We speak IN CODE

COLLEGE OF
SCIENCE & ENGINEERING

COMPUTER SCIENCE

CENTRAL MICHIGAN UNIVERSITY

Spring 2022

The Computer Science department is pleased to offer our Spring 22 newsletter. We hope you enjoy this newsletter issue, where we highlight our outstanding faculty, students, and alumni.

We also highlight Cybersecurity, a program that will kick off in Fall 2022. The department continues to provide vital education for CPS and IT students and adapt and change to meet their needs.

Please stay in touch and let us know all of the great things we know you are doing!

Sincerely,

Lisa Gandy
Chairperson, Computer Science

Computer Science Faculty

Lisa Gandy, *Chairperson, Associate Professor*
Norm Cregger, *Lecturer III*
Jesse Eickholt, *Associate Chairperson, Professor*
Daniel Grigoletti, *Lecturer II*
Dylan Kelly, *Lecturer I*
Patrick Kinnicutt, *Professor*
Liling Li, *Lecturer II*
Qi Liao, *Professor*
Jay Murthy, *Professor*
Gowri Ramalingam, *Lecturer I*
Alex Redei, *Assistant Professor*
Patrick Seeling, *Professor*
Dakun Shen, *Assistant Professor*
Ahmet Ugur, *Professor*

Staff

Julie Bloom, *Executive Administrative Assistant*

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CYBER SECURITY UPDATE

The Department of Computer Science is on track to launch a new Cybersecurity major in Fall 2022! The Cybersecurity major is committed to providing students with high-quality cybersecurity educational opportunities and skills for successful careers. The latest major provides a comprehensive cybersecurity curriculum.

The security sequence begins with CPS 333 Introduction to Computer Security and Cryptography, which covers the basic knowledge of Cybersecurity area. After that, students can take higher-level security classes focusing on different areas of security, such as CPS 373 Network Security, CPS 375 Social Engineering, Cybersecurity Law, Policy, and Ethics, CPS 463 Hardware Security, CPS 475 Software, Database, and Operating System Security, and CPS 477 Security Informatics: AI and Visualization.

Other cybersecurity areas such as risk management and forensics may be covered through electives from BIS 512, 521, 523, 525, and 530. We believe the new major will provide student-centered education and foster personal and intellectual growth. The major will prepare students for one of the most rapidly growing interdisciplinary fields: Cybersecurity!

ABET VISIT

Over the past few years, the department has diligently worked to gain ABET accreditation. Towards this goal, in 2019, the curriculum for the CS major has changed, and four courses were added to the major. These courses include CPS 270 (Computational Analysis and Simulation), CPS 301 (Social Issues of Computing and Professional Practice), CPS 498 (Senior Design), and ITC 341 (Introduction to Databases and Applications). Also added to the major was a requirement for six natural science coursework credits intended for science and engineering majors. Beyond the more visible changes to the curriculum, the department has been working behind the scenes and adjusted the program's assessment plan, advising strategy, and survey of program graduates.

The department's request for evaluation was accepted by ABET early this year. ABET has agreed to evaluate our CS program for the 2022-2023 accreditation cycle and will be on campus this fall. The ABET team will meet with faculty, visit students and alumni, and review our facilities to determine our compliance with the accreditation criteria and make a recommendation to the CAC regarding the initial accreditation of our CS program in 2023.

ABET is the primary external accreditation body for engineering and computing programs and, through the CAC, accredits programs in computer science, cybersecurity, data science, and information technology.

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ADVANCE GRANT

In August 2019, CMU became one of six higher education institutions to receive the ADVANCE Catalyst Award from the National Science Foundation. Dr. Lisa Gandy, Computer Science chairperson, is one of the Co-PIs of this award.

The National Science Foundation's (NSF) ADVANCE program aims to increase the representation and advancement of women in academic science and engineering careers, thereby contributing to the development of a more diverse science and engineering workforce.

