C-Day Winners Fall 2020

Category: Graduate Capstone Project

1st place IT GC-4 ALUMNI INFORMATION SYSTEM
by Vara Kalyani Vundavalli (MSIT), Jayashree Pakkirisamy (MSIT), Sangita Rai (MSIT), Winston Kone (MSIT)
Advisor: Dr Lei Li

2nd place SWEGD GC-13 CCSE EVENTS
by Michael Vanderbilt (MSSWE), Shannon Bryce (MSSWE), Scott Robinson (MSSWE), Rukmini Srija Kalidindi (MSSWE), Paul Hillier (MSSWE)
Advisor: Dr. Reza Parizi

Category: Graduate Research Project

1st place IT GR-3 Analyze Risk Communication COVID-19
by Elaine Harris (MSIT), Maryline Kwa (MSIT), Chelsey West (MSIT), Raviteja Pasumarthi (MSIT), Gabriel Oyebanji (MSIT), Michael Farris (MSIT), Sang Nguyen (MSIT)
Advisor: Dr. Meng Han; Project sponsor: Dr. Shirley Tian

2nd place CS GR-42 Federated IoT Botnet Detection
by Christopher Regan (MSCS)
Advisor(s): Dr. Reza Parizi. Dr. Seyedamin Pouriyeh, Dr. Mohammed Aledhari, Dr. Ali Dehghantanha (Assistant Professor of Computer Science University of Guelph)
Funded by US SunTrust Fellow in Cybersecurity/Information SecurityResearch Funding Program, No. ST20-01.

3d place CS GR-41 IoT Botnet and Nw Intrusion Detect
by Madhuri Gurunathrao Desai (MSCS)
Advisor: Dr. Yong Shi

Category: Undergraduate Capstone Project

1st place CS UC-16 Autonomous Sentry Gun
by Gustavo Mejia (BSCS, BSSWE), James Bozhkov (BSCS), Merry Nguyen (BSCS)
Advisor: Dr. Ken Hoganson

2nd place IT UR-55 CCSE Student Engagement Application
by Raymond Hebard (BSIT), Jessy Redington (BSIT), Nelly-Anne Ndikum (BSIT)
Advisor: Dr. Ying Xie

3d place IT UC-20 CCSE CRM
by Cecelia O'Koli (BSIT), Ethan Luettegemann (BSIT), Patrick Lowhorn (BSIT), Evan Tanner (BSIT)
Advisor: Dr. Ming Yang

Category: Undergraduate Research Project

1st place CS UR-44 Diagnosing ALL with Computer Vision
by Dasarath Katragadda (HS Intern)
Advisor: Dr. Dan Lo

2nd place CS UR-45 Detecting Schizophrenia - ML
by Rohan Shiknis (HS Intern)
Advisor: Dr. Dan Lo

3d place CS UR-53 Motion Prediction for Vehicles
by Neel Patel (BSCS), Matthew Korpi (BS Mechatronics Engineering), Shivank Rao (BSCS)
Advisor: Dr. Mohammed Aledhari

Category: Alumni Award

IT GC-4 ALUMNI INFORMATION SYSTEM
by Vara Kalyani Vundavalli (MSIT), Jayashree Pakkirisamy (MSIT), Sangita Rai (MSIT), Winston Kone (MSIT)
Advisor: Dr Lei Li

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Fall 2020 C-Day Program

December 3, 2020

Location: Virtual. *Please scroll down to find the links to the sessions and presentations.*

Mark your calendar for Spring 2021 C-Day: Thursday, April 29th, 5-8pm

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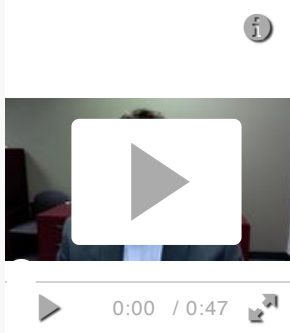
C-Day Home Page

Return to the C-Day home page.

Fall 2020 Winners

View the Fall 2020 C-Day winners.

