Computer Science Alum Spends Summer as a NASA Software Engineering Intern

Dr. Michael Stinson Endowment
The Computer Science department is pleased to offer our inaugural newsletter. We hope you enjoy this issue of the newsletter, where we highlight our outstanding faculty and students. We also feature two new exciting programs which will premier in Fall 2022: CS+AI and our Data Engineering Minor. Though this year has been a challenge, the department continues to provide a strong education for CPS and IT students. Please stay in touch and let us know all of the great things we know that you are doing!

Sincerely,

Computer Science faculty and staff
The CPS Department is fortunate to have world class professors and lecturers. Everyday they strive to provide CPS/ITC students with a first rate education. In this section we highlight the achievements of four of our faculty.

**JESSE EICKHOLT**

Dr. Eickholt's research focuses on the areas of classroom design and educational technology. He recently concluded direction of a multi-year study into the effectiveness of practical active learning stations (PALS) to support active learning. This was a project funded by the National Science Foundation and culminated with an article published in *IEEE Transactions on Education*.

During his sabbatical in spring 2020, Dr. Eickholt visited the Learning, Education and Design Lab led by Dr. Stephanie Teasley at the University of Michigan. Dr. Eickholt continues investigating the use of student-facing learning analytics dashboards through this collaboration. Dr. Eickholt introduced a new course, CPS 580: Supervised Machine Learning, in Fall 2020. This course overviews newer advances in machine learning such as deep learning and data augmentation. Prior to the development of CPS 580, Dr. Eickholt taught a special topics course on machine learning in which several student course projects were extended and later published in journals such as *ACS Applied Material Interfaces* and *ICES Journal of Marine Science*.

Recently, Dr. Eickholt's student researchers have been working on applications of machine learning and big data. Projects include filtering and detecting fish in underwater SONAR surveillance data, classifying fish by species with deep convolutional neural networks, and identifying candidate battery materials with machine learning.
Dr. Redei is a new exciting addition to the CPS department, he began as an assistant professor in 2020. Dr. Redei's research focuses on flight simulations, and he has written the update below:

“It has been an exciting year for the Michigan Aerospace Center for Simulations. We launched a new partnership, helped President Davies land a plane, acquired an FA simulator, and published seven papers.

This summer we launched our educational space simulation called Paragalactic. This was done in partnership with the Fleischmann Planetarium, a museum in Reno, NV that sees over 75,000 attendees a year.

Space cadets (participants) receive an astronaut ID card which allows them to customize their profile, compete with friends for the top score, and win badges. Collin Van Brabant is alpha testing a VR capability and scheduling system, and we hope to be open to the public once COVID restrictions are lifted. For more details, check out: http://paragalactic.com

Stephane Millard re-launched SimVol, one of the largest online simulation communities in Europe. This reboot focuses on all things flight simulator 2020. One of the highlights is a complete Airbus A320 tutorial written by a real pilot who flies the A320 for Air France. The tutorial guides you through category 3 (minimum visibility) landings. Check out: http://simvol.org

President Davies paid us a visit in the Fall semester. The team and I couldn’t pass up this chance. We put President Davies in a simulation landing a small plane in his hometown of Reno, NV. We included some monkey-wrenches in that landing, such as incorrectly setting the barometer, and mountainous crosswinds. President Davies was able to complete the landing at KRNO, and as pilots say: “any landing you can walk away from, is a good landing.”

Also this summer, we acquired an FAA-approved FTD level 6 Diamond DA40 simulator. This is an authentic simulator made from air-worthy aviation parts and will enable new horizons for our group. The FAA considers this type of simulator to be so accurate
that you can actually log hours like a real pilot. Up to 20 (out of 40) flight hours can be logged in the sim that will count towards your FAA instrument rating. Thanks go to Jeff Thompson, for travelling and helping me retrieve this gem in the middle of COVID.

