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Spring 2018

## The Circuit, Spring 2018

Department of Electrical and Computer Engineering, Michigan Technological University

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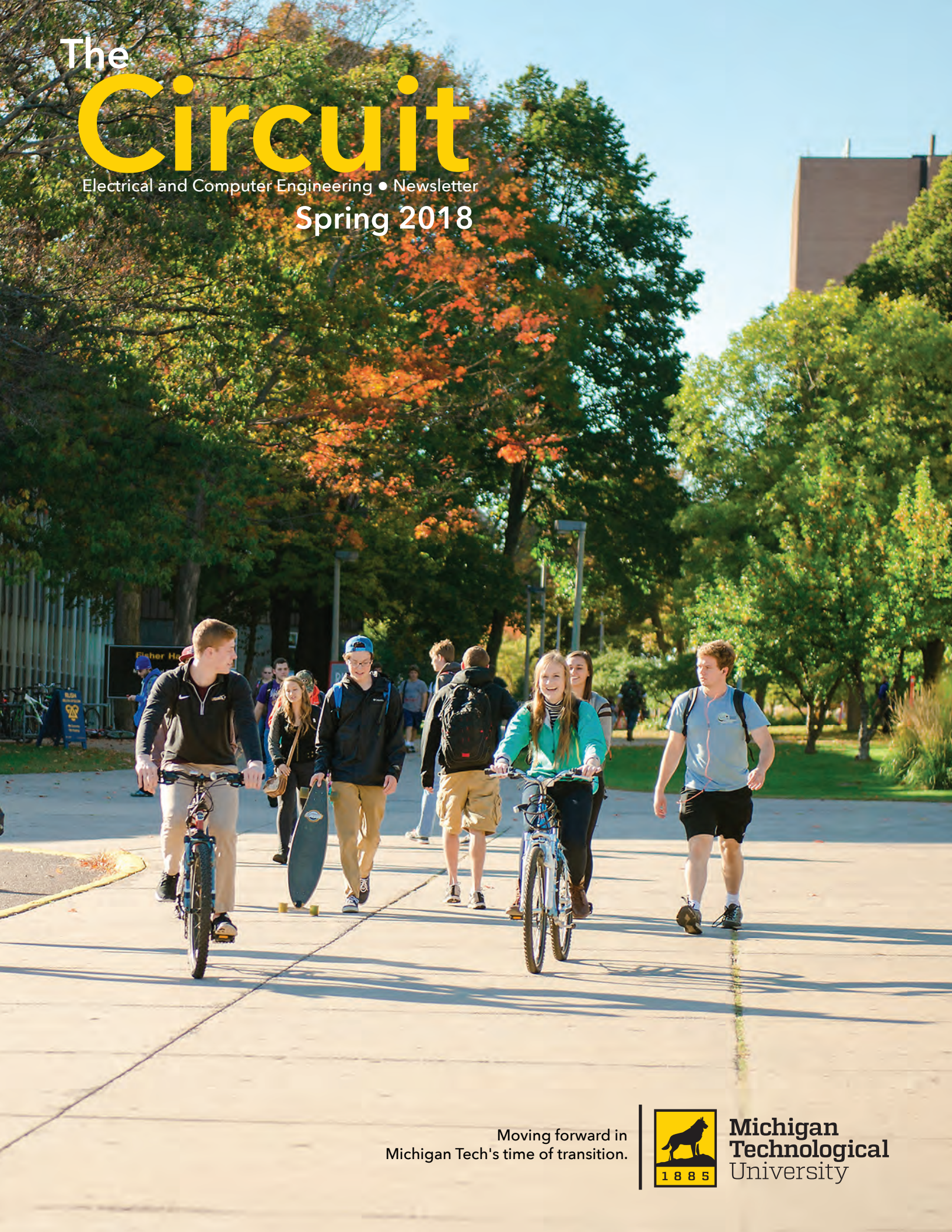
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# The Circuit

Electrical and Computer Engineering • Newsletter

Spring 2018



Moving forward in  
Michigan Tech's time of transition.



**Michigan  
Technological  
University**



## From the Chair

Daniel R. Fuhrmann  
Dave House Professor and Chair

Cheerful greetings to all our alumni and friends from the electrical and computer engineering department at Michigan Tech—our winter wonderland of technology development and engineering education! I am pleased to bring you the latest edition of our newsletter, *The Circuit*, describing many of our activities and accomplishments from the 2017 calendar year.

This has been a very interesting year of transition at Michigan Tech, as we have been engaged in simultaneous searches for a new president and four academic deans. The casual observer might think that this was the result of some crisis at the University, but in fact, it is just a highly unusual coincidence of multiple retirements. All of the searches are complete and the leadership is in place for the real transition, which starts next year. Our new president is Rick Koubek, who officially begins his tenure at Michigan Tech on July 1. You can read all about Dr. Koubek

on the University website ([mtu.edu/president-elect](http://mtu.edu/president-elect)). I am also excited to welcome Janet Callahan from Boise State University to Michigan Tech as the new Dean of the College of Engineering. I am optimistic about our future and believe that the University is in good shape.

Times like these create opportunities for introspection, and at Michigan Tech, we decided this was a good time to think about what we are doing in the area of computing and information sciences. At the request of the provost, I have been leading a working group on this topic and our activity is described in a separate article in this newsletter. Our recommendations have been submitted; our group sees both a need and an opening to change the way we approach computing. This is worth a serious University-wide conversation, and I am doing what I can to get it started.