The ADVANCE teamwork centers on finding the barriers to success at CMU for women faculty in STEM. This work has involved leading focus groups, institutional data review, department bylaws analysis, bringing in speakers, and hosting workshops.

The team plans to apply for the next iteration, the "Adaptation grant," in Fall 2022 to implement solutions to challenges uncovered during the data collection process.

ACCELERATED MASTERS

The accelerated master's program at Central Michigan University allows students to count up to 12 credit hours of coursework towards their undergraduate and graduate degrees. By double-counting course work, students can complete their master's degree within 12 months of finishing their bachelor's degree. In addition to shortening the time to graduation, students also benefit by paying the undergraduate credit hour rate for some coursework that counts towards the MS. Students in the program have noted that the accelerated master's allows them to delve into fields like artificial intelligence, cloud computing, and big data, broadening the scope of their studies and turning them into well-rounded developers. The additional coursework at the graduate level affords opportunities to learn how to handle large projects, balance academics and personal life, and conduct research.

FACULTY SPOTLIGHT

Liling Li

Ms. Liling Li is an enthusiastic lecturer in the Department of Computer Science (CPS) at CMU. She teaches a wide range of undergraduate courses, including beginning programming, data structures, computer organization/architecture, multimedia design, and game design.

Liling states: "I joined the CPS department as a lecturer in 2017 and have enjoyed teaching the courses assigned to me. I loved working with students, helping with their problems, and discussing their issues, and I felt thrilled to see their accomplishments.

Photo Courtesy of Andrew Travis

Recently, I read a lot more about player-centric game design philosophy. I love their statement about the obligation as game designers that 'we must stand in the player's shoes, and imagine how it is like to play the game we design.' When I read this, I not only wanted to share this with my students in the game design course but also asked myself: if I stood in my students' shoes, what would it be like to take my class?

Like the player-centric philosophy in game design, there should be a student-centric philosophy in teaching. Towards this goal, I have been collecting student feedback, adjusting and improving teaching materials based on that feedback, promoting the active learning environment and integrating lecturing into hands-on labs, etc. Also, I enjoy continuous learning as it is essential to update my knowledge and carry these learning experiences into my teaching.

At the beginning of this semester, a CPS 282 (Introduction to Multimedia Design) student told me that CPS 282 was one of the challenging courses in the Multimedia Design series. Previous students said to him that the course was challenging, and he worried about whether he could survive it or not. I told him not to worry but enjoy it because the classes were "hard fun."

The hard part of the Multimedia Design courses, including the game design, was the hands-on tasks we must work on. In the series, we must get our hands dirty, work in those labs, and turn our dream world into virtual reality through our work. They were not like some other courses where one could sit back, listen to the lectures, and then walk out. However, as long as you enjoyed getting your hands dirty, the "hard" part was the "easy" part, and the courses were effortlessly fun.

You got to learn how the software simulated our real-world behaviors, how the computer programs made actions happen, and, more importantly, how we made our dream come true through our work.
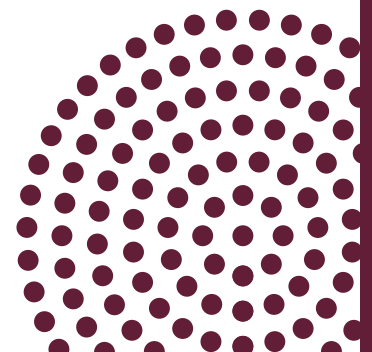
This semester, other faculty teaching the courses series and I have worked hard to redesign course materials for the multimedia design classes, especially the labs.

I wish to integrate the knowledge of multimedia elements into a fun, hands-on in-class projects. I believe multimedia design is creative, interactive, and experiential. Thus the hands-on and active learning approach would be beneficial for student learning. Once students learn the necessary skills, they can fly."

FACULTY SPOTLIGHT

Patrick Seeling

Dr. Seeling next to some of the available Cnets equipment, such as a private 4G access point, software-defined radio, and electromagnetic-isolating test enclosure.

