMMUNITY COLLEGE TO TRAIN STUDENTS ON LIGHTWEIGHT MATERIALS IN MANUFACTURING

A research team comprised of faculty from Wayne State University and Washtenaw Community College (WCC) was recently awarded a \$200,000 grant from the National Science Foundation Advanced Technological Education Program. Wayne State College of Engineering faculty members Jimmy Ching-Ming Chen, assistant professor of engineering technology, and Gene Liao, professor of engineering technology and electric-drive vehicle engineering, are co-principal investigators on a project titled “Training Tomorrow’s Technicians in Lightweight Materials: Properties, Optimization, and Manufacturing Processes.”

In response to an imminent need for skilled technicians in advanced manufacturing and automotive technology within the area of lightweight materials, the two institutions intend to develop integrated curriculum in these emerging technologies in order to develop a deeper talent pipeline of educators and industry leaders. Courses will be multidisciplinary, project-based

and designed around specific lightweight materials or categories of materials, rather than focused on specific manufacturing disciplines.

“The use of lightweight materials in manufacturing has emerged as a transforming innovation,” said Chen. “Lightweight materials are changing the nature of advanced manufacturing, from designing for manufacturability to the manufacturing processes to the repair of parts and objects built with these materials. Concurrent with this shift in materials and the corresponding changes in design and manufacturing processes is the need to train the workforce of today and tomorrow in these technologies.”

Washtenaw Community College is also joining with Square One Educational Network to engage and recruit K-12 students in lightweight manufacturing training, a key strategy in addressing the sustainability of the advanced manufacturing industry.

This project is the first of its kind in Michigan and unique across the nation in that it will develop course materials and laboratory exercises in lightweight materials and their broad applications for community college students and technicians.

“Southeast Michigan is a leader in research and development for lightweight materials manufacturing in the aerospace, automotive, defense and health care sectors,” said Chen. “As the use of these materials becomes more widespread, design and manufacturing technicians will require education and training to incorporate new technologies and processes into their skill bases.”

The principal investigator for this project is Thomas Penird, professor of industrial technology at WCC. Allen Day, professor of automotive services at WCC, is a co-principal investigator.

The grant number for this project is 1601261.



WAYNE STATE PROFESSORS RECEIVE \$500K FROM NSF TO ENHANCE COMPUTATIONAL RESEARCH



JEFFREY POTOFF



LOREN SCHWIEBERT

A team of researchers from Wayne State University's College of Engineering recently received nearly \$500,000 from the National Science Foundation for its research project, SSE: Development of a High-Performance Parallel Gibbs Ensemble Monte Carlo Simulation Engine.

"Molecular dynamics codes that utilize parallel computation on CPUs and GPUs [graphics processing units] are relatively well developed; however, there are a number of problems that cannot be simulated with this methodology," said Jeffrey Potoff, Ph.D., co-principal investigator of the project and associate dean for academic and student affairs and professor of chemical engineering in the College of Engineering. "Problems that require the simulation of an open system, such as adsorption in porous materials, require an alternative

methodology that allows for fluctuation in the number of molecules in the system. There are a number of systems where the presence of large free-energy barriers and slow diffusion preclude the use of standard molecular dynamics."

Examples of such problems requiring alternative methods include prediction of phase equilibria in multicomponent lipid bilayers, polymers or ionic liquids. For these types of problems, Monte Carlo or hybrid Monte Carlo/molecular dynamics simulations have the potential to significantly improve computational efficiency.

According to Loren Schwiebert, Ph.D., professor and interim chair of computer science in Wayne State's College of Engineering, the project is focused on the development of the open-source Monte Carlo simulation engine known as the GPU Optimized Monte Carlo – or GOMC – which is able to use low-cost graphics processing units and CPUs to significantly reduce computational time.

"Our research will enable Monte Carlo simulations to be performed with higher fidelity in larger systems than is currently accessible with standard Monte Carlo simulation codes, enabling the accelerated development of new materials," said Schwiebert. "The project also will benefit graduate and undergraduate students by providing them training in Monte Carlo simulation, design of efficient algorithms for parallel computation on a variety of hardware architectures, and software development."

The grant number for this National Science Foundation award is 1642406.



BIG DATA AND BUSINESS ANALYTICS SYMPOSIUM CONTINUES TO GROW IN ITS FOURTH YEAR



Last March, the fourth annual Big Data and Business Analytics Symposium brought together a record number of top-level academic and industry leaders from across the United States to discuss how big data strategies can drive business success.

“We had close to 600 registrations and 175 companies represented at the event,” said Ratna Babu Chinnam, professor and co-director of the Big Data and Business Analytics Group at Wayne State. “The predominant feedback is that the event was a phenomenal success.”

The two-day conference agenda was built around case studies of top practitioners in areas ranging from health care to privacy and security. Attendees also enjoyed the various tutorials, networking receptions and panel discussions, as well as a keynote address each day.



“ I found the symposium refreshing, as so many real-world case studies were presented,” said Nick Curcuru, vice president of global big data practice at MasterCard and one of the symposium’s panel speakers. “And there were no sales pitches.”

An added feature this year was the Startup Showcase, which gave several new companies a platform to demonstrate what they are doing in the big data sector and expand their industry network.

Wayne State students were also engaged in the conference, not only as attendees but also in the poster session, which allowed students across all engineering disciplines to display their innovative research projects.

“I was thoroughly impressed with so many young people involved in data science, applications and frameworks. Their enthusiasm was evident,” said Janis E. Landry-Lane, a global sales executive for IBM Systems and a case study presenter.

Chinnam and other WSU dignitaries took the opportunity to further illustrate the university’s commitment to leadership in big data by sharing information about the new master of science program in data science and business analytics, a collaboration between the College of Engineering and the Mike Ilitch School of Business.

For more on the symposium and the new master’s program visit bigdata.wayne.edu.





WAYNE STATE LAUNCHES NEW DATA SCIENCE AND ANALYTICS MASTER'S PROGRAM

Last winter, the Wayne State University Board of Governors approved the establishment of a new, highly innovative master of science in data science and business analytics (MSDSBA) program, offered jointly by the College of Engineering and the Mike Ilitch School of Business.

Analytics is a fast-growing STEM field with a high demand for individuals who possess the skills and expertise necessary to navigate the process of transforming data into insight for making sound business decisions.

"While a lot of programs have been created in recent years, most of them tend to focus on just technology or analytics or the business case," said Ratna Babu Chinnam, one of the directors of the Big Data Group at Wayne State. The novel and interdisciplinary MSDSBA program is designed to give graduates a balanced core of computing, business, statistics and operations research skills to identify, analyze and solve analytics problems.