Meanwhile, the ECE department continues to do what we do best: carrying out exciting research and preparing the next generation of electrical and computer engineers to enter the workforce. As always, we highlight the activity of several faculty members we think you should know about, including Sumit Paudyal, Zhuo Feng, and Elena Semouchkina. I am especially grateful for the hard work of Senior Lecturer Kit Cischke, who is profiled in this issue. Kit does a tremendous job in teaching and

student mentoring; this year he has taken on an administrative role as well. I am proud of the fact that, unlike at many other institutions, our non-tenure-track lecturers are full voting members of the department and are treated with the respect they deserve.

We are profiling some of our alumni in this issue as well, and I especially want to recognize alumnus Jim Fugere '61 and his wife, Marlene. The Fugeres have been quietly supporting the ECE department for many years, with annual contributions that have had a huge impact on the department, from our renovation of the fifth floor of the EERC, to the growth and development of our program in robotics and automation. Our newly renovated conference room now bears their name.

If you see anything here that strikes a chord, please feel free to call or drop me a line—as you might gather, I love talking about Michigan Tech and the ECE department. If you just want to talk about skiing, we can do that, too. You can follow me on the weekly blog post, "Fridays with Fuhrmann," on the department website, and we are on Facebook and Twitter, too. No matter how you do it, stay in touch and let us know how Michigan Tech has made a difference in your lives.

A handwritten signature in black ink that reads "Dan Fuhrmann". The signature is written in a cursive, slightly slanted style.

### On the Cover

Michigan Tech begins leadership transition with the hiring of new president and four deans.

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## Fugere Generosity Creates Opportunities



The dictionary defines “opportunity” as “an advantageous combination of circumstances.” Through their gracious generosity, James and Marlene Fugere have been empowering those circumstances and creating numerous opportunities for students and researchers at Michigan Tech for nearly 20 years.

Jim Fugere earned his Bachelor of Science in Electrical Engineering from Michigan Tech in 1961. Starting his career at Control Data Corporation in Minneapolis, Minnesota, he then moved on to become vice president of hardware engineering at Computer Communications in Los Angeles, California. In 1982, Jim was one of six who formed McData Corporation of Boulder, Colorado, a company producing fiber channel switches and software for storage area networks, which let users anywhere on

a network share storage devices—a groundbreaking new technology of the time.

Jim recalls that, in 1961, he had to learn digital logic design and computer organization through on-the-job training, and wanted to be sure that future generations of students would be well grounded in these topics by the time they left school. His wish has come true, as these topics are now staples in undergraduate degree programs in electrical and computer engineering at Michigan Tech and many other engineering schools in the country.

In 1995, McData was acquired by EMC Corporation and Jim remained with the company until retiring in 1997. During this time, Jim and his wife Marlene began to pursue a different kind of life ambition and established the Fugere Family Foundation, providing support to charitable and educational activities that promote social welfare and assist in the relief of the poor and homeless. The Fugere Family Foundation has been a reliable and consistent supporter of the Michigan Tech ECE department, with annual gifts dating back to 1999 targeted toward computer engineering, but otherwise unrestricted. The Fugere funds were instrumental in enabling the 2010 renovation of the fifth floor of the EERC, former home of the Seaman Mineral Museum, and now home to the Institute of Computing and Cybersystems, with multiple faculty and graduate student offices, and one of the best gathering spots on campus for social events overlooking the Portage.

Most recently, the Fugere Foundation has made possible for the ECE department to accelerate its presence in robotics, control, and automation, through gifts to the Robotic Systems Enterprise and our student team in the GM/SAE AutoDrive Challenge. Our students now compete in the arena of autonomous vehicle design, which in addition to all the technical challenges, includes the ethical and social aspects of self-driving cars.

In recognition of their generosity over the years, the refurbished conference room on the fifth floor of the EERC now bears the names of James and Marlene Fugere.

### Writing & Editing

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### Design

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# Faculty News

Jan. 1, 2017-Dec. 31, 2017

## Promotion and Tenure



**Joshua Pearce** was promoted from associate professor with tenure to professor with tenure. The ECE department congratulates Professor Pearce on this accomplishment, and on all his achievements in research and teaching.

## Awards

**Glen Archer** received the 2017 Jackson Center for Teaching and Learning Award for Large Class Teaching.

**Jeff Burl** was awarded an Erskine Fellowship and taught the spring 2017 semester at the University of Canterbury, Christchurch, New Zealand.

**Lucia Gauchia** was promoted to IEEE senior member.

**Saeid Nooshabadi** received the Royal Society International Exchange Award for collaboration between the University of Newcastle and Michigan Tech.

## Professional Service

**Glen Archer** was appointed to serve on the Accreditation Board for Engineering and Technology as an Engineering Accreditation Commission evaluator (ABET EAC).

**Leonard Bohmann** is the treasurer of the IEEE Education Society and serves on the board of governors. He is a member of ABET EAC and serves as a team chair on accreditation visits. He serves on the Finance Committee of the Women in Engineering ProActive Network (WEPAN) and is the faculty advisor for Michigan Tech's chapter of the engineering honor society, Tau Beta Pi.

**Jeremy Bos** was reappointed SPIE Scholarship committee chair for 2018 and serves as a conference chair for Laser Propagation through Atmospheres and Oceans. Bos also serves as associate editor for *Applied Optics*.

**Bo Chen** serves as associate editor of the *IEEE Transactions on Intelligent Transportation Systems*.

**Durdu Guney** serves on the editorial board of *Nanomaterials and Nanotechnology*, is associate editor of *Nanodevices*, and serves on the program committee for the SPIE Conference on Defense + Commercial Sensing.