I’m so proud of the software engineering and senior design class which I teach. We had some terrific projects. I applaud you on your success. Notable highlights include Simple Valuation, which used Github Actions to automatically deploy to Azure, Parking Tracker which used computer vision and machine learning to track open parking spots in lot 48, and a GTA-V self-driving car bot. Dylan Richards will be going to 3M in St. Paul after graduating this Spring. Apologies if your project didn’t get mentioned, there were too many good ones to list.

We have made some exciting first steps towards an autonomous drone racer. Luke Rogers was able to connect the drone to our platform, and pilot it from our software. The drone’s telemetry data is relayed back to the simulator so you feel the rolls and flips of the drone as it races through the obstacle course.

We published 7 papers, most with CMU student co-authors. I had the honor of watching two of my students present: Paul Cappaert presented his research on Heroku in Computers and Their Applications (CATA), and John Apo presented his research in VR in Software Engineering and Data Engineering (SEDE).

Just before Christmas break, I made one of the flight simulators mobile. This will allow us to tow our simulator to airshows in the future. Expect to see many new things from our lab in 2021 including: a drone racing circuit, VR gaze-tracking, a thrilling new deep sea adventure game, a fully-modeled A-10 Warthog cockpit, and God-willing, COVID will subside and we’ll be able to attend some airshows this year.

I applaud our graduates on their success. I wish you the best and please keep in touch.

Best Wishes,

-Alex Redei
Computer Science Lecturer, Daniel Grigoletti, completed his Doctorate in Educational Technology at CMU and will be applying the learning science and research knowledge to his teaching of courses such as Client/Server Web Development and Multimedia Design using languages and web frameworks such as C#, JavaScript and ASP.NET.

His research project involved exploring the best practices for design of effective digital teaching assistants for higher education computer science students, developing a prototype application in the Unity game engine software. The design focused on implementing a human-computer interface (HCI) which is intuitive, interactive, adaptable, and customizable.

Dr. Grigoletti developed and pilot tested what he titled the Virtual AI Teaching Assistant (VAITA), which included multimedia elements, curated content, design simplicity and encapsulated learning science and theories to support heutagogical (self-determined) learning to aid students in learning the C# (C-Sharp) programming language. For now, VAITA (Virtual AI Teaching Assistant), is a 2D graphical application developed by the researcher in the form of an executable program for Windows/ Mac desktop/laptop computing platforms utilizing the Unity software development tool also used in coursework such as CPS 282, CPS 382 and CPS 383. Unity makes a free educational edition available for students to utilize in their courses for developing their own games and other applications. The VAITA tool concept can be used in the future to augment learning experiences beyond human instructors and TAs.

The research explored accessibility and personalization in the design of learning applications, and highlighted the importance of interactivity and how the design of virtual applications need to be dynamic, extensible, reusable and scalable. College level learners need applications that have user-centered interfaces, and are usable and practical. The research showed that when designing applications, that heutagological learning approach can be beneficial in the effectiveness of skills acquisition using digital tools augmenting instruction. Computer Science learners need to develop a highly technical and specialized skill set as they start as software developers in the workplace. Digital apps can help prepare students by providing authentic experiences which model workplace environments. Dr. Grigoletti’s research will help to understand how better to design tutorial or teaching assistant apps.

Dr. Shen’s research continued to focus on computer and mobile system security. Highlights for Dr. Shen this year include designing a video geolocation scheme to determine where a web video was taken, supervising the implementation of an auto battler software for the Battlegrounds mode in the game Hearthstone, and building an unmanned aerial vehicle equipped with LiDAR sensors to create 3D environment models.
Adhav Kumar, a research assistant under Dr. Shen’s supervision, designed a video geolocation scheme to identify the location of social media videos. By combining Convolutional Neural Network (CNN) methods with Google Street View API, this scheme reaches 93% accurate rate. To achieve this goal, thousands of Google street view pictures are analyzed and trained in a CNN model. In results, GPS locations of random social media videos were detected. (See below)

Namuunbadralt Zolboot, another research assistant in Dr. Shen’s group, has been working on the Hearthstone Battlegrounds Auto Battler since Fall 2019. The goal of this research is to build an artificial intelligent software that helps players to win the game and achieve a high rank without player’s interactions. By adopting neural network and machine learning algorithms, the software should suggest which card player should pick by displaying win percentages of the cards. (See below)