The program offers specialized training that allows students to integrate those skills in an interdisciplinary fashion, preparing graduates to succeed in various business, industry and government careers.

Admission began in January in anticipation of the program's fall 2017 launch. A total of 33 new students were enrolled across the program's three concentrations — data-driven business, advanced analytics and computational engineering.

"There is critical shortage of good talent in the Midwest, and the program hopes to produce a stream of high-quality graduates in the years to come," said Chinnam.

"The depth of the commitment that Wayne State has made in the area of big data and business analytics is very refreshing and quite impressive," said Jim Anderson, CEO of Urban Science and a College of Engineering Hall of Fame inductee. "Students should be interested in the area because it is the future."

Anderson and Urban Science are among the industry experts and companies who have participated in Wayne State's Big Data and Business Analytics Symposium, held every March since 2014. Representatives from DTE Energy, Ford Motor Company, General Motors, Chrysler, Henry Ford Health System, Quicken Loans, IBM and many other corporations have expressed a strong interest in Wayne State establishing a master's program of this kind.

"While symposia have started to address the need within the business community for better understanding the business case and effective design and deployment of big data systems, technologies and processes, this program seeks to address the talent gap," said Chinnam.

The MSDSBA program is a collaboration of the Department of Computer Science and the Department of Industrial and Systems Engineering in the College of Engineering, as well as several departments from the Mike Ilitch School of Business.

"The business school's role is to provide a broad perspective to the role and importance of analytics to business," said Mike Ilitch School of Business Associate Dean Toni Somers. "A primary focus is on pursuing 'analytics that matter' — those that are associated with sustainable competitive advantage."

The MSDSBA program requires students to complete a minimum of 30 credits, including 24 credits in coursework and a six-credit practicum final project with industry.

Applicants must meet requirements for admission to the Wayne State University Graduate School. Students must have earned a bachelor's or its equivalent in engineering or business from an accredited college or university. Students from all STEM disciplines are considered for admission on a case-by-case basis. Learn more at engineering.wayne.edu/data-analytics.



WAYNE STATE STUDENTS ENJOY SPECIAL DAY WITH YAZAKI ENGINEERS AT NORTH AMERICAN INTERNATIONAL AUTO SHOW

Six Wayne State University engineering students were among the participants in Yazaki's fifth annual Student Liaison program at the 2017 North American International Auto Show (NAIAS) in Detroit. The program, designed to expose the next generation workforce to the future of the automotive industry, was a special invitation-only event and included 32 students from 12 local universities.

Representing Wayne State were mechanical engineering students Kadhim Allohaibi, Andy Gutierrez and Tyler Knott; industrial and systems engineering major Andrew Jacks; and electrical engineering students Ahmad Aledrisi and Hunter Thornhill.

Thornhill, a freshman at WSU, appreciated the invitation after being on Yazaki's radar since interviewing for an internship as a senior at Canton High School, which is only a 10-minute drive from the company's North American headquarters. The event's exclusivity was not lost on Jacks either, who saw several of his friends participate over the years and was relieved in his senior year to be offered the chance.

"After years of waiting on the sidelines, I finally got into the game," said Jacks.

Each student was paired with a Yazaki engineer and, upon arriving at Cobo Hall in the morning, had the opportunity to network with their mentors during breakfast in the Yazaki hospitality suite, where product displays also gave them greater familiarity with the company.

Following a welcome from Yazaki's chief

engineers, the students and mentors made their way to the showroom floor, where they had full access to displays, exhibitions and more than 750 vehicles during the two Industry Preview days at NAIAS. Naturally, everyone had their favorites.

"The BMW I8 was very impressive because it's a classic BMW sports car, but it's also a hybrid," said Jacks, who also noted his fondness for the Ford GT and the Chevrolet Colorado. Thornhill commented that the Lexus U.S. concept vehicle "was a beautiful SUV."

Thousands of people pack Cobo Hall on a normal day at NAIAS, but the students and mentors were among only a couple hundred business and industry leaders, allowing them to see the show from a different perspective.

"On Industry Days, unlike the public offering, you have a chance to go inside some of the locked vehicles and look under the hood," said Jacks. "It's much more hands-on."

The wealth of knowledge from Yazaki mentors helped the students link classroom lessons with real-world applications as they toured NAIAS for over two hours.

"These students have the opportunity to see up close the vehicles and technologies that will shape the future automotive landscape," said Doug Burcicki, BSEE '93, chief engineer in engineering operations for Yazaki and member of the WSU College of Engineering Board of Visitors.

Yazaki was looking to gain knowledge as well, as the company used the event to conduct market research for a fresh perspective on the

automotive space from the next generation.

"This is our chance to learn from the students, pick their brains and see what makes millennials different," said Burcicki.

Spending the day with Yazaki engineers gave the students plenty to consider regarding their own futures.

"I originally wanted to go into the power electronics field, so the biggest takeaway for me was learning about electrical engineering in the auto industry, because I didn't have much insight about it," said Thornhill. "There's a lot of career pathways for electrical engineers in the auto industry, and that's one of the most important things I learned from this experience."

A Flint native, Jacks said he's been around car culture his whole life. His father worked for over 30 years at General Motors, and his sister works there today. While he recently completed a co-op at DTE Energy, Jacks could see himself in the auto industry, especially after observing how passionate Yazaki engineers were about their profession.

"They told us to stay curious and find something that you love to do," said Jacks.

Find more insight and photos from program participants on Twitter and Instagram by searching #NAIASyazaki.

Photos and quotes from Doug Burcicki courtesy of Yazaki North America, Inc



COMTO YOUTH SYMPOSIUM GIVES ASPIRING ENGINEERS A GLIMPSE INTO THE FUTURE OF TRANSPORTATION



This past summer, Detroit served as the host city for the 46th Conference of Minority Transportation Officials (COMTO) national meeting, a five-day training summit that drew nearly 700 transportation professionals from across the country. The event carried a theme of “Smart Transportation — The Next Frontier.”

“We believe Michigan is the perfect place to explore transportation innovations and prepare for future transportation evolutions,” said Kim Avery, president of COMTO

Michigan and the southwest region engineer for the Michigan Department of Transportation (MDOT).

A key element of the conference and COMTO’s mission is community outreach. To that end, Avery and others collaborated with Mumtaz Usman, professor and chair of civil and environmental engineering at Wayne State University, to bring the COMTO Youth Symposium to campus. The symposium welcomed 125 students — a record for the organization — from fifth through 12th grade and from various regions of the country to the College of Engineering.

“The youth symposium is a signature piece of every COMTO national conference,” said Avery. “We want to make sure that we are continuing to inspire students to join the transportation industry.”