TIME	EVENT
Welcome from Interim Dean Chastine	▶ 0:00 / 0:47
Thursday, December 3, 2020, 11 am	Judging starts. The judges will review videos and posters.
Thursday, December 3, 2020, 5:00 pm - 6:00 pm	Q&A sessions
Friday, December 4, 2020, 11 am	Deadline to submit completed score sheets.
Monday, December 7, 2020	Winners of the awards announced ○ Best UndergraduateProject ○ Best Graduate Project ○ Best Undergraduate Research Project ○ Best Graduate Research Project ○ Alumni Award

Fall 2020 C-Day Projects

Judges   +

Rubrics and Acceptance Rate   +

Session Capstone 1

Moderator: Ashley McClure
Industry Judge: Andrew Greenberg
Industry Judge: Charles Chidi Igwilo
Alumni judge: Sharon Perry

MS Teams guest link

- **IT UC-19 Hackathon Mobile Web App** (Undergraduate Project)
  by Ashleigh Ladd (BSIT), Austin Wilcox (BSIT), Frank Campbell (BSIT), Katie Crane (BSIT), Sydney Hollingsworth (BSIT) Advisor: Dr. Ying Xie
  Description: The Hackathon Mobile Wep App provides a real-world solution to Kennesaw State University's College of Computing and Software Engineering's Hackathon event that occurs multiple times a year. Previously, the college was using multiple platforms to bring event registration and collaboration together to make the event a success, placing a large amount of manual work on the administrators who manage the event. The Hackathon Mobile Web App provides a central platform in which students can create an account for and register for the Hackathon event to be placed on teams with sponsors, allowing them to log in to manage their registrations and accounts independently. At the same time, registered administrators have full access to the same platform from an "administrator view" to manage all aspects of the event in terms of getting, adding, updating, and deleting pertinent information, making this solution invaluable in terms of automating many tasks and easing the workload of the administrators in charge of the event.
  Merit: The Hackathon Mobile Web App goes above and beyond the project requirements as set forth by the stakeholders. With this mobile web application, students can create user accounts and register as members of Hackathon events going forth with ease, allowing team selection in four different ways: to create a team, join an existing team by selection, be automatically placed with an existing team, or work individually. The student can then manage their own account and registration from the student dashboard, relieving the administrators and organizers of the Hackathon event from extensive manual handling and processing of student registrations and initial team selections. The administrator dashboard allows the administrator for the event to manage almost all CRUD operations of event-related data - most importantly, the teams and their members, as well as events. In addition, the administrator can send SMS messages to all registered members of a selected event with ease.
  Presentation | Poster | More information
- **SWEGD UC-5 Swipe Slicers** (Undergraduate Project)
  by Hakeem Thomas (BSCGDD), Advisor: Prof. Nicholas Murphy
  Description: Swipe Slicers is a competitive mobile action game where two or more players face off and try to win rounds swiping or tapping each other.
  Merit: Knowledge gained from the game could provide insight into the mobile market with competitive games.
  Presentation | Poster | More information
- **IT UC-22 Containerization for Bioinformatics** (Undergraduate Project)
  by Jascha Cohen (BSIT), Joyce Anderson (BSIT), Duane Romany (BSIT), Javen Stegall (BSIT), Advisor: Dr Ming Yang Project sponsor: Dr. Tsai-Tien Tseng
  Description: Analysis of containerization solutions for bioinformatics software packages to simplify the distribution, installation, and use by end-users.
  Merit: For this phase of the greater project, the probable impact is negligible. As part of

a greater effort to streamline how scientists can get and use important software tools it stands to have some quality-of-life impact.

Presentation | Poster | More information

- **IT GC-4 ALUMNI INFORMATION SYSTEM** (Graduate Project)
  by Vara Kalyani Vundavalli (MSIT), Jayashree Pakkirisamy (MSIT), Sangita Rai (MSIT), Winston Kone (MSIT), Advisor: Dr Lei Li

  Description: A web-based system which allows admin to view, search, delete and update KSU alumni information. The system allows KSU administration to keep track of Master of Science in Information Technology graduates and their career paths. The project is sponsored by Professor, MSIT Coordinator & Asst. Dept. Chair Dr Lei Li for IT Capstone 7933 Fall Semester 2020. The system provides various functionalities which includes: User friendly GUI interface, Import New Graduate's data into database, Search functionality, Backup and Restore and allows system admin to update alumni's information (jobs, education, email and such). The application was developed using php and MySQL workbench.