**Tim Havens** serves as associate editor of *IEEE Transactions on Fuzzy Systems* and was appointed executive director of Michigan Tech's Data Science Program. He also serves on the technical program committee for IEEE International Conference on Fuzzy Systems.

**Bruce Mork** serves as the IEEE Working Group (WG) chair on Ferroresonance, the IEEE WG chair for Power Globe, and is a member of the Scientific Advisory Board for the Norwegian Smart Grid Center.

**Saeid Nooshabadi** presented a full-day tutorial at the International Symposium on Circuits and Systems about circuits and systems on machine learning. He also presented a full-day tutorial at the Canadian Conference on Electrical and Computer Engineering about circuits and systems on statistical data processing.

**Aurenice Oliveira** was appointed to serve as an ABET EAC evaluator. Oliveira has also joined the Pavlis Honors College leadership program as faculty site coordinator for a new project site in Brazil.

**Sumit Paudyal** serves on the Customer Systems Committee for IEEE PEs Smart Buildings, Loads and Customer Systems.

**Chee-Wooi Ten** is a member of the editorial boards for the *IEEE Transactions on Smart Grids and Sustainable Energy, Grids, and Networks*.

**Reza Zekavat** served as workshop chair on Space Solar Power for the 2017 IEEE Wireless for Space and Extreme Environments Conference. He serves on the editorial boards of Springer's *International Journal of Wireless Information Networks* and the *Global Science & Technology Forum's Mobile Communications, Networking, and Applications* journal.

## Sabbatical Activity

**Saeid Nooshabadi** is spending the 2017-18 academic year with Ford Research and Innovation Laboratory in Palo Alto, California. As part of the autonomous vehicle team, Nooshabadi is working on computer vision and data analytics, including a patent-pending project for Ford.

**Joshua Pearce** received the Fulbright-Aalto University Distinguished Chair for 2017-18 and is working in Finland for the year.

## Faculty Early Career Award: Sumit Paudyal



Congratulations to Sumit Paudyal, who won a five year, \$500,000 National Science Foundation (NSF) Early Career Development Program Award (CAREER). The award is NSF's most prestigious and is intended to support faculty early in their careers who exhibit strong potential to lead and advance research and education in their departments or universities.

Paudyal is interested in improving power grid efficiency by focusing on the advancement of resources on the consumer level—like electric vehicles and energy storage systems—as opposed to the more traditional path of advancement for legacy power providers like coal plants.

NSF's generous award will aid Paudyal in his development of a computational method for small distributor energy sources. Additionally, he will use the funds to facilitate several educational outreach activities which include: training online and traditional undergraduate and graduate students of level power engineering; motivating K-12 students to pursue STEM fields through activities connected to Michigan Tech's Smart Grid Operations Center; and bringing Tech's Mobile Microgrid Laboratory to Texas and South Dakota to engage minority student populations in the study of power engineering.

## Meet the Newest Members of the ECE Faculty and Staff



### John Pakkala

In July 2017, Pakkala '01, returned to Michigan Tech as both the graduate academic advisor for electrical and computer engineering, as well as an adjunct assistant professor, teaching courses on automatic control systems, circuits, and power systems. Pakkala is no stranger to

Michigan Tech's ECE department, as he earned both his master's '99 and doctorate '01 in electrical engineering here. During his time away from Tech, Pakkala was an associate professor of mechanical engineering and held the position of program director of mechanical engineering technology at the Milwaukee School of Engineering. He also held appointments as director of a dual-degree program and instructor of vehicle dynamics at Fachhochschule Lübeck (translation: University of Applied Sciences) in Lübeck, Germany, as well as consulting positions for electric power companies and automotive manufacturers. Pakkala also has more than two decades of industrial experience.



### Anthony (Tony) Pinar

After earning his bachelor's '11, master's '14, and doctoral '17 degrees in electrical engineering from Michigan Tech, Pinar joined the department in August 2017 as lecturer and Senior Design coordinator. Pinar brings both academic and professional experience to the classroom.

Prior to pursuing his graduate degrees, he was an electrical design engineer at GE Aviation; he continues to work as an independent consultant and research engineer for the Advanced Power Systems Research Center in the Department of Mechanical Engineering-Engineering Mechanics at Michigan Tech. His continued work in industry, coupled with his active scholarly publication schedule, benefits students in his courses.

# Sparsifying Graphs for Faster Data Processing



As Big Data gets bigger, it begs the question: How can we code algorithms scalable to handle increasing complexities due to network size?

Spectral graph sparsification computes ultra-sparse graph proxies that can greatly accelerate numerical and graph-related applications. Zhuo Feng, associate professor of electrical and computer engineering, recently proposed a highly scalable algorithm that tackles computational challenges for analyzing large graphs, as well as nanoscale integrated circuit problems. In June, Feng will present at the 2018 Design Automation Conference in San Francisco. The Design Automation Conference is a leading conference in the area of electronic design automation.

Metaphorically speaking, a transportation network between

communities can be considered as a graph in which cities are the nodes and the roads are the edges. Feng's work on similarity-aware spectral graph sparsification allows us to dramatically reduce the complexity of big graphs according to a desired approximation quality level. For instance, using many country roads could help connect the cities, but building one highway would potentially provide faster transportation between any of them.

Additionally, the highway must be as high of quality as the country roads, while getting people to their destinations faster. Spectral sparsification aims to maintain the most important edges (highways) in a much sparser graph, so that the distances between nodes in the original graph can be well preserved.

"Graph sparsification algorithms can reduce the original graph into a

much smaller one that allows running graph and numerical algorithms in a more scalable manner," Feng says. "People want to do machine learning or data mining, and our research will allow them to do that more efficiently. If you have a network with 100 million edges and a few million nodes, you can reduce that to a much sparser one with only a few million edges—a 100-fold reduction in graph complexity."