Dr. Shen is also building a drone for 3D environment modeling. The drone is equipped with multiple sensors, including gyroscope, compass, accelerometer, LiDAR and magnetometer and cameras. By combining data obtained from all the sensors, a precise 3D environment modeling could be generated. There are multiple applications of the generated 3D environment, such as acting as a guidance on aviation of the drone, giving 3D tours, and creating video games and movies.
Students in the CPS department continue to gain invaluable experience in summer internships. In this section we highlight three of our students. Our CPS/IT students have interned at companies and government organizations such as Auto Owners Insurance, Consumers Energy, Dover Corporation, Ford Motor Company, NASA, Quicken Loans and many more. We thank all of our industry and government partners in helping our students gain this much needed experience!

**Evrard Fankam**, an IT major, interned in the IT department at Consumer Energy in Summer 2020. Evrard was able to job shadow both the Cybersecurity and Networking team at three Consumer’s Energy locations. Good job Evram!

**Juwan Dobson**, an IT major, interned as a cyber security specialist at Dover Corporation. This internship required Juwan to complete four interviews. Dover Corporation is an international manufacturing company. Great job Juwan!

In spring of 2020, **Carrie York**, who has her B.S. in Computer Science from CMU had the opportunity to work as a software engineer intern at NASA. This was located at the Kennedy Space Center in Cape Canaveral, FL. While completing the internship, Carrie also continued her studies pursuing a Master of Science in Administration from Central Michigan University. Carrie’s internship was on location until March, then it continued virtually until May.

In addition to NASA, Carrie also was an Amazon intern and a Tesla associate. She says “I learned a lot with each experience and I look forward to what is up next!”
Alumni Highlight

Andrea Wharry, Class of 2014, graduated with her B.S. in Information Technology and B.A.A. in Broadcast and Cinematic Arts. Andrea is an AI/ML Product Owner at General Motors. In her role she manages an AI/ML product that is leveraged by GM’s autonomous vehicle program. In her spare time she loves taking online courses, doing “deep dives” into topics of interest (mainly linguistics, history, social justice, and politics), and spending time with her two cats and her partner Allison. During her time at CMU she was president of the Women in Technology RSO and a member of the CMU Film Society RSO. She worked at CMU Public Broadcasting as a UI Developer / Junior Graphic Designer, and later at CMU College of Health Professions as Junior Full Stack Developer.

CS+AI AND DATA

The Computer Science department has been busy! The department received a large internal grant to develop a CS+X set of majors and a Cybersecurity major. In this issue of the newsletter we will highlight the CS+AI major and will include more information regarding Cybersecurity in our Fall issue.

The CS+AI major will be the first major of the planned CS+X programs. Currently, in Michigan, there are no CS+X programs and no programs that exclusively focus on Artificial Intelligence as a degree. Central Michigan University will become a leader within the state in this area. The benefits of a CS+AI major vs. a double major is that the extra major could cause students to delay their graduation date. New curriculum developed for this major will feature CPS 325:

- Human Computer Interaction, CPS 525
- Introduction to Text Mining, CPS 551
- Biocomputing and Evolutionary Computation and CPS 583
- Nonlinear Dynamic Analysis and Learning.

This major will also feature existing state of the art AI classes offered within the department such as CPS 585: Applied Data Engineering, CPS 480: Introduction to AI, and CPS 580: Supervised Machine Learning. The department is planning for this program to launch in Fall 2022!

Data Engineering Minor

A new minor in data engineering is being developed by the department. The minor will prepare students to design and manage data storage options and to construct data pipelines in the context of data science. The plan of study for the new minor will naturally complement and extend skills developed in computer science and information technology majors but would also be accessible to students from other disciplines, providing them with a foundation to apply data engineering to their respective disciplines. The effort to develop the new data engineering minor has been
led by Dr. Lisa Gandy and Dr. Jesse Eickholt in collaboration with faculty from the Department of Statistics, Actuarial & Data Sciences.

In addition to core programming and data engineering courses, the new minor also includes courses on data visualization and exploratory and predictive analytics. As a whole, the curriculum for the data engineering minor will equip students to collect and transform data to produce actionable insights and support data informed decision making. The data engineering minor is currently working its way through the curricular process at the university and targeted to be open to enrollment for the 2022-23 academic year.

Dr. Michael Stinson Endowment

Dr. “Mike” Stinson, was a beloved member of the CPS department for 30 years, and sadly passed away in October 2018.

Dr. Stinson was a well-liked professor among faculty and students and is an alum of CMU, having received his bachelor’s degree in mathematics in 1971. He later received his Master of Science in probability/statistics and Master of Arts in mathematics from Michigan State University and earned his doctoral degree in computer science in 1988 from Louisiana State University.

Dr. Stinson was an active faculty member in the CPS Department, having served on the Pascal Standards programming language committee and as faculty advisor for the Association of Information Technology Professionals student organization. Dr. Stinson also served as chairperson of the department and was a key faculty in developing CPS curriculum which is still being used today.

Dr. Stinson’s family has set up an endowment in his name, that when completely vested will serve to create scholarships for CPS department students. If you have been lucky enough to be a student of Dr. Stinson’s or have heard about his warm personality and mentorship of countless number of students, please consider donating to his endowment. For more information you can contact Morgan Hales, the director of development for the College of Science and Engineering by phone at 989-774-1287, email at curt1mm@cmich.edu, or include your donation in the attached envelope.
A new course is underway at the department, the first general education and online course allowing everyone to become familiar with modern computing principles anywhere, anytime: CPS 101 - A First Byte of Computer Science. This course does not assume any prior knowledge in the computing domain and welcomes anyone interested in computing or curious about how to use computing in their endeavors. Learners will use the popular BBC micro:bit together with their computer while engaging in hands-on experiments and scientific inquiry activities. The micro:bit is an amazing, pocket-sized computer with sensors, microphone, speaker, and an LED display, all for about $20. Learners connect their micro:bit initially directly and later wirelessly to their computer as they journey from the basics of programming with graphical approaches over networking and distributed computing to implementing an Internet of Everything solution as a final project. Throughout their journey, students also learn about related topics, such as how to evaluate measurement granularities and the security of communications. For more advanced and curious learners, the course provides ample opportunities for additional challenging activities and more conventional programming using JavaScript and Python. This course will be formally offered beginning Fall 2021. The course development effort has been spearheaded by Dr. Patrick Seeling and culminates several years of working with the micro:bit in outreach activities. It is part of the invigoration of the undergraduate experience as well as lifelong learning and professional development delivered by the Department of Computer Science for everyone, anywhere, anytime.

Cybersecurity Major

The rapidly growing Cybersecurity market provides the department of Computer Science an opportunity to pursue an undergraduate Cybersecurity major under the Bachelor of Science degree. The major will prepare students for a variety of in-demand cybersecurity careers, dedicated to securing vulnerable data and information infrastructure and stopping cyberattacks in the digital environment. The proposed Cybersecurity major focuses on both rigorous theory and extensive practice of security and privacy in computer systems, networks, software and hardware, database and web applications. On the basis of computer science core courses, six new cybersecurity courses are developed. New curriculum developed for this major will feature CPS 333 Introduction to Computer Security and Cryptography, CPS 373 Network Security, CPS 375 Social Engineering, CPS 463 Hardware Security, Cybersecurity Law, Policy, and Ethics, CPS 475 Software, Database, and Operating System Security, and CPS 477 Security Informatics: AI and Visualization. The department is planning for this program to launch in Fall 2022!
CMU Computer Science Alumni:

Where are you now? What are you doing? We genuinely would like to know!

Please send a letter to the department or an email to 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 experiences during Alumni Career Day or be a guest speaker for our many RSOs!

Thank you for helping us to keep in touch!