Dr. Seeling's research focuses on services enabled by communication networks and new educational approaches (typically computing-mediated). Communication networks are currently undergoing a tremendous change brought on by softwarization. With nearly all things today offering computing (computation + storage + networking) in varying degrees, networking research nowadays encompasses everything from sensing to actuation, inclusive of all things computing in between. Enabled by virtualization approaches, such as Docker containers, computing can fluidly move anywhere from the cloud to end devices and anywhere in-between: we enter a time of truly mobile computing.

Dr. Seeling's collaboration with the Deutsche Telekom Chair of Communication Networks at the Technical University Dresden, Germany, has resulted in several publications in this domain, including a book aptly titled Computing in Communication Networks – From Theory to Practice.

Networking is no longer about just transporting bits but about new services that become possible. Transdisciplinary research on these services' impact has gained increasing importance.

Dr. Seeling has pivoted his research towards the Tactile Internet in recent years. The Tactile Internet is based on these paradigm shifts and requires ultra-low latencies – a challenge in current networks. Answering this challenge requires new approaches, such as machine learning, which will be enabled in 5G and beyond communication network implementations. Courses in mobile application development and mobile and cloud computing that Dr. Seeling has recently offered incorporate these new developments.

Dr. Seeling is currently creating the Cnets networking research environment for students at Central Michigan University, enabling research opportunities for computing services and solutions integrating different communication networks.

Now, a private sensor network gateway is mounted on the roof of Park Library (have a lookup while you are on campus, though it looks just like a lightning rod). Thanks to his recent certification, Dr. Seeling is also setting up a private 4G/5G network, which will provide Cnets students with even more opportunities to investigate mobile computing.

Software-defined radios are also available for students who want to go "off the beaten path" to develop their radio networks. The Cnets research environments can facilitate industrial partnerships in these increasingly essential domains.

Dr. Seeling investigated the pivot to more collaborative, distributed, and online-supported learning in cooperation with the Waterford Institute of Technology even before the required changes to continue education in 2020. While Dr. Seeling has reorganized the courses he teaches to incorporate new and immediate requirements; he also pushes for a reformulation of the roles of participants in higher education post-covid. He described his competency-focused approaches and self-regulation in flexible learning settings that will outlast today's reactions to the pandemic at the 2021 ACM SIGITE conference.

FACULTY SPOTLIGHT

Qi Liao

Dr. Qi Liao is a Professor in the Department of Computer Science at Central Michigan University. He received his M.S. and Ph.D. in Computer Science and Engineering from the University of Notre Dame, Indiana. He graduated summa cum laude with a B.S. and departmental distinction in Computer Science from Hartwick College, New York, with a minor concentration in Mathematics. He was named Hartwick College Faculty Scholar and received President's Global Fund Award. He was inducted as a lifetime member of the National Mathematics Honor Society (KME), the International Honor Society for the Computing and Information Disciplines (UPE), and the Engineering Honor Society (TBP).

Dr. Liao's research interests include computer security, machine learning, visual analytics, and economics/game theory at the intersection of network usage and cybersecurity. He has published more than 70 peer-reviewed journal and conference papers. Dr. Liao received numerous awards, including the USENIX best paper award at LISA, IEEE best session paper at ICCCBDA, Emerald Literati Awards Excellence - Outstanding Paper for Information and Computer Security, IEEE Visual Analytics Science and Technology (VAST) Challenge Award, 2nd place winner in National Security Innovation Competition, and Center for Research Computing Award for Computational Sciences and Visualization. Dr. Liao received the CMU CAREER Award and College of Science
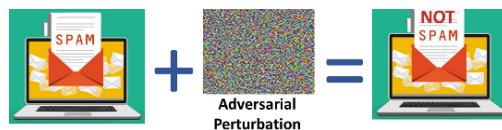
& Engineering (CSE) Award for Outstanding Research.