  Merit: This project helps the MSIT admin to track any number old and new alumni complete information. Through this application the admin can get the details of alumni's who are searching for jobs and their current status after graduation. Using this application the admin can make KSU students connect for job opportunities. This application also can also be used as a study/report purpose in getting data about the KSU graduated alumni The application provide options to backup the database at any time. The database can also be restored with that backup file in case of any issues. Future development for application is to expand this system for all departments in KSU. It will certainly give more merit for MSIT department in track the alumni complete current information.

  Presentation (short) Presentation (long) | Poster | More information

Session Capstone 2

Moderator: Adriana Clark
Industry Judge: Frank Ziller
Alumni judge: Preeti Aggarwal

MS Teams guest link

- **SWEGD UC-29 CCSE Project Management** (Undergraduate Project)
  by Andrew Rittenberg (BSSWE), Robert Rioja (BSSWE), Marcus Dorsey (BSSWE), Abdullah Aboud (BSSWE), Allison Romans (BSSWE), Advisor: Dr. Reza Parizi
  Description: CCSE had a need for a repository to manage all capstones, contracts for hire, and research projects. This will include all necessary documentation relating to the projects such as NDAs and IP documentation. There was also a need for generating reports and creating custom forms. The objective for this semester was to build upon the current prototype to develop a final, user friendly, secure system. The focus was on final development, implementation, and testing.

Merit: This software will create a better environment for faculty and staff members within CCSE. As requirements are always changing the implementation of custom forms was a nice addition to the software making the software more modular. The software will allow users of different areas to communicate, while protecting everyone's best interest and storing information in a secure location. Implementation of UAC was included creating a more secure system.

Presentation | Poster

- **CS UC-14 MyCare - Telemedicine Web App** (Undergraduate Project)
  by Christina Tamba (BSCS), Baboucarr Sanneh (BSCS), Darius Tiglao (BSCS), Xiaoran Liu (BSCS), Jeremy Wilson (BSCS), Advisor: Dr. Ken Hoganson
  Description: Our team has developed a website that can allow patients to communicate with their doctors. Through this web app, patients can send messages to their doctors, set appointments, view health reports, and browse information by their doctors in a blog-like fashion. The project is secure and developed using Django and React.
  Merit: During the COVID-19 pandemic, it's encouraged that people quarantine and limit going outside. Because of this, people are paranoid to go anywhere, including the doctor's office. Being able to communicate with patients right from the comfort of their own home provides a business merit and allows hospitals and doctor offices to continue to operate.
  Presentation | Poster | More information

- **SWEGD UC-30 Georgia Music Business Directory** (Undergraduate Project)
  by Jonathan Van Baush (BSSWE), Samuel Wilson (BSSWE), Kayla Hanks (BSSWE), Michael Lane (BSSWE), Henok Demisse (BSSWE), Advisor: Dr. Reza Parizi
  Description: The Georgia Music Business Directory will be a web-based Application that connects different entities of the music industry in the state of Georgia. Artists, venues, managers, event planners, and industry workers should be able to connect with and search for other entities within the state of Georgia.
  Merit: Creating a website for the government of Georgia to promote music.
  Presentation | Poster | More information

- **IT UC-28 CCSE Hackathons Web & Mobile App** (Undergraduate Project)
  by Jessie Tran (BSIT INT - Info Assur & Sec Track), Kamsy Osy-Odife (INT - Info Assur & Sec Track), Cameron Canto (INT - Info Assur & Sec Track), Advisor: Dr. Ying Xie
  Description: CCSE has a need for a solution to manage the registrations and virtual community for our 2 hackathons (Fall/Spring). Objectives for the Fall semester are to: 1) Create Web and Mobile App for Students to Register/Manage and Select a Team - Allow Login/Manage Single/Team Registration - Admin -Manage Event Program - Ability to Add Marketing/Branding for KSU CCSE and Sponsors - Ability to Showcase Winning Teams 2) Create Minimum Viable Product for Use in Spring 2021 3) Added Capabilities - Virtual Community - Photo Upload (approval before publish) 4) Technical and User Documentation
  Merit: We solved the problem of organizing the Hackathon registration and team assignment as single/multiple members with the corresponding SMS notification

feature that reduced manual effort required to administrate registration process, streamlining the process for the end user.