For instance, based on Feng's spectral graph sparsification framework, his group recently introduced a highly scalable spectral clustering and graph partitioning algorithm that can potentially benefit many graph-based data mining and machine learning applications.

From this research, Feng's team has developed a software known as GRAPh Spectral Sparsifier (GRASS). GRASS is being tested or used by dozens of researchers worldwide. Additionally, Feng's team is also collaborating with researchers from the University of Illinois Urbana-Champaign and the University of Notre Dame to work on reduction of deep neural networks and spectral methods for big graph analytics.

"We hope more people will start to use the software," Feng says, noting that though it is currently only available on Linux operating systems, it could be made more widely available if demand calls for it. "It could become a standard tool for processing large graphs."

Feng's research has been supported most recently by Keysight Technologies, as well as three NSF awards (including a CAREER award), a Michigan Tech Research Excellence Fund award, and Intel Corporation.

# Manipulating Electromagnetic Waves by Artificial Materials



Strip away the extraneous, and at its most basic, Elena Semouchkina's work is about controlling electromagnetic waves; namely, making them travel uncommon paths in media formed by artificial materials. The outcomes include developing unusual devices, such as invisibility cloaks, and creating novel high-frequency probes to increase the resolution of Magnetic Resonance Imaging (MRI). These two lines of research have been funded by the National Science Foundation (NSF).

Current MRI machines typically use coils to test responses of samples in alternating magnetic fields. By introducing antennae instead of coils, it is possible to increase the uniformity of high-frequency fields, which greatly increases imaging resolution. Semouchkina's research group designs unconventional antennae structures for ultra-high field MRI. Graduate student researcher Navid Gandji has spent time at collaborating institution Pennsylvania State University to test the probe prototypes at the university's High Field Magnetic Resonance Imaging Facility. Though the high-field, high-frequency

MRI is not intended to be used for humans, it promises significant advances in animal and cell studies.

Another topic of research, employing the concepts of transformation optics for creating invisibility cloaks and other unconventional devices, is one Semouchkina has pursued for years. She uses metamaterials and photonic crystals, instead of natural materials, to create transformation media capable of bending wave paths, altering their speed, and even moving them with superluminal phase velocity. This promises numerous applications in the fields of health, defense, and communications, among others.

Metasurfaces—planar arrays of resonators rather than bulk metamaterials—offer a new direction of research in the field, an area Semouchkina sees her research evolving toward.

"By manipulating the geometry and material properties of resonating particles, we can make incident waves scatter in desired directions," Semouchkina says. "This opens new ways in creating nano-scale optical devices."



# Taking A Close Look at Computing

There is no question that Michigan Tech is a great school for getting an engineering education, as many of our alumni and industry partners can attest. The College of Engineering can claim roughly two-thirds of all the undergraduate majors, and most of the departments are ranked in the top 100 in their disciplines nationwide.

The story of computing at Michigan Tech is a little different. While there are many talented people and a lot of good work being done, the computing and information sciences side of Michigan Tech does not yet enjoy the same reputation as their colleagues in engineering.

In an effort to understand ourselves better, and to better position the University as a go-to institution for education in computing and related areas, Provost Jackie Huntoon formed a Computing and Information Sciences (CIS) Working Group and asked me to lead it.

Our charge was to develop recommendations to promote growth, in size and quality, of our degree programs and the University's research portfolio in computing and information sciences in the broadest sense; and to deliver those recommendations to the provost by the end of the spring 2018 semester.

The CIS Working Group was fairly small—nine faculty members from various units across the University—but we also held meetings with a larger CIS Advisory Group, about 50-60 people, to kick around ideas and receive feedback.

We divided our tasks into three phases, and each phase concluded with a meeting with the Advisory Group. In the fall 2017 semester, we did some benchmarking against

other universities, looking particularly at how they are organized and where computing and information sciences sit within that organization. In the early part of the spring 2018 semester, we took a closer look at computing at Michigan Tech—our institutional history, the trends in enrollment and research activity, the various ways in which we collaborate, and so forth. In the latter half of the spring 2018 semester, we conducted interviews and paid personal visits to a few institutions that we found particularly interesting.

In our benchmarking exercise, we looked at more than 90 universities, including all universities in Michigan, all universities in the US considered “technological” universities in some sense, as well as universities with the best departments of computer science, and universities with a distinct academic unit devoted to computing, such as a “College of Computing” or something similar. We were surprised by the variety of organizational models; we take note of the possibility that maybe we are not the only ones having such a discussion.

In some universities there are departments of computer science outside a college of engineering, as is the case at Michigan Tech. At many universities, there is a department of computer science inside a college of engineering, and in some of those universities the unit is called the “College of Engineering and Computer Science” or something similar. There are some universities that have no college of engineering but still have departments of computer science. Finally, there are universities that have a separate “College of Computing,” which of

course was no surprise since we were specifically looking for such universities. Those universities include Georgia Tech, Northeastern, and University of California-Irvine. Creating a new academic unit is a pretty radical step, by university standards, and that certainly aroused our curiosity.

Based on the information we gathered, along with our own reflections and sometimes heated discussions, we crafted recommendations to the provost, which were submitted mid-May.

While it is too early to make those recommendations public, before the University administration has had time to review them, I will say that the CIS Working Group does see the need, and the opportunity, to make some pretty significant changes that will increase our footprint in computing.