Hands-on STEM activities were a new component of the symposium, granting students the opportunity to learn about autonomous vehicles, aerodynamics, intelligent transportation systems, connected vehicle instrumentation and adaptive signals. Interactive displays featured an autonomous Mercedes SUV, a magnetic levitation (maglev) model, a demonstration of MDOT’s connected vehicle equipment, and a signalized control system demonstration in the Department of Civil Engineering’s Intelligent Transportation Systems laboratory.

Participants were also treated to a presentation by Steve Remias, assistant professor of civil and environmental engineering, and provided information on the various educational paths offered by the College of Engineering before departing to tour the Toyota Technical Facility in nearby Saline, Michigan.

COMTO also awards scholarships to high school and undergraduate students at the national meeting. Among the 2017 recipients was Jenna Kirsch, a civil and environmental engineering student and undergraduate research assistant at Wayne State, who was awarded a \$500 scholarship.



SHAPE INITIATIVE PROVIDES HIGH SCHOOL STUDENTS WITH HANDS-ON EXPERIENCE IN BATTERY TECHNOLOGIES

In September, the Wayne State University College of Engineering welcomed to campus five outstanding students from AGBU Alex and Marie Manoogian School in Southfield, Michigan, to receive certificates for completion of the Summer High School Apprentice Program in Engineering (SHAPE).

SHAPE was introduced this year as an opportunity for high school students to work on emerging energy technologies, particularly batteries. The initiative was inspired by another youth outreach effort coordinated by Leela Arava, assistant professor of mechanical engineering at Wayne State.

“We visited Manoogian as part of the Mobile Energy Lab program and recruited those five brightest students to come and work in the lab for six weeks,” said Arava. “They worked with my graduate students on research projects and gained tremendous hands-on experience at a very early stage of their careers.”

Students came to campus Monday through Wednesday. Each week’s curriculum was centered on a unique theme, including material synthesis, micro-level structure and composition, coin cell fabrication, battery testing, and sensor integration. In the final week, the students

toured various laboratories and made presentations to faculty and mentors.

The College of Engineering leverages its resources and unique urban setting to foster community partnerships and provide foundational experiences for aspiring engineers. The purpose behind SHAPE and other programs is to introduce STEM concepts in real-world practicality and keep young people interested in engineering as a college major and career.

When the students and Principal Hosesep Torossian visited the Wayne State campus on Sept. 12, they had an opportunity to share their stories with College of Engineering Dean Farshad Fotouhi and Professor Nabil Chalhoub, chair of mechanical engineering. The students gave glowing reviews of the program and several indicated that they planned to pursue their undergraduate studies at Wayne State.

“I want to extend my utmost gratitude to Drs. Chalhoub and Arava for their passion and commitment to inspire and train our future engineers,” said Torossian. “Our students loved their engineering internship. Their lives have been changed by this experience.”

COLLEGE OF ENGINEERING EXHIBITS STUDENT INNOVATIONS WITH DESIGN DAY AND HEALTHCONNECT SYMPOSIUM

The Wayne State University College of Engineering hosted two events on April 21, including the third annual Student Design and Innovation Day, which showcased nearly 70 unique student projects covering a wide range of applications and engineering disciplines.

Sponsored by the James and Patricia Anderson Engineering Ventures Institute, Student Design and Innovation Day demonstrates students' solutions to engineering challenges as well as commercial and social needs. The event offers up to \$1,000 in cash prizes to the best projects and reflects the mission of the Anderson Institute to foster entrepreneurship through investment in marketable technologies.

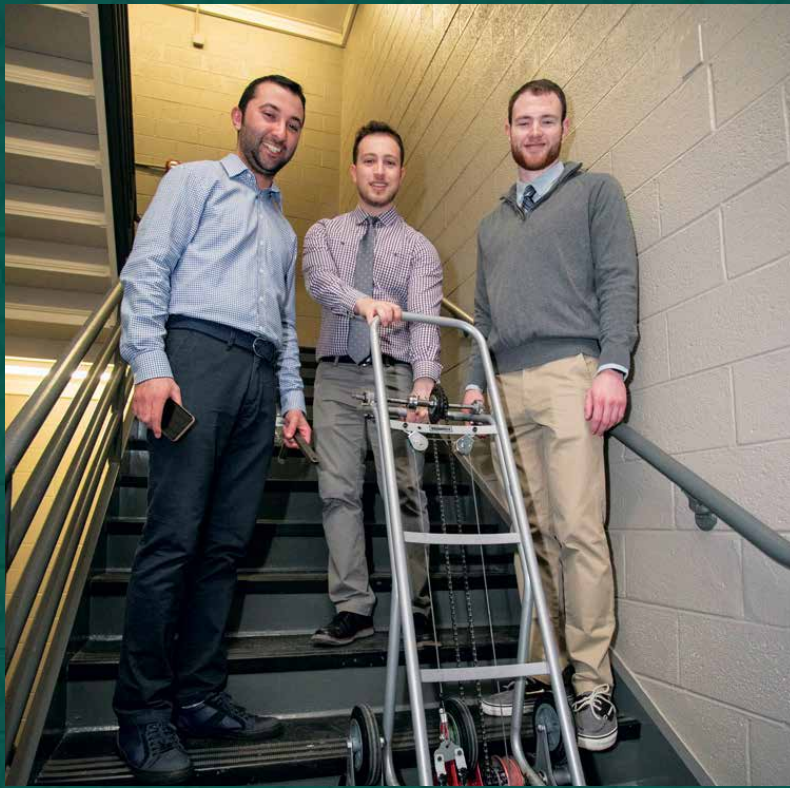
Taking first place honors was a five-member team of mechanical engineering students — Andrew Abdunour, Charlie Wilson, Fawaz Yono, Ghadi Kanso, and Omar Alzuhd — who designed a stair-climbing, three-wheeled hand truck designed to ease the burden of transporting heavy or bulky objects, a simple but common problem.

“It was rewarding to be able to put all the engineering knowledge that we had gained in the past few years to work,” said Abdunour. “Seeing the project come to life in a matter of a few weeks was cool, but the process wasn't without a few setbacks. By the end, we felt like we gained a lot from the whole experience.”

Other top projects included an Internet of Things sensor package for environmental sampling, a self-cleaning vehicle camera housing and a portable audio software application for aspiring musicians.

Student Design and Innovation Day was preceded by the inaugural WSU HealthConnect Symposium, which presented an overview of trends in wireless health tools development, including sensor technologies and their applications. This event also featured a design contest, with biomedical engineering graduate student Afreen Fatima taking top honors for her design of a wearable brain imaging cap.





SUMMARY OF TOP PROJECTS:

FIRST PLACE: STAIR-CLIMBING HAND TRUCK

A three-wheeled hand truck that would allow an operator to climb stairs while transporting boxes and other bulky or heavy objects easily, smoothly and safely.