Presentation | Poster | More information

- **IT UC-56 OWL EVENTS** (Undergraduate Project)
  by Paul Kruskamp (BSIT), Patrick Mean (BSIT), Michael Thomason (BASIT), Seth Moreland (BSIT), Novann Rouse (BSIT), Advisor: Dr Ming Yang
  Description: In an effort to increase student participation in CCSE Events, we are working on a mobile application for students of KSU to be notified of CCSE events taking place in the near future. The student will have easy access to this list and will be able to easily sign up for these events from their phone and receive reminders of these events as the event dates approach. The application will provide maps, social media and event calandars.
  Merit: Increasing student participation in CCSE events will enrich the relationship between KSU and its CCSE students, encouraging learning and participation outside the classroom.
  Presentation | Poster | More information

Session Capstone 3

Moderator: Nicholas Murphy
Industry Judge: Leslie Dugosh
Alumni judge: Frank Lamar

MS Teams guest link

- **SWEGD UC-32 Clover Server** (Undergraduate Project)
  by Faraz Bukhari (BSSWE), Jeff Scoggins (BSSWE), Mohammad Asif (BSSWE), Tyler Reno (BSSWE), Andrew Shein (BSSWE), Advisor: Dr. Reza Parizi
  Description: Meet Clover Server, one of our current projects in development for a client. This new software is aimed to restaurants to allow them to manage, update and keep track of of orders. Our Clover Server Solution for restaurants would allow you to place an order through a tablet (iPad mini). With Clover Server Pay-at-the-table gives customers a sense of security knowing that they keep control of their credit card and its financial information.Clover Server system reduce trips back and forth to the POS terminal, which in turn decreases the time it takes to close the sale. This lets tables wrap up their meal and get back to their day quicker and reduces friction due to split checks or servers multitasking while payments are being made. Although most of the site has been developed with a responsive design and most features have been implemented, we would like to add a couple integrations into the software which include print api integrations and clover pay api's.
  Merit: The software will be used on iPads to allow for restaurants to have an easy to implement system for customers to pay at their table in a restaurant or bar.
  Presentation | Poster | More information

- **SWEGD GC-13 CCSE EVENTS** (Graduate Project)
  by Michael Vanderbilt (MSSWE), Shannon Bryce (MSSWE), Scott Robinson (MSSWE), Rukmini Srija Kalidindi (MSSWE), Paul Hillier (MSSWE), Advisor: Dr. Reza Parizi
  Description: The CCSE department holds events for students to attend where they have the opportunity to network and submit resumes with the industry. the CCSE department needed a way to keep students in the loop. Our team created an application that will keep students abreast of CCSE events, track specified events, provide real-time notifications of all events as well as updates to selected events. The student can select to receive a reminder notification for any event as well as send feedback to the CCSE for CCSE review.
  Merit: Students attend KSU because they believe that KSU will make them more marketable and thus increase their net worth. KSU's business model revolves around making students more marketable and the CCSE events are a way of demonstrated to the student and the industry that KSU has succeeded in this business model. The application closes the communication gap between the student, CCSE and the the business community. KSU gets a better idea of attendance through rsvp's and student feedback from the app. The business community gets an opportunity to speak to a larger crowd of potential employees. Finally, the student can increase their knowledge of opportunities for career advancement provided by CCSE and simultaneously decrease the amount of time needed to search for these opportunities
  Presentation | Poster | More information
- **IT UR-55 CCSE Student Engagement Application** (Undergraduate Project)
  by Raymond Hebard (BSIT), Jessy Redington (BSIT), Nelly-Anne Ndikum (BSIT), Advisor: Dr. Ying Xie
  Description: This project targets students of the CCSE department, the aim of this application is to improve student engagement, KSU offers a large array of social, personal development, and career events on campus. The institution has noticed lately a drop in engagement in on-campus activities.
  Merit: This project enables students to build a relationship between the academic and the industry world. It enhances out of class learning or putting what we learn in class into practice.
  Presentation | Poster
- **SWEGD UC-10 CCSE Hackathons Web and Mobile App** (Undergraduate Project)
  by Spencer Taylor (BSSWE), Andrew Dell (BSSWE), Ayo Awodu (BSSWE), Daniel Melton (BSSWE), Josh Musilli (BSSWE), Advisor: Dr. Reza Parizi
  Description: The current project will be a dynamic web application to aid students in registering for hackathons and being placed into randomized teams. A user when accessing the web application will be directed to create an account and they will be sent a confirmation email to verify information. After the scheduled time for registration has ended each user will be placed into a team generated by the system. Further the web application will host the daily events and allow for promotion among company sponsors.
  Merit: The dynamic web application we are building if selected by the College of

Software Engineering and Computing will be used in registration and future Hackathon events. The project is business merit and will allow KSU to host and manage Hackathon events more efficiently.