Dr. Liao has served on NSF program review panels, international conference co-chairs, technical program committees, journal editorial boards, and numerous peer reviewers. Dr. Liao became an American Society for Engineering Education (ASEE) Fellow to conduct sponsored research at the United States Air Force Research Laboratory (AFRL). Dr. Liao was a visiting research scientist at IBM Research and a guest research faculty at Argonne National Laboratory (ANL).

Dr. Liao, and his collaborator Dr. Zhen Li at Albion College, have recently authored a research paper, "Preventive portfolio against data-selling ransomware - a game theory of encryption and deception." The paper has been accepted for publication in the Spring 2022 issue in the journal of Computers & Security by Elsevier, which is a top journal in cybersecurity with an impact factor of 4.438. The paper investigates the new data-selling ransomware, proposes a novel solution of a preventive portfolio of data encryption and deception, and derives the equilibrium strategies for both the attacker and the users/victims in a game-theoretical framework. More information on Dr. Liao's research can be found at http://people.se.cmich.edu/liao1q/.


class, ITC 520 Foundations of Computer Security, recently researched how attackers can defeat machine learning for spam filtering. As our society relies more on artificial intelligence (AI), the security of AI, especially the machine learning algorithms, becomes increasingly important and remains largely untested. Under Dr. Liao's supervision, the students developed and tested three invasive techniques that are effective in fooling the machine learning models. They published their findings in a peer-reviewed paper entitled "Adversarial Machine Learning for Spam Filters" in the 15th ACM International Workshop on Frontiers in Availability, Reliability, and Security (FARES).

Cybersecurity Research by Dr. Qi Liao

Two graduate students (Bhargav Kuchipudi and Ravi Teja Nannapaneni) in Dr. Liao's
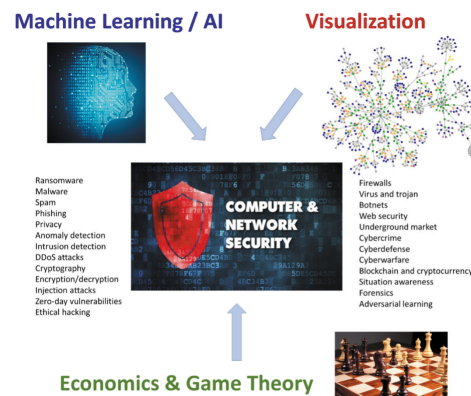
ALUMNI HIGHLIGHTS
DEPARTMENT OF COMPUTER SCIENCE

Dale Karolak, *Engineering Senior Director, Dart Container*

Dale is a 1981 CMU Computer Science graduate who continued his education, earning an MBA and Ph.D. in Software Engineering. His career includes over 40 years of industry experience in the Telecommunications, Aerospace, and Defense, Automotive, Lumber Equipment, Asset Tracking, and Food Packing industries focusing on software development, R&D, and Engineering. His roles included software development and leadership positions, including several positions as Vice President.

Dale is a recipient of 3 US patents in communication and software architectures. He has published several software engineering books and academic and industry papers and was an invited speaker at multiple national and international conferences. He has also received numerous corporate awards, including several CMU outstanding alumni awards.

Dale has enjoyed contributing back to CMU as a member of numerous advisory councils in the Colleges of Science and Engineering. At the same time, as a student at CMU, one of his favorite classes in his CS major was a two-semester compiler construction course. Besides the technical challenge, the class required me to work in a small team which was rare back then. Learning how to divide work, improve communication approaches, set deadlines, and depend on others were critical skills he discovered in the course that he used later in his career.

One of Dale's hobbies is fencing, a class he took while not focused on work at CMU. He continues to fence and has medaled at the state, national and international competitions.

CLASSROOM AND CONFERENCE ROOMS

Rat-tat-tat and clank-clank-clank were familiar sounds on the fourth floor of Pearce Hall during the summer of 2021. The result of this commotion was a new classroom and two renovated spaces.

Pearce 422, formerly a computing lab and often used for ITC 190 and 191, was combined with an OIT office to create a 50 seat, state-of-the-art flexible learning classroom. The classroom features movable furniture arranged in pods for peer-oriented learning activities or row seating for the lecture. The classroom is also equipped with eight large displays and several dry erase boards and is ideally suited for collaboration and discussion.