All this activity is taking place in the context of major changes in University leadership, which is described elsewhere in this newsletter. It is no accident that we are carrying out this investigation at this moment in the University's history, with its unprecedented opportunity for change. My personal belief is that in this era of the Fourth Industrial Revolution, the Internet of Things, and everything that goes with it, Michigan Tech has an obligation as a technological university to have the same visibility and impact in computing as it does in engineering. Now that the CIS Working Group has completed its task, I will continue to work toward that goal, or whatever goal related to computing that the new University leadership considers appropriate.

— Dan Fuhrmann

## COVOX is My Co-Pilot



It was five years ago this May, on a calm morning in the Keweenaw, when Warren Perger invited a few friends to take a ride with him in his plane. He was flying to his hometown of Phillips, Wisconsin, and thought it would make a nice day trip for the foursome. But as late spring weather goes in the UP, conditions quickly changed. Somewhere mid-flight, the blue skies turned gray and a heavy layer of fog blanketed the area. If that wasn't challenging enough, the engine warning light illuminated.

Minutes can seem like hours when a pilot is fumbling to find the emergency checklist. Once in hand, the reading of action items hastily begins. As nonpilots, Perger's passengers were no help. It was this experience that inspired Perger to devise a solution to paper checklists for private aircraft pilots through voice recognition.

As an electrical engineering professor, Perger drew from his knowledge of parallel processing and programming threads to create a hands-free response to a pilot's voice command for customized take-off and landing checklists, emergency procedures including location of nearest airport, and more. The system interfaces between an iOS device and the audio panel of an aircraft, as the software interacts with the downloaded FAA database. Use of an iOS operating system has its advantages, especially

because most pilots already have iPhones or iPads, but it also means on-going programming to synchronize with the latest updates. These considerations are just the technical side of the equation. The other side is getting the product to market.

Perger began working with MTEC SmartZone to create his company, CMX Avionics, LLC. SmartZone provided valuable resources including contact with a patent attorney, assistance in creating an advisory board, entrepreneurial training, referrals, and connection to Monte Consulting. Instead of flying solo, Perger was introduced to a wide-range of resources with extensive business experience. Advice he would give to anyone just starting out with a new idea: Form a team!

This past-year, Monte Consulting helped design the new technology's trademark COVOX and pilots will soon be able to purchase the application in the Apple App Store. Other modifications in the works includes replacing the current wired connection to the audio panel with a wireless version via Bluetooth.

Perger's love for flying is somewhat meditative. "You have to be in the moment," he says. No other thoughts take precedence over the here-and-now when you are 10,000 feet in the air. And thanks to his voice recognition system, the location of a paper checklist won't be on a pilot's mind, either.

## Taking on New Departmental Roles



### Graduate Programs Director, Mike Roggemann

Mike Roggemann, professor of electrical engineering, stepped into a new role as graduate programs director in fall 2016. In addition to his research and teaching in photonics and optics (among others), as graduate director, Roggemann sets policies for the graduate program. The department currently has 53 PhD students and 141 MS students. Part of Roggemann's role is to help recruit more graduate students, a goal he believes will be attained through the department's new online degree program. Through a partnership with KeyPath Education, the Department of Electrical and Computer Engineering has offered online programming for more than a decade—including an online Master of Science in Electrical Engineering (MSEE) that focuses on power and energy. A new program, to begin fall 2018, is an online MSEE program with a communications and signal processing focus. Roggemann is excited that the program will offer more people who would like to have a master's degree from Michigan Tech the opportunity. The first course in the new online master's degree program will be offered fall 2018. The course, tentatively titled Mathematical and Computational Methods for Engineering, will focus on foundational math and computer programming skills to make sure all incoming students are on the same page. Roggemann has been a faculty member in the department since 1997.



### Undergraduate Programs Chair, Christopher (Kit) Cischke

Christopher (Kit) Cischke, senior lecturer of computer engineering, became undergraduate programs chair in fall 2017. Cischke is enjoying his new role, which includes managing the electrical and computer engineering learning center and running the department Twitter page. He says that his new role fits into his interest of working closely with students, of which the department has approximately 280 computer engineering and 350 electrical engineering undergraduate students. As undergraduate programs chair, Cischke says his focus is ensuring that "students are prepared for the market, without ever losing touch with what we're good at—our education in power systems." To prepare students to meet employers' expectations for Michigan Tech graduates means regular updates to the curriculum. Cischke says, "One of the fun challenges about being in this department is that the state of the art is always changing. Our curriculum constantly has to change and be updated with what employers expect our students to graduate with." To keep up to date, Cischke oversees three initiatives in the department to meet current industry expectations: 1) Preparing students to become programmable logic controls engineers for work in manufacturing environments; 2) teaching more courses in circuit board design; and 3) making headway in cybersecurity, with the goal of becoming a center of excellence for students to leave the program with a good security education. Cischke has been a member of the department since 2005.

## Graduate Students Spotlight



### Hanieh Deilamsalehy '17

Congratulations are in order for Hanieh Deilamsalehy, 2017 electrical engineering PhD graduate and software engineer at Microsoft in Redmond, Washington. Deilamsalehy received her Bachelor of Science in Electrical Engineering from K. N. Toosi University of Technology in Tehran, Iran, and her Master of Science in Medical Radiation

Engineering from Amirkabir University of Technology, also in Tehran. She began her tenure at Michigan Tech in 2012 to pursue an MS and PhD in Electrical Engineering.

During her final semester before graduation (spring 2017), Deilamsalehy applied her education as an autonomous

vehicle engineer intern at the Ford Research and Innovation Center in Silicon Valley in Palo Alto, California. She credits her Michigan Tech education for landing both the internship and her current full-time position at Microsoft.