Presentation | Poster | More information

Session Capstone 4

Moderator: Terrance Coursey
Industry Judge: Vladimir Rusanov
Alumni judge: Abdul Wahab

MS Teams guest link

- **IT UC-20 CCSE CRM** (Undergraduate Project)
  by Cecelia O'Koli (BSIT), Ethan Luettegemann (BSIT), Patrick Lowhorn (BSIT), Evan Tanner (BSIT), Advisor: Dr. Ming Yang
  Description: The CRM was handed down from last semester and lacks the ability to keep industry relationship contact names and contact information. What we need to do is to organize and manage the data within it. Not only that, but we need to learn the programming and to find out where the programmers left off. Our product is a web-based CRM that uses the bootstrap framework and php. It's tied to a sql server database for information storage.
  Merit: The objective of this project is to create a vm for testing. The VM needs functioning so that individuals can be added well outside the calendar. Another objective is to learn the code to find where the programmers left off.
  Presentation | Poster | More information
- **CS UC-6 Math Learning Machine** (Undergraduate Project)
  by Grant Williams (BSCS), James Mann (BSCS), Raj Kapadia (BSCS), Steven Kemp (BSCS), Spencer Brown (BSCS), Advisor: Dr. Ken Hoganson
  Description: Math Learning Machine utilizes image segmentation and image classification to create a math oriented optical character recognition system which can solve complex mathematical equations given an image of a handwritten equation.
  Merit: There is a wide range of possible merit for this project. Young children in school who find themselves having to learn math at home during the pandemic can utilize this tool (or the parent who is now playing a role in teaching their child) to verify their math homework before turning it in. Academic researchers can save time by handwriting extremely complex equations and then being able to scan the image and copy the LaTeX form of the equation for their research papers. Everyday individuals who have a math problem written down that they forget how to solve. These are just a few examples of a very wide user base for this project.
  Presentation | Poster
- **CS UC-15 FeelBetter** (Undergraduate Project)
  by Jason Bice (BSCS), Sqielyr Person (BSCS), Jason LaPrad (BSCS), Aydan Mufti (BSCS), Eric Mo (BSCS), Advisor: Dr. Ken Hoganson

<u>Description:</u> The application is intended to let parents track the symptoms a child experiences during illness and learn more about how to appropriately track their symptoms such as temperature, body aches, bathroom issues, and various other common ailments. The application will also provide information regarding symptom timelines and common children illnesses. The app will have a section for medical information from various online medical sources. It will give the user the tools to make their conclusions.

<u>Merit:</u> The intellectual merit in this project is giving parents and guardians the ability to track their child's symptoms when they are ill.

<u>Presentation</u> | <u>Poster</u> | <u>More information</u>

- **CS UC-7 Fuzzy Logic Chess AI** (Undergraduate Project)

  by <u>John Hurd</u> (BSCS), <u>Rafael Quarles</u> (BSCS), <u>John Foster</u> (BSCS), Mina Hanna (BSCS), Leonel Hernandez (BSCS), Ian Gregoire (BSCS), <u>Jordan Gibbons</u> (BSCS)

  Advisor: Dr. Ken Hoganson

  <u>Description:</u> This project is a game containing a chess variant that relies on fuzzy logic in order to determine if pieces are taken. Our team created custom backend code to facilitate the game, an intuitive user interface, and a distributed AI that is able to take on human players and itself.

  <u>Merit:</u> Our project delves into the topic of distributed AI. Distributed AI relies on most decisions being made by one centralized AI and communicated to AI or human agents. In the case of the game, this central AI corresponds to the king. In the real world, it could mean a large supercomputer that commands less hardware intensive AIs running on smartphones or a military server controlling AI-powered drones. as such, complex distributed AI has