The pandemic has muted its use this academic year, but faculty and student groups are eager to put it through its paces in the coming academic year. Pearce 419, previously the department's conference room, was refitted to house the new CANAL lab, and what was the graduate assistant's office suite, Pearce 401, has become the department's new conference suite.

CLASSROOM AND CONFERENCE ROOMS

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INTERNSHIPS

Hello, I am Trevor Houck, an Information Technology major, and I had the privilege of completing an internship and MyMichigan Medical Center-Midland. I am an Information Technology. My training had me working in the hospital's information technology department as a device support technician. I supported multiple devices around the hospital and saw areas that most people don't get to. I had the opportunity to see the hospital's server room, their networking closets, and various devices. I witnessed firsthand how crucial it is to keep computer systems up and to run.

This internship was also very enjoyable because of the great staff working there. The technicians I worked with were incredibly knowledgeable and provided guidance whenever needed. I was able to do a lot of hands-on tasks through their advice, such as replacing components inside laptops, patching cables in networking closets, imaging computers, and installing equipment. This was a valuable experience that I hope to use in my future career.

Hi, my name is Johnny Leek, and I am a Computer Science major. I will be starting an internship at Microsoft Corporation on Summer 22. By learning programming techniques and advanced algorithms, I was able to be successful in securing and completing interviews for companies across the nation. In the summer of 2nd sophomore year, I worked remotely for an organization in California named Esri, providing geospatial analytics and data to solve the world's most challenging problems regarding science, sustainability, and the environment. I was even able to get college credit for the internship!

Using the skills I had learned from my real world, networking, and taking more courses, I secured a position as a Software Engineer Intern at Microsoft. Microsoft has a highly selective interview process, recruiting many students from Ivy League universities, and has a reputation for only accepting the best of the best. I had to complete a multiple-hour-long programming assessment in front of interviewers. Using the techniques I had learned from my courses at CMU, I achieved this interview and received an offer of employment successfully.

In memory of CMU Computer Science professor "Thomas E. Ahlswede"

Dr. Thomas "Tom" Ahlswede, a long time professor in the Computer Science department, and a professor emeritus passed away March 14, 2022. As a professor at Central, Tom taught a wide array of classes and specialized in computer graphics and animation courses. Tom worked within the department to create many new courses which were relevant to a changing industry and valuable to students. We will miss Tom, and are grateful for his years of service to the department!
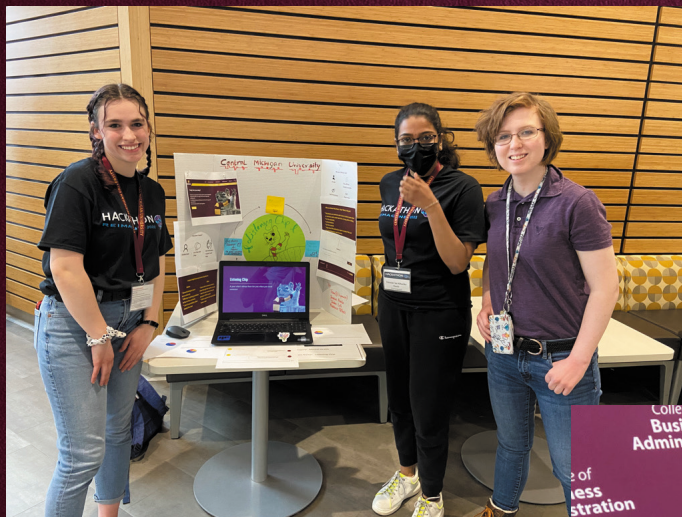
HACKATHON
REIMAGINE·2022

Over 50 students participated in Central Michigan University's first Hackathon: Reimagine 2022 from March 25-26 in Grawn Hall. Dr. Lisa Gandy, the Computer Science department chair, worked with Dr. Julie Messing, Isabella Bank Institute for Entrepreneurship Director and an Entrepreneurship Faculty in the College of Business Administration, to spearhead the event. The event was through a grant from the Ford Foundation.