STUDENTS: Andrew Abdalnour, Charlie Wilson, Fawaz Yono, Ghadi Kanso, Omar Alzuhd

ADVISOR: Golam Newaz

SECOND PLACE: LOW-COST AND SCALABLE IOT SENSOR PACKAGES FOR ENVIRONMENTAL SAMPLING

Users can test environmental criteria using IoT sensors, an option which is less expensive, low weight, easy to use and capable of transmitting data from anywhere to a cloud-based platform.

STUDENTS: Javad Roostaei, Hamid Sadeghi, James D. V. Wagnen, Zohreh Doosti

ADVISOR: Yongli Zhang

THIRD PLACE (TIE): PMEAS

A modulation application which can be loaded onto a small, affordable computer (i.e. Raspberry Pi) to replace expensive hardware modulation effects pedals, making musicianship more widely accessible.

STUDENTS: Matthew Gaertner, Zein Hijazi, Lee Lazarecky, Joshua Walters

ADVISORS: Khayyam Hashmi, Sam Bryfczynski

THIRD PLACE (TIE): PROJECT IRIS

A self-cleaning camera housing for various automotive applications including backup cameras and autonomous vehicle systems.

STUDENT: Brandon Matesic

ADVISOR: Mohsen Ayoobi

HEALTHCONNECT WINNER: SMART CROWN FOR BRAIN IMAGING

A wearable cap with embedded sensors that can perform functional brain imaging and transmit data in real time to a mobile/PC unit.

STUDENT: Afreen Fatima

ADVISOR: Mohammad R. N. Avnaki

BUILDING ON A LEGACY OF INNOVATION

Detroit is a city built by engineering, and its revitalization is fueled by discovery and innovation. The College of Engineering at Wayne State University is seizing new opportunities in the region's automotive industry while creating pathways to emerging industries. Students are empowered to be creative, collaborative professionals in diverse fields including biomedical engineering, automotive systems, clean water and energy, and big data. As the innovation economy strengthens, the College of Engineering will lead the way.

PIVOTAL MOMENTS

Pivotal Moments: Our Campaign for Wayne State University celebrates the life-changing moments the university has helped ignite and creates new ones. Our campaign is an ambitious effort with a goal to raise \$750 million, and every gift to every area of the university counts toward our goal.

HELP US MAKE MORE MOMENTS

How did Wayne State change your life? How do you want Wayne State to help change the lives of others? Pivotal Moments: Our Campaign for Wayne State University is your opportunity to recognize the impact the College of Engineering has made and to make such moments possible for future generations of students, faculty and community members. After all, what is a campaign but a series of moments when, together, we can change everything?

For more information on supporting future engineers, visit pivotalmoments.wayne.edu or contact our development professionals:

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GIVING TO THE COLLEGE OF ENGINEERING

The College of Engineering has focused on five high-impact practices to strengthen the student experience, which complement the Pivotal Moments campaign priorities:



EXPERIENTIAL LEARNING

Through internships and co-ops, students learn interdisciplinary skills that translate across a variety of professional settings. You can support this practice through scholarships and professional development funding.



GLOBAL PERSPECTIVE

Engineers must be global citizens, able to navigate diverse cultures and economies around the world. To develop students' global perspectives, you can support study abroad scholarships.



UNDERGRADUATE RESEARCH

Research opportunities for undergraduate students set Wayne State apart from its peers. You can support improved laboratories, renovated workspaces, research awards, and endowed chairs, professorships and fellowships.



HANDS-ON EXPERIENCE

Students gain valuable skills in national engineering competitions, building everything from Formula-style racing cars and robots to concrete canoes and model steel bridges. You can provide real-world experiences by supporting flexible learning spaces, equipment and programs.



COMMUNITY ENGAGEMENT

The College of Engineering offers programs that introduce K-12 students to teaching labs and research facilities, providing a glimpse of higher education and career opportunities. You can support this practice by investing in youth science and engineering programs.

MECHANICAL ENGINEERING ALUMNA AWARDED BY SAE INTERNATIONAL FOR LEADERSHIP AND SERVICE



Wayne State University College of Engineering alumna Denise Rizzo recently received the 2017 J. Cordell Breed Award for Women Leaders from the Society of Automotive Engineers (SAE) International in recognition of her contributions to the mobility industry and service to her company and community.

Rizzo, a senior research mechanical engineer for the U.S. Army Tank Automotive Research, Development and Engineering Center (TARDEC), received the award in April during the WCX 17: SAE World Congress Experience in Detroit.

“It is always an honor to be recognized for doing the work that you love,” said Rizzo, who holds a B.S. and M.S. from Wayne State in mechanical engineering as well as a Ph.D. from Michigan Tech.

Rizzo, who was promoted to her current position earlier this year, joined TARDEC in 2008 after spending eight years in the Powertrain Group at Chrysler, where she was a controls research and development engineer. She specializes in modeling, simulation and control of propulsion systems of ground vehicles.

She says the most rewarding aspect of her job is “helping the

soldiers and learning from other talented researchers.” She also demonstrates a commitment to service and mentorship in her industry as an active member of SAE, Society of Women Engineers, National Defense Industrial Association and Women in Defense.

“I was lucky to have amazing mentors such as Dr. Michele Grimm when I was an undergraduate student and new engineer. It only feels right to pay that back,” said Rizzo.

“Furthermore, entering the work force and choosing a career path is not only challenging, it can be amazingly confusing. My goal is to help women understand how many different career paths exist and how to pick one that works for them.”

Rizzo has received seven awards for outstanding contributions during her tenure at TARDEC and been published in numerous journals and technical reports. She also holds two patents.

The dual alumna looks back on her time at Wayne State fondly. “Not only did WSU provide me with an outstanding technical education,” said Rizzo, “but it gave me the confidence and skill to follow a career path that is unique and rewarding.”





INDUSTRIAL ENGINEERING ALUMNUS FOLLOWS PATH THROUGH PH.D. PROGRAM TO PROMINENCE IN AUTO PARTS INDUSTRY



For Mark Dolsen, it started as an exit strategy.

In 2008, Dolsen was the general manager of operations at TRQSS Inc., the only remaining seat belt manufacturer in Canada. However, in the midst of an economic downturn, the future of the auto parts industry in southern Ontario looked bleak.

Not ready to retire, but with no experience in other fields, Dolsen thought, “What else am I going to do?”

Going back to school was an option, but it had been a while since he had been a student – he earned his master’s in industrial engineering from Wayne State in 1990. He had considered pursuing a Ph.D., but the timing wasn’t right, as he was a newly married man with a good job at General Motors at that time.