Her dissertation research in sensor fusion and localization, coupled with her internship at Ford in the same field, made her an ideal candidate for the position at Microsoft. In her work as a software engineer, she says she is refining skills that were established during her studies at Tech, under the direction of her advisor, Professor Timothy C. Havens. Havens describes her as "a paragon of the excellence to which all PhD students should strive. She is very deserving of her success and I couldn't be more proud. I look forward to the time when she comes back to visit us to tell us about all the cool things she is accomplishing."



### Ian Thomas Cummings

In March 2016, Ian Thomas Cummings was awarded a National Science Foundation (NSF) Graduate Research Fellowship. While finishing up the last semester of his Bachelor of Science in Computer Engineering at Michigan Tech, he earned dual credit for his Master's in Computer Engineering. He says receiving the fellowship solidified his plans to pursue the doctoral

degree in electrical engineering at Tech.

The NSF's Graduate Research Fellowship is one of the most prestigious and competitive programs supporting graduate study in science and engineering. Cummings' application was one of 18,000 NSF received and one of the 2,000 awards granted.

He partially credits his good fortune to the mentorship he received during his internship at the Los Alamos National Laboratory in 2015. He says mentors guided him through the NSF application and wrote him strong letters of recommendation. With the help of advisor Tim Havens, associate professor of electrical and computer engineering and computer science at Tech, Cummings proposed studying drone dispersal algorithms for plume measurement applications. Cummings says he chose this topic while working with Havens on sonar research for the US Navy.

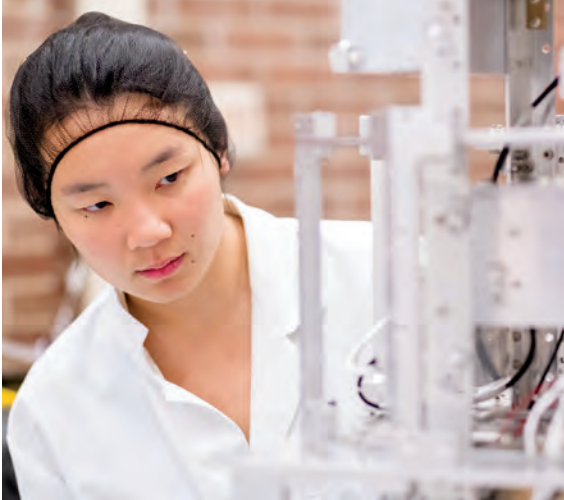
Graduate Research Fellows have the opportunity to conduct collaborative research with international researchers, as well as undertake research internships in

a number of national laboratories in the US; Cummings does both. He conducts collaborative research with his Tech co-advisors Tim Havens and Tim Schulz, professor of electrical and computer engineering at Michigan Tech, and undertakes research internships at MIT Lincoln Laboratory (summers 2017 and 2018). According to Havens, "Ian is independent, creative, wicked smart, and has the motivation and drive to get things done. Because of Ian, we have built a collaboration with MIT Lincoln Laboratory, which involves funding coming to Michigan Tech for his research, and Ian spends the summers at Lincoln among the brightest scientists in his research area. He is a point of pride for our program; it will be fun to watch his career continue to flourish."

Echoing Havens, Schultz describes "Ian's level of maturity and integrity is as high as I've seen in any of the student's I've worked with."

These opportunities and collaborations have led Cummings to the focus of his doctoral project on optimizing the configuration of phased antenna arrays for simultaneous transmit and receive operation, something he studies with Havens and Schulz and Jon Doane at MIT Lincoln Laboratory. This work will make it possible to operate communications links and radar applications at the same time from one phased array, with applications in vehicle networking and sensing, a wide variety of defense platforms, and next generation cellular networks. Having laid the groundwork for narrowband imaging applications, he is now in the midst of research on enabling full-duplex communication links that will dramatically increase achievable data rates between transmitting and receiving nodes.

# Undergraduate Student Spotlight



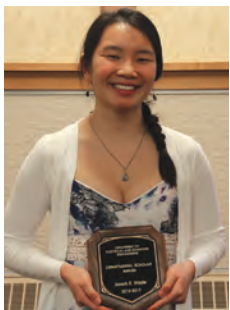
Sarah Wade, recipient of the spring 2017 ECE Departmental Scholar Award, is not your average undergraduate student. With a GPA of 3.83, she's been on the Dean's List at Michigan Tech since fall 2014 and she's a student athlete, participating on the Michigan Tech varsity Nordic skiing and cross country teams. In June 2017, she received a Great Lakes Intercollegiate Athletic Conference All-Academic Excellence Award for her top GPA while running cross country. Later that summer, she installed solar panels, a sustainable garden, and an updated water filtration system in India as a member of the Pavlis Honors College Global Leadership Pathway.

Wade is also a member of the aerospace engineering Enterprise team, busy assembling the Auris microsatellite under the direction of Mechanical Engineering Professor L. Brad King. Last June, another microsatellite Wade helped assemble, the Oculus-ASR microsatellite, was shipped to the Kirtland Air Force Base for its final launch preparations.

## 2017 ECE Student Awards



**Casey Strom**  
Carl S. Schjonberg Award for Outstanding Undergraduate Student



**Sarah Wade**  
ECE Departmental Scholar



**Aref Majdara**  
Jonathan Bara Award for Outstanding Graduate Teaching Assistant



**Elizabeth (Libby) Held and Jenna Burns**  
ECE Woman of Promise, Martha Sloan Scholarship Recipients



**Navid Gandji**  
Matt Wolfe Award for Outstanding Graduate Research Assistant

For more details visit  
[mtu.edu/ece/department/student-awards](http://mtu.edu/ece/department/student-awards)

# 2017-18 Senior Design and Enterprise Sponsor Acknowledgements

## ECE Senior Design

Our Discover-Design-Deliver philosophy is at the core of our Senior Design program, during which students experience a project's entire design process as it would be in industry. Students enrolled in Senior Design work as teams on client-based engineering projects under the consultation of a client representative and the direction of a faculty advisor. Our department's Senior Design experience spans a full year, by the end of which a team has delivered design reviews, a final report, a formal presentation, and an end product to the client. Senior Design Coordinator: Tony Pinar



- **Consumers Energy**—Performance and Protection Characterization of Plug and Play Solar Systems



- **ITC Holdings Corp.**—HMI Annunciator Replacement



- **Stryker Instruments**—Medical Device Tool One-Wire Communication Emulator

## Wireless Communication Enterprise

The Wireless Communication Enterprise (WCE) focuses on wireless, optical, renewable energy, user interface, and biomedical technologies. WCE functions much like an engineering company with a variety of different projects. These small teams allow members to be involved in project work and provide ample opportunity to gain technical skills, business presentation skills, and leadership experience. Advisor: Kit Cischke



- **Ford**—Phase II: Smart Charging EV App Development
- **Ford**—Phase IV: Development of Consumer Electric Vehicle Driving Efficiency Training System

## Blue Marble Security Enterprise

Blue Marble Security is made up of several sub-teams, each working on projects related to security. The goal of Blue Marble is to create sustainable, secure systems for our sponsors—either corporate or within the University. Though located in the ECE department, Blue Marble members come from many other disciplines, including mechanical engineering, computer science, and business. Advisor: Glen Archer



- **Oshkosh Defense**—Oshkosh Baja LCV Suspension Design—Phase I



- **Halla Mechatronics**—Electric Assist Braking System—Phase III (finished December 2017)
- **Georgia-Pacific**—Alternative Power Sources for Product Dispensers (finished December 2017)

## Robotic Systems Enterprise

The Robotic Systems Enterprise is an innovation-driven student team that focuses on integrating knowledge in electronics, robotics, programming, and mechanical principles to solve real-world engineering problems. From designing a soil sample collecting submersible robot, to a power management system for weather buoys, and a counter UAV to prevent invading drones, RSE projects come in all shapes and sizes. Advisor: Jeremy Bos

GENERAL MOTORS

- **General Motors**—On-boarding Enterprise students for rapid contribution on electronics, robotics, and programming projects.



- **SAE/GM**—AutoDrive, a three-year competition for autonomous vehicle design.

**Thank you to all our sponsors!**

# Caring About Each Student



Judy Donahue helps Michigan Tech's electrical and computer engineering students with their academic plans, something she's done for more than 13 years as an academic advisor. Trever Hassell joined the department nearly four years ago. He wears three hats as instructor, senior design advisor, and academic advisor for computer engineering students. Together, Donahue and Hassell help students find their best path and then some.

## More than just a number

With approximately 280 computer engineering and 350 electrical engineering undergraduates enrolled each semester, Judy and Trever help hundreds of students understand their degree requirements and create individual plans to take them from orientation through graduation. They also present information on our ECE educational programs to prospective students and their families who tour Michigan Tech throughout the year.

## Judy Donahue

### What motivates you?

Believing that every individual has a valuable contribution to this life, to society, and to creating the future. That is why I care about each student. Also, I enjoy contributing to the goals of the ECE department and field.

### Is there a particular moment or memory that stands out?

The time one student came in and thanked me for being there for him and encouraging him at a time when he was severely depressed. The fact that I had some positive affect in his life is very rewarding to me. He graduated with an EE degree!

### Goals you most want to accomplish?

One of my goals as academic advisor is to hold each student as valuable to the world and assist them as much as possible as they pursue their undergraduate degree. Ultimately, this will advance the ECE field and help the world.

### Has working with students changed you?

I am naturally very shy. I chose my college major so that I could

work with computers, not people. Now, I love working with students and am very comfortable in one-on-one advising meetings. I also meet with prospective students and their families and enjoy telling them about our programs, something that I couldn't see myself doing when I first started in my position.

### One piece of advice you want young people to know.

Ask questions of your professors, look for internships or co-ops, and study abroad if you can fit it in. Knock on many doors, and just peek inside. You never know what opportunities will come your way!

## Trever Hassell

### Your biggest challenge?

Dividing my workload. Advising and instruction get busy at the same time during the semester.

### Goals you most want to accomplish?

I want to keep moving forward and expand my skill set. I also want to put my family in the best place and situation that will make us have a happy and successful life.

### Has working with students changed you?

I feel I have softened around the edges considerably since joining the ECE department. There are many different perspectives students present to me on a daily basis, more than I've ever before experienced.

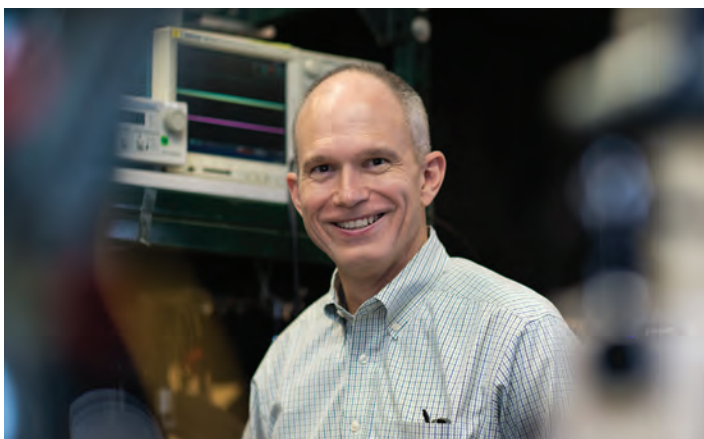
### Mentors/advisors who deeply influenced you?

Many people in my life have helped me along the way. My dad, who taught me the value and reward of hard work. My first professional employer, who taught me the value of doing every job to the fullest. My master's advisor, who demonstrated all the good qualities I will need as an educator.

### One piece of advice you want young people to know.

Do what you enjoy. I enjoyed working with electricity and electrical components from a very early age. I continue to enjoy it to this day.

# Alumni Spotlight: Volunteering the Husky Way



Paul Juodawlakis, BS EE '86, has made volunteering a central part of his life, actively contributing to professional, academic, and community organizations for more than 30 years. While an undergraduate at Michigan Tech, he was a member of the IEEE Eta Kappa Nu (HKN) honor society and he founded the  $i\pi^3R$  (i Pi-Cubed R) social organization, serving as its president from 1983-86. He later served as a member of the External Advisory Committee for Michigan Tech's Department of Electrical and Computer Engineering (2000-15), during which time he supported the department's effort to establish a photonics concentration in the undergraduate curriculum.

Juodawlakis' volunteer work has extended beyond Michigan Tech. After receiving his master's (Purdue University '88) in electrical engineering, and while pursuing his doctorate (Georgia Institute of Technology '99), also in electrical engineering, he volunteered as inaugural coordinator of a seminar series within Georgia

Tech's Microelectronics Research Center. He enjoyed the experience so much that he volunteered as a member of the Microwave Photonics Subcommittee of the IEEE Lasers and Electro-Optics Society (LEOS) Annual Meeting, the predecessor of today's IEEE Photonics Conference. Juodawlakis reflected on his volunteer life in a recent issue of the *IEEE Photonics Society* newsletter writing:

"My volunteer life has been built from the minutes, hours, and days that I carve out of my work life and my personal life to do things like . . . helping to establish a photonics concentration in the electrical engineering curriculum at Michigan Tech, bringing light kits into my son's fifth grade classroom, and coaching youth soccer players on skills, tactics, and teamwork. My volunteer life has also benefited from the skills, experience, and network that I contributed from the work and personal components of my life."

Juodawlakis has been a continuous volunteer for LEOS and the Photonics Society since 2001. In 2017, he was awarded the Society's Distinguished Service Award. He is presently the secretary-treasurer for the Society. Juodawlakis is an assistant leader of the Quantum Information and Integrated Nanosystems Group at MIT Lincoln Laboratory where he leads a team developing integrated photonics technologies for a variety of applications. He also enjoys running, cycling, following Premier League football, collecting eclectic music and compiling annual mixes, and spending time with his wife, Amy, and son, James, in Arlington, Massachusetts.

We applaud Paul for enacting the Michigan Tech values of community, possibilities, and tenacity through his volunteering.

## ECE External Advisory Committee

The mission of the committee is to serve the Department of Electrical and Computer Engineering in an advisory capacity, providing counsel to the department chair and the faculty from the viewpoint of industry. The aim of these activities is to improve the quality of electrical and computer engineering education at Michigan Tech, and to provide ECE graduates who are valuable assets to industry employers.

**David Aho** Eaton Cooper Power Systems

**Ellen Bauman** IBM

**Keith Behnke** Stryker Instruments

**Anthony Champagne** Nexteer Automotive

**Rob Cooke** GS Engineering

**Jonathan Doane** MIT Lincoln Laboratory

**Ben Galloway** Dematic Corporation

**Brett Giem** Chrysler Technology Center

**Gordon Halt** ITC Holdings Corp.

**Steve Kennell** Retired

**David Rowe** Systems Control, A Division of North Star Industries, Inc.

**Eric Larson** 3M Corporate Research

**Ken Leisenring** Ford Motor Company

**William Lepak** ArcelorMittal

**Steve Mathe** Harris Corporation

**David Perry** Independent Consultant

**Matt Schroeder** General Motors

**Jerrod Shaffer** Plexus Engineering Solutions

**Nirmal Singh** Detroit Edison

**Jeff Wells** Retired



## System Control Scholarship Recipients



Heather Harris and Josh Poquette are the 2017-18 Systems Control Scholarship recipients. The students' achievements rose to the top of the 46 submitted applications as the best and brightest. The generous \$10,000 scholarship has been awarded to undergraduate students annually since 2015 by Dave Brule Sr., owner

of Northern Star Industries and its subsidiary, Systems Control. Brule '72 is an alumnus and longtime supporter of Michigan Tech. The Systems Control scholarships are designed to promote the study of electrical power engineering. In addition to receiving their scholarships, Harris and Poquette are now Systems Control Scholars, and are poised to receive internship and co-op experiences at Systems Control (main headquarters in Iron Mountain, Michigan), with the hopes of gaining full-time employment after graduating.

Harris, from Kingsford, Michigan, is an undergraduate student majoring in electrical engineering technology (School of Technology). "I am deeply honored to be chosen as a Systems Control Scholar, and I greatly appreciate Mr. Brule's generosity with these awards. Without this scholarship, I would not have been able to attend Michigan Tech. In the future, I plan to intern at Systems Control and hopefully continue working there because I would love to stay in my hometown."

Poquette, of Iron Mountain, Michigan, is majoring in electrical engineering with a concentration in photonics. He transferred to Tech from Northern Michigan University.