Groups of students had 24 hours to select and solve a problem from a list of three unique categories: sustainability and transportation, student experience, and mental wellness on campus. The event was heavily attended by Computer Science students but also featured students from Engineering, and Information Systems!

Students' final products were presented to a panel of judges at 3 p.m. on March 26. The overall winners of the vent were graduate and undergraduate students in the Computer Science department! Team Listening Chip, including Jordan Leh (CPS-BS), Mackenzie Pollock (CPS-BS), and Yasaswi Avula (CPS-MS), earned a $1000 award. They created a website that offers students one-on-one counseling. Other winners from the CPS department included Team Ride and Go, including Emily Naegelin (CPS Minor-BS), Shashwat Marjan (EGR-BS) and Sunil Parvatina (CPS-MS), took home a Best Solution award in the Sustainability and Transportation category with their creation of a carpooling app. It allowed students to order a ride and anyone needing to go to the destination could carpool.

The department would also like to thank CPS faculty Dr. Jesse Eickholt for participating as a judge, and for Rachel Crowley (CPS-MS), Ankriti Gupta, and Lucas Loedler (CPS-BS) for all their hard work in planning the event. The CPS department is proud of all participants and is excited about next year's event!

ABOVE: ReImagine hackathon overall winners!: Jordan Leh, Yasaswi Avula, Mackenzie Pollock
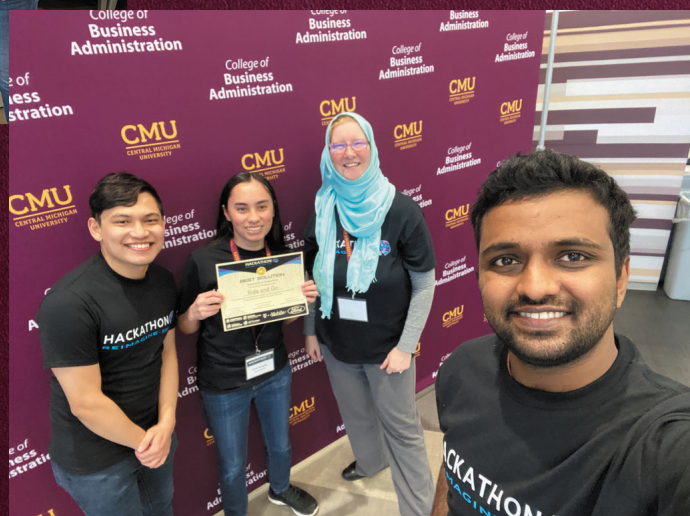
RIGHT: Best Solution Award: Shashwat Maharjan, Emily Naegelin, Sunil Parvatina (with Dr. Gandy)

Computer Science Alumni:

Where are you now? What are you doing? We genuinely want to know! Please email our chair (gandy1l@cmich.edu) and fill us in on your whereabouts, your career, and your achievements. Let us know if you would like to share your knowledge and achievements as a guest speaker for our many RSOs and courses!

Thank you for helping us keep in touch!

Thank you to all the alumni and friends who helped support the Department of Computer Science over the past year!

In memory of Jerome J. Bechtel '60
Diane D. Comstock-Davidson '88, '07
Mildred Diget '75
Dean W. Dolley '84
Steven G. Faber '85
Arnie '62 and Merrie Hammel '69, '82
Michael '79 and Susan Kay '81
Robert V. Kovach '66, '67

Richard J. Meyer '82
Freeman '75, '77 and Jeannie Moore
John '88, '97 and Lori Rathje '89
Michael D. Shoemaker '86
Jon E. Stasiuk '88
James '83 and Kimberly Streib '83
Jill '90 and Leo Timbers '89, '91
Wei Wang '94

Mitchell B. Wolfgang '04
Leslie Sharon Worf '82
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