As he pondered his next move, Dolsen’s wife went to Google and searched Ken Chelst, the former ISE department chair and current professor of operations research at Wayne State. Dolsen had long

credited Chelst as an influential figure in his education and career.

“I wanted to be a guy like him, an expert in something,” said Dolsen. “I don’t want to push what I know, but rather have people come to me.”

Through that fortuitous search came a video about the Wayne State College of Engineering’s Global Executive Track (GET) Ph.D. program.

“I just decided to apply,” said Dolsen. “I found out at orientation that I was the first person to apply out of the blue without attending an information session.”

The GET Ph.D. program is designed to develop high-level, globally minded technical leaders by providing an opportunity for working executives to merge real-world experience with academic skills. Dolsen entered the 2009 cohort with plenty of both.

In the mid-1980s, Japanese-owned auto parts supplier Tokai Rika established a foothold in Ontario when Toyota began expanding its North American operations. At the same time, GM and Toyota were working together on an initiative called NUMMI (New United Motor Manufacturing Inc.) in California.

“At the time, Toyota’s production system and the Japanese manufacturing techniques were really hot in the auto industry,” said Dolsen. “Everybody was trying to figure out what the secret was.”

TRQSS was established in 1987 through a joint venture between Tokai Rika and TRW, a Michigan-based seat belt supplier. Dolsen, having



earned his master's on top of a bachelor's from Kettering University, came on board in 1990 as a supervisor of engineering and maintenance.

He left in 1999 to join a family owned company in Windsor called Centerline, which specialized in welding equipment. However, in 2003, Tokai Rika was in the process of buying TRQSS outright, and contacted Dolsen about coming back.

Five years later, uncertainty in the auto industry loomed and Dolsen was concerned that it would be intimidating to go back to school after so much time away.

"I had great respect for the professors, and I thought that there wasn't anything that I could say that these people would find smart," said Dolsen.

He was amazed how the core courses and modules captured so much of what he had learned and worked on in his career. Each module had reading and application assignments, and Dolsen received positive feedback from the faculty. He did all of the coursework for the GET program in the first two years.

Dolsen wrote two case studies, including one co-authored by Chelst and Ratna Babu Chinnam, co-director of the GET program, that was published in the book, *Sustainability in Supply Chain Management Casebook: Applications in SCM*. Dolsen feels that was one of his proudest moments.

With a keen interest in operations research, Dolsen's company became his lab, as he would try out many of his ideas there. In the meantime, he was promoted to vice president of TRQSS in 2012.

As the time came to work on his dissertation, Dolsen knew that, with a job to do, it had to be a project that could feasibly be accomplished on the job and applicable to his company. Realizing that the auto parts industry was not facing extinction after all, he thought about ways to ensure that it would continue to thrive.

Dolsen considered American academic Michael Porter's three strategies for corporate competitive advantage — lower cost, focus or differentiation. Dolsen looked at the latter in particular.

"A lot of differentiation comes through innovation," he continued. "Many of us are manufacturing products that you could argue are commoditized — there isn't much room for product innovation for seat belts, per se."

In his dissertation, "Developing Innovation Capability in a Mass Production Organization," Dolsen examined two sources of problems — strategic issues identified by management, and technological thresholds

identified by production.

"Engineers were the most engaged group of employees, and the source of the most creative solutions. If engineers are working on those problems identified by management and production all the time, then you will develop a capability for innovation that will teach the organization how to adapt," he concluded.

Running parallel to his progress through the GET program was his continued rise within TRQSS, which had become a leader within Tokai Rika's global safety business unit. Dolsen was promoted to president in 2014, and he attributes much of his recent success to the GET program, from which he graduated in May 2017 after successfully defending his dissertation in January.

"It was a tremendous outlet for me, and I think going through the program and having to think about how to apply what I knew, and writing case studies, really changed my outlook on my career," said Dolsen. "I believe it was because of that, that I was chosen for promotion."

Dolsen no longer sees the GET program as an exit strategy, but rather as a life-changing discovery process.

"One of the things Dr. Chinnam used to say was different about me was that I didn't have a preconceived idea of what I wanted to get out of this program when I went into it," said Dolsen. "If you go into it thinking you'll find the answer, you may or you may not. But what you should find is how to get the answer."



A REFINED LEGACY: CHEMICAL ENGINEERING ALUMNUS PAYS SUCCESS FORWARD TO TODAY'S STUDENTS



It's appropriate that Hank Kuchta was in the Wayne State Student Center last spring addressing a room full of faculty and students at the

College of Engineering Honors Convocation. It was in that building — albeit an older version of it — that a chance encounter in the late 1970s with an old friend changed his life.

Kuchta was a biology major considering medical school, but it just didn't feel right and he was concerned about his limited job prospects. His friend was an engineering major, and when he told Kuchta about his numerous lucrative job offers, Kuchta was inspired to change directions.

Ralph Kummeler, then the dean of the College of Engineering, met with Kuchta to discuss his options. Kummeler suggested that Kuchta consider graduate school for engineering, but Kuchta wanted to get in while still on an undergraduate scholarship, and vowed to finish in less than two years.

"He thought I was crazy," said Kuchta, who made good on his vow and earned his bachelor's in chemical engineering in 1980.

As someone who previously spent most of his time in rote sciences, Kuchta recalls his system of learning being shocked when he came into engineering. He quickly learned that engineers are the world's problem solvers, and it affirmed his belief that this was the right profession for him.

He also found that he enjoyed the classes, particularly those taught by Professor Harold Donnelly, who emphasized the fundamentals of being on time, doing homework and asking thoughtful questions.

"He was like a grandfather to us," said Kuchta. "The guy was unbelievable."

Kuchta joined Theta Tau and met Greg Mullins, who was the president and preparing to graduate and take a job at Marathon. Mullins not only suggested to Kuchta that he take over as president, but also encouraged him to consider the refining business. Kuchta took a co-op at Marathon, and his career was off and running.

He joined Exxon after graduation, where he worked for 12 years in various roles, including several overseas assignments. His proactive, hands-on approach and desire to break from the operational status quo set him apart.

"I loved being out in the plant, and I learned the whole operation from the bottom up," said Kuchta. "As an engineer, you want to improve what's in front of you and get more out of it."

His refinery in New Jersey was eventually sold to the Tosco Corporation, and in 1993 he was offered a new job. By "picking up the crumbs" and helping Tosco acquire assets overlooked by the bigger conglomerates, Kuchta helped grow Tosco into the largest independent refining company in the country.

Kuchta went on to Premcor Inc., ascending to president and chief operating officer before retiring in 2005, when the company was acquired by Valero. However, it wouldn't be long before he accepted a new challenge.

He and a friend founded Northern Tier Energy and acquired a refinery in 2010 from Marathon in St. Paul Park, Minnesota, as well as the SuperAmerica gas station and convenience store chain.

"Two guys with a desk and a telephone turned this into a \$3.5 billion company," said Kuchta. "Our investors said it was one of the best investments they ever made. Their return on capital was monstrous."

Among the talent that joined Kuchta on this venture was Mullins, who had parlayed his modest beginnings at Marathon into a 30-year career. Kuchta was more than happy to rekindle a connection with a Wayne State alumnus.

"I have a lot of pride in the university," said Kuchta, who was inducted into the College of Engineering Hall of Fame in 2006. "There's something different about the education here. I think the people here are grounded differently."

Kuchta and his wife established the Hank and Joy Kuchta Endowed Support Fund for Chemical Engineering to benefit student activities such as Chem-E-Car and AIChE. They also founded an endowed scholarship fund to recruit students, recognize scholastic achievement, encourage continued progress and provide assistance to students in financing their graduate education in chemical engineering and materials science.

"This engineering college is a jewel," said Kuchta. "I love to tell people I went to Wayne State."

FORD CUSTOMER SERVICE DIVISION CREATES ENDOWED SCHOLARSHIP IN THE COLLEGE OF ENGINEERING

A \$35,000 gift from the Ford Motor Company has established an endowed scholarship at Wayne State University's College of Engineering to support students pursuing degrees in engineering or STEM-related fields. Scholarships will support financially challenged students and those who have participated in the Detroit Area Pre-College Engineering Program (DAPCEP) or any of the College of Engineering's Office of Community Engagement's K-12 outreach programs.

“This scholarship is an investment in Detroit's future,” said Frederiek Toney, president, Global Ford Customer Service Division. “Providing financial support to economically challenged students is an important step in building a skilled and motivated work force in our community. We are proud to partner with Wayne State University in this endeavor.”

Ford Motor Company established the Ford Customer Service Endowed Scholarship with proceeds from the annual UAW-Ford Customer Service Division Charity Golf Outing. Each year, proceeds from the outing will be shared between immediate need-based scholarships for students and building the endowment.

“We are thankful Ford Motor Company chose to support our students and further contribute to building Detroit's STEM workforce,” said College of Engineering Dean Farshad Fotouhi. “Ford's continued generosity to Wayne State will help more of our talented students succeed.”

“We are grateful for the new partnership created between Ford Motor Company and Wayne State University,” said Sandra Hughes O'Brien, Wayne State University Board of Governors. “This scholarship enshrines the Ford name with the university for years to come.”



DEPARTMENT



BIOMEDICAL ENGINEERING

THE DEPARTMENT'S UNDERGRADUATE PROGRAM received accreditation through the Engineering Accreditation Commission of ABET, retroactively applied to October 2013.

ASSOCIATE PROFESSOR MICHELE GRIMM was positioned as co-chair of the White House Task Force on Technology for Aging.

DOCTORAL STUDENT TONYA WHITEHEAD was awarded the Garrett T. Heberlein Excellence in Teaching Award, the only universitywide teaching award for graduate students.

ASSISTANT PROFESSOR MAI LAM'S research on customizable vascular grafts was published in JoVE's Video Journal.

CHEMICAL ENGINEERING AND MATERIALS SCIENCE

PROFESSOR GUANGZHAO MAO'S research on nanowire organic sensors was featured at the 2016 Defense Innovation Challenge in Austin, Texas.

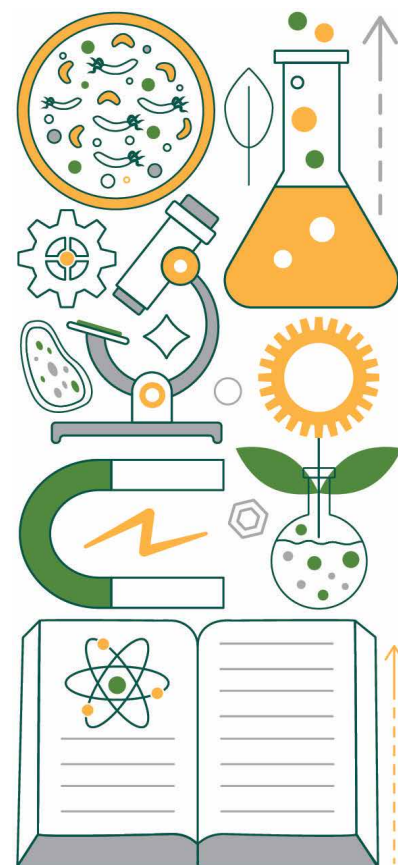
PROFESSOR JEFFREY POTOFF was appointed to the editorial board of the Elsevier journal Fluid Phase Equilibria.

ASSISTANT PROFESSOR ZHIQIANG CAO'S research team received a \$1.3 million award from the National Institute of Diabetes and Digestive and Kidney Diseases of the National Institutes of Health for developing a novel formulation to improve the longevity of insulin infusion implants.

MAO was awarded a \$50,000 National Science Foundation I-Corps grant for her project, "Electrochemical Deposition of Organic Nanowire Sensors," which aims to improve gas sensing for chemical and environmental monitoring, food safety and antiterrorism capabilities.

ZHIQIANG CAO was selected to receive the WSU Academy of Scholars Junior Faculty Award for the 2017-18 academic year.

PH.D. CANDIDATE MAJID MORADI ALIABADI received the 2017 Sustainable Engineering Forum's Student Best Paper Award from the American Institute of Chemical Engineers (AIChE) for his article, "Multistage Optimization for Chemical Process Sustainability Enhancement under Uncertainty."



EVENT NEWS

CIVIL AND ENVIRONMENTAL ENGINEERING

ZUZANNA SOBCZAK, a senior on the women's fencing team, received a Deans' Award from the Department of Athletics at the 17th annual Academic Recognition Luncheon in April for having the highest cumulative grade-point average among all student-athletes in the College of Engineering.

PROFESSOR CAROL MILLER AND ASSISTANT PROFESSOR YONGLI ZHANG were co-principal investigators on a five-year, \$2.9 million NSF Research Traineeship grant to address challenges faced in postindustrial urban settings and prepare them for public, private and academic leadership positions.

COMPUTER SCIENCE

THE DEPARTMENT COMPLETED A RENOVATION of its eight computer labs on campus, installing a virtual desktop infrastructure which includes a central server cluster and 230 zero clients.

UNDERGRADUATE STUDENT OMER KHAN'S team finished in first place at the Civic Tech Challenge at ThinkChicago, proposing a mobile app which allows users to report traffic and safety issues to city officials using photos and location tracking technology.

DOCTORAL GRADUATE LENA MASHAYEKHY received the IEEE Technical Committee on Scalable Computing (TCSC) Outstanding Ph.D. Dissertation Award for her work titled "Resource Management in Cloud and Big Data Systems."

