Dear CMU Science and Engineering Family

University employees have a saying that you don't know a new job until you have been through an entire academic year because then you will have seen everything at least once. I have been Dean of CSE (College of Science and Engineering) for a year and a half, so I have officially arrived! I am so impressed with the contributions of our students, staff, and faculty. We continue to be a college that provides world-class learning experiences with a personal touch.

As you will see in this newsletter, we are starting exciting new academic programs like the B.S. degree in Cybersecurity and the InSciTE (Integration of Science, Technology, and Engineering) certificate. The latter will turn the usual educational model on its head, with faculty serving as coaches to multidisciplinary teams of students working on "grand challenge" problems.

Our students continue to pursue their passion for extracurricular activities that give back to the community and help prepare them for their future.

You will read about Central Sustainability, a student-driven office now physically housed within the Department of Geography and Environmental Studies, that has had a remarkable impact over a short time.

Our SAE student vehicle teams, Baja and Formula, were part of an October CSE recognition event at a Chippewas football game. They are pursuing opportunities for electrification and other concepts in advanced mobility critical to the state of Michigan.

On the faculty side, Dr. Carl Lee of the Department of Statistics, Actuarial, and Data Sciences won the Distinguished Professor of the Year Award from the Michigan Association of State Universities, showing how incredible the CSE faculty truly are.

Finally, we continued to build research in the college, surpassing the $7 million mark in new external grants in 2021.

I wish you a happy and healthy new year and Fire Up Chips!

David Ford
Dean, College of Science and Engineering

THE IMPORTANCE OF CYBERSECURITY AND ITS BOOMING JOB MARKET

Cybersecurity is one of the most in-demand job markets in the U.S. in 2022

In 2004, the President of the United States and Congress declared October to be Cybersecurity Awareness Month to help individuals protect themselves online as threats to technology and confidential data become more commonplace.

While the word "cybersecurity" may cause you to envision a hacker on a computer in a dark room in a far-off land, cybersecurity is actually something that you're likely involved in every single day whether you realize it or not.

The annual proclamation released by President Biden declares that Cybersecurity Awareness Month aims to "highlight the importance of safeguarding our Nation's critical infrastructure from malicious cyber activity" as well as raise awareness for "simple steps Americans can take to secure their sensitive data and stay safe online."

Qi Liao, computer science faculty member and professor for Central Michigan University's College of Science and Engineering, shared his expertise on cybersecurity, what is being done to combat Cyber Threats and how CMU is educating future cybersecurity professionals.

Since it is Cybersecurity Awareness Month, why is cybersecurity so important? Why should most people care?

"Thirty years ago, we computer scientists only focused on making things work, such as early versions of Windows, emails and websites. Security was only an afterthought. Nowadays, there is no need to convince anyone security is important. Security is in everyone's daily life. For example, if one falls for a phishing scam they may suffer major financial loss, malware infections may cause major business interruptions and huge financial loss. On a larger scale, security breaches in national infrastructures could cause large-scale power outages, water poisoning, nuclear disasters or more issues."

What are cybersecurity professionals doing to combat issues?

"Traditionally, cybersecurity industries come up with malware signatures, like a vaccine in medicine, whenever a new computer virus comes out. To combat the vulnerabilities, professionals adopt behavioral-based mechanisms utilizing artificial intelligence and machine learnings techniques. While AI/ML-based automations are important, researchers have also used data visualizations to bring humans into the loop for better decision making in terms of cybersecurity situation awareness and investigations. Viewing cybersecurity as a purely technological problem sometimes results in a never-ending arms race between the good and bad sides. Often, economic principles and game theoretical modeling may be helpful to analyze the dynamic interactions between attackers and defenders, ultimately removing the root cause (i.e., financial incentives) of many cybersecurity criminal activities."

We need to train professionals to build safe, secure, and dependable systems, and to trace and fight cyber-criminals. On the other hand, we cannot win the war if we only rely on military soldiers. The vast majority of security incidents are not overly technical but are performed on unaware users so we need people to have security built into their mind. Even simple security education such as: don't click on links on suspicious emails, don't type in passwords on phishing websites, don't set up a Wi-Fi router without a password, etc., can help. A heavily fortified front door is meaningless if the back-door is left open. Security always depends on the weakest link."

How can people get educated on cybersecurity?