PROFESSOR WEISONG SHI was selected as an Association for Computing Machinery (ACM) Distinguished Member for his significant impact on the computing field.

DOCTORAL STUDENT TAYEBEH BAHREINI received the Best Poster Award for her project, "Placement of Multi-Component Services in Edge Systems," at the Michigan Celebration of Women in Computing conference in April.

PROFESSOR VACLAV RAJLICH received the 2017 Distinguished Service Award from the Institute of Electrical and Electronics Engineers (IEEE) Technical Council on Software Engineering (TCSE).

FACULTY MEMBERS DANIEL GROSU AND ALEXANDER KOTOV received \$40,000 through the university's "Student Success Through Evidence-based Pedagogies (SSTEP)" program to reform CSC 2200 – Computer Science II, a required foundational course for computer science majors and the gateway to all the higher level courses for computer science and information systems technology students.

ELECTRICAL AND COMPUTER ENGINEERING

ASSOCIATE PROFESSOR CAISHENG WANG received a 2015 Applied Energy award, which recognizes highly cited research and review papers published in Applied Energy between 2013 and 2014, for his paper, "Optimal sizing, operating strategy and operational experience of a standalone microgrid on Dongfushan Island."

THE WAYNE STATE IEEE CHAPTER was presented with the Outstanding Student Branch award at the IEEE Southeastern Michigan fall conference, and subsequently hosted the 2017 Student Leadership Conference in the spring.

SALIM MAROUF was part of the first-place team at the Lear Open Innovation Challenge, earning an opportunity to spend the summer as a Lear innovation fellow.

THE SOUTHEASTERN MICHIGAN LIFE MEMBER AFFINITY GROUP, chaired by Professor Harpreet Singh, received the 2017 IEEE Life Member Affinity Group Achievement Award.

ASSISTANT PROFESSOR PAI-YEN CHEN was selected to receive the 2017 IEEE Sensors Council Young Professional Award as well as the Young Scientist Award from the International Union of Radio Science.



INDUSTRIAL AND SYSTEMS ENGINEERING

PROFESSOR KAI YANG was awarded as a fellow of the Institute of Industrial and Systems Engineering (IISE), the first Wayne State faculty member since 1985 to receive this distinction.

ASSOCIATE PROFESSOR KYOUNG-YUN KIM was elected to the Digital Manufacturing and Design Innovation Institute (DMDII) Executive Committee as a Tier 2 academic representative.

ENGINEERING TECHNOLOGY

PROFESSOR GENE LIAO was named to the new Expert Educator Team (EET) for the Aligning Technology and Talent Development initiative of the Lightweight Innovations for Tomorrow (LIFT) manufacturing institute, the Association of Public and Land-Grant Universities (APLU), and the National Center for Manufacturing Sciences (NCMS).

FACULTY MEMBERS EMMANUEL SSEMAKULA, ANA DJURIC AND MOHSEN AYOABI were awarded nearly \$90,000 through the SSTEP program for a project called ALERT (Active Learning in Engineering Technology) to improve student success rates and nurture interest in targeted courses including statics, dynamics and thermodynamics.



MECHANICAL ENGINEERING

WAYNE STATE'S FORMULA SAE TEAM, Warrior Racing, came in 10th place out of 80 teams for the second year in a row at the Formula West Competition in Lincoln, Nebraska.

INTERDISCIPLINARY

JEREMY RICKLI, ASSISTANT PROFESSOR OF INDUSTRIAL AND SYSTEMS ENGINEERING, AND ANA DJURIC, ASSISTANT PROFESSOR OF ENGINEERING TECHNOLOGY, collaborated with Oakland Community College faculty to receive a \$309,000 National Science Foundation grant to fund a cobot learning program.

FOUR INTERDISCIPLINARY RESEARCH TEAMS comprised of College of Engineering faculty were awarded funds ranging from \$50,000 to \$100,000 from Wayne State's Michigan Translational Research and Commercialization (MTRAC) program for various projects related to medical devices and biomedical materials.

ENGINEERING STUDENTS ERIN KRONELL, JUSTIN BEKKER, ALI ASADI, AMANDA NOWICKI, AND AARON WILLCOCK joined representatives from all 13 Wayne State schools and colleges in Lansing to meet with over 70 legislators at the Michigan State Capitol in March.

DOCTORAL STUDENTS JAVAD ROOSTAEI (CE) AND MELISSA WRABEL (BME) were among the first place finishers at the WSU Graduate and Postdoctoral Research Symposium in March. Saeed Zamanzad Gavidel (ISE) placed third.

THE COLLEGE OF ENGINEERING HOSTED THE FIFTH ENGINE COMBUSTION NETWORK workshop, bringing experts from 14 countries and 19 labs to Detroit to promote the development of fuel efficient, low emission engines.

FENCERS ZIAD ELSISSY (ME) AND ZUZANNA SOBCZAK (CE), AS WELL AS SWIMMER MANUELA FERREIRA (CHE), were voted to the Academic All-America At-Large First Team by the College Sports Information Directors of America (CoSIDA).

THE WAYNE STATE UNIVERSITY COLLEGE OF ENGINEERING

is pleased to announce the addition of six outstanding scholars to its faculty



MOHAMMAD RADWAN AHAWARI, ELECTRICAL AND COMPUTER ENGINEERING

Mohammad Radwan Alhawari will join the WSU faculty in winter 2018. Alhawari earned his Ph.D. in electrical and computer engineering in 2016 from Khalifa University in Abu Dhabi, and is currently a postdoctoral research fellow at the Khalifa Semiconductor Research Center focusing on low-power designs for energy-harvesting applications. His other interests include biomedical applications and sensors, power delivery and storage, and wearable self-powered health care devices. Alhawari's work has been published in numerous IEEE publications, and he holds two U.S. patents with several others pending.



SUZAN ARSLANTURK, COMPUTER SCIENCE

Suzan Arslanturk is a former assistant professor at Ozyegin University in Istanbul. She also worked as a health care research analyst for Improvement Path Systems while completing her Ph.D.

at Oakland University in 2015. Suzan's research interests include medical data analysis, biomedical informatics, simulation modeling and predictive analytics. From 2011-14 she was a research scholar at the OU Biomedical Engineering Lab.



TIMOTHY DITTRICH, CIVIL AND ENVIRONMENTAL ENGINEERING

Timothy Dittrich spent the last five years as a postdoctoral research associate at Los Alamos National Laboratory in New Mexico, conducting research for the Department of Energy's Used Fuel Disposition campaign. His interests include contaminant transport modeling, studying how small clay particles

help radioactive materials move faster through shallow surface and groundwater environments. Dittrich earned his Ph.D. in civil and environmental engineering from the University of Colorado – Boulder in 2012, and worked as an NSF Fellow teaching science and engineering to high school students at Skyline High School in Longmont, Colorado.



HELEN DURAND, CHEMICAL ENGINEERING AND MATERIALS SCIENCE

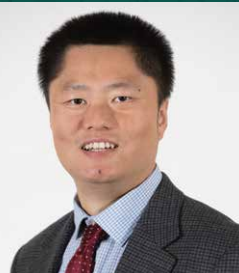
Helen Durand, who received her Ph.D. in chemical engineering from the University of California, Los Angeles earlier this summer, was the graduate student winner of the Harry M. Showman Prize, which recognizes students who have effectively communicated the achievements, research, results or social significance of any aspect of engineering. In 2014, she was the school's Edward K. Rice Outstanding Master's Student, and this year was a co-recipient of the Chemical and Biomolecular Engineering's Department Outstanding Ph.D. Student award. She previously worked at a materials and processes engineer at Aerojet Rocketdyne for more than two years while completing her master's.



CAROLYN HARRIS, CHEMICAL ENGINEERING AND MATERIALS SCIENCE

Carolyn Harris has been an assistant professor of neurosurgery in the WSU School of Medicine with a joint appointment in biomedical engineering since 2014. She is internationally recognized as an

expert in hydrocephalus, a brain disorder that causes an accumulation of excess cerebrospinal fluid. Harris investigates shunt obstruction and infection utilizing unique model systems, and her research has been broadly funded by the National Institutes of Health and focused foundations. Harris received her Ph.D. in 2011 from the University of Utah.



YANCHAO LIU, INDUSTRIAL AND SYSTEMS ENGINEERING

Yanchao Liu is a data analytics expert with several years of industrial experience, most recently as the director of brand marketing analytics for Catalina USA in Chicago. Liu was a data scientist and advanced

analytics manager at Sears Holdings for three years, and an optimization researcher for the Wisconsin Institute of Discovery from 2010-14. He has published his research in Energy Policy and IEEE Power and Energy Society journals. Liu holds a Ph.D. in industrial and systems engineering from the University of Wisconsin – Madison.



FACTS & FIGURES



TOTAL ENROLLMENT:
3,699 STUDENTS

LEVEL

UNDERGRADUATE:
2,362
(63.9%)

GRADUATE:
1,337
(36.1%)



FULL/PART TIME

FULL TIME: 2,631 (71.1%)
PART TIME: 1,068 (28.9%)



GENDER



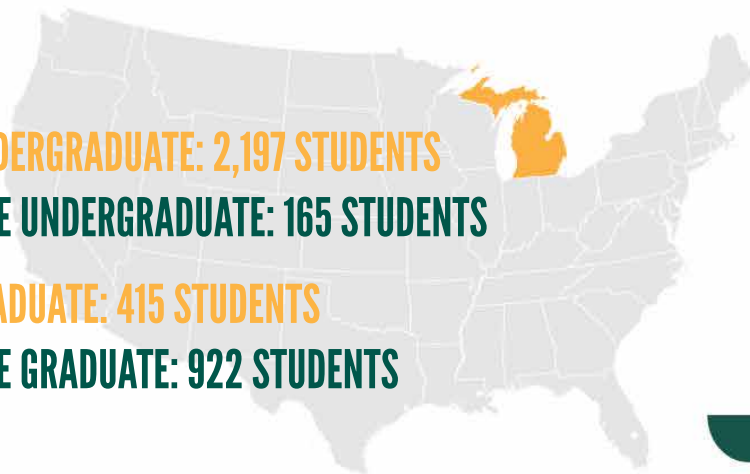
MALE: 2,886
(78.0%)

FEMALE: 813
(22.0%)



RESIDENCY AND LEVEL

IN-STATE UNDERGRADUATE: 2,197 STUDENTS
OUT-OF-STATE UNDERGRADUATE: 165 STUDENTS
IN-STATE GRADUATE: 415 STUDENTS
OUT-OF-STATE GRADUATE: 922 STUDENTS



CLASS LEVEL

FRESHMAN: 492 (13.3%)
SOPHOMORE: 395 (10.7%)
JUNIOR: 541 (14.6%)
SENIOR: 934 (25.3%)
MASTER'S: 1,034 (28.0%)
DOCTORATE: 303 (8.2%)

**All figures represent fall 2017 unless otherwise indicated*

FULL-TIME FACULTY: 135



FULL-TIME STAFF: 52

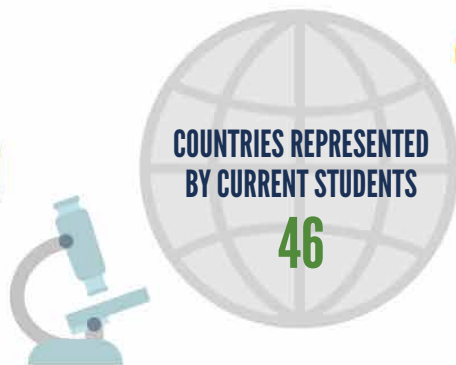
DEGREES AWARDED IN 2017

BACHELOR'S: 284

PH.D.: 42

MASTER'S: 448

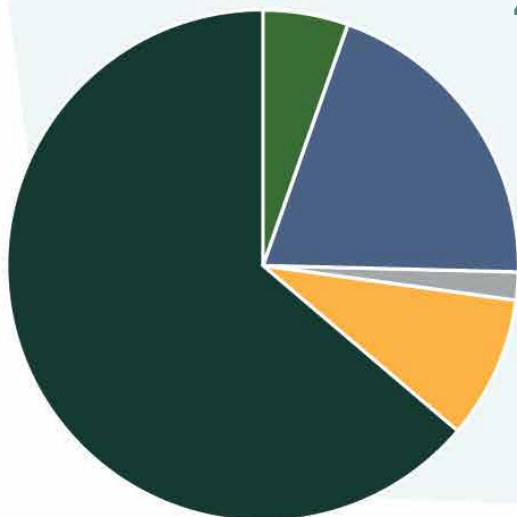
CERTIFICATE: 3



RESEARCH EXPENDITURES

2016 FISCAL YEAR

\$18,993,000



NATIONAL INSTITUTES OF HEALTH: \$1,021,000

NATIONAL SCIENCE FOUNDATION: \$3,811,000

DEPARTMENT OF ENERGY: \$319,000

DEPARTMENT OF DEFENSE: \$1,737,000

ALL OTHER FED/STATE/LOCAL AGENCIES, PRIVATE INDUSTRY, ETC.: \$12,105,000

*All figures represent fall 2017 unless otherwise indicated

College of Engineering

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