"Cybersecurity is one of the fastest growing and in-demand job markets in the world. The worldwide cybersecurity market was valued at $156.24 billion in 2020 and is expected to reach $352.25 billion by 2026. According to Cyberseek, there was an annual talent shortfall of 39,000 information security annalists from May 2021 through April 2022. There are currently 534,548 additional openings requesting cybersecurity-related skills, and employers are struggling to find workers who possess them."

This fall, CMU introduced a new cybersecurity bachelor's degree program through the Department of Computer Science, which compliments the university's cybersecurity graduate program and cybersecurity graduate and undergraduate certificates. The cybersecurity major is interdisciplinary, involving mathematics, management of information systems, computer science and information technology, and integrates closely with the computer science curriculum so students are trained with security in mind. The cybersecurity major prepares students for a variety of in-demand cybersecurity careers, dedicated to securing vulnerable data and information infrastructure and stopping cyberattacks in the digital environment.

Cybersecurity public awareness, education and training opportunities at local community levels and K-12 students at schools also have broad impact on public cybersecurity education.

What can we expect in the future of cybersecurity?

"While I wish I had a crystal ball to predict the future of cybersecurity, I do not, but my research in cybersecurity will focus on the following areas. First, while we are more and more relying on AI/ML-based defense mechanisms, the security of AI/ML is largely unknown. As we move to Internet of Things and autonomous vehicles, research on adversarial attacks on AI/ML-based mechanisms is promising. Second, as we are transitioning to quantum computing, we need to design new security protocols and cryptographic framework. Our current cybersecurity curricula also need to be rewritten under this revolutionary change. Lastly, data-selling ransom ware is inevitable so my near-term research will focus on building prototypes of preventive encryption and deception to defend against it. We must always prepare to be one step ahead of potential attacks."

CSE Professor Honored for Teaching Excellence

Carl Lee among MASU's 2022 Distinguished Professors of the Year

Carl Lee, founding chair and faculty member in the Central Michigan University Department of Statistics, Actuarial and Data Sciences, has been recognized by the Michigan Association of State Universities as a recipient of the 2022 Michigan Distinguished Professor of the Year award. The award recognizes the contributions and dedication of faculty from Michigan's 15 public universities to the education of undergraduate students. Lee is one of three 2022 recipients.

In the award announcement, MASU recognized Lee's significant impact on undergraduate student learning through hands-on learning activities, applied research, experimental learning and innovation.
Lee implements what he calls the P.A.C.E. model of teaching, which emphasizes projects, hands-on activities, cooperative learning and exercises. Lee says his motivation lies in conducting research to investigate how students best learn quantitative concepts.

"As a professor, you must find ways to get students interested and motivated," Lee said. "One way I have been successful is by finding activities that really associate with their daily lives and piques their interest."

Lee is known for designing the undergraduate statistics and actuarial science program at CMU, in addition to creating an interdisciplinary program on campus in data science. This involved coordinating a new degree and major with faculty from four colleges and nine academic departments, said Lee.

Lee said data science has a variety of different applications. "We want students with different levels of experience to have a chance to learn the basics of data science," Lee said. "Using data evidence for decision making is very important in the business industry as well as our daily living, so we think students in all areas should have the opportunity to do that."

Lee said he believes education provides students with hope.

"As a professor, seeing students come into class with disadvantages or high levels of talent they aren't aware of, you want to encourage them to aim higher," he said. "I strongly believe that education, regardless of level, is to provide students with hope and help them see the light at the end of the tunnel."

Of the award, Lee said he is simply grateful to be recognized.

"There are many outstanding faculty deserving this recognition at CMU." Lee said. "I am fortunate and honored to represent our outstanding faculty to receive this award."

CSE Highlight

The College of Science and Engineering at CMU is assuring the rigor and relevance of its programs by aggressively pursuing external accreditation.

In the past year, the Accreditation Board for Engineering and Technology (ABET) continued the accredited status of our Computer, Electrical, and Mechanical Engineering programs for a full six-year period.

ABET Accreditation Board for Engineering and Technology

Our Computer Science program passed the "Readiness Review" stage of initial ABET accreditation, leading to a campus visit. The outcome will be known in summer 2023.

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RESEARCH

Continues to be at the forefront of what **We Do!**

The College of Science and Engineering continues to be a leader in research. Over the last fiscal year, new external grant funding increased from $6.25 to $7.15 million. The largest single new grant was for $600,000 from the U.S. Department of Energy for the nuclear astrophysics work that CMU Physics faculty members Georgios Perdikakis, Alfredo Estrade, Matthew Redshaw, and Mihai Horoi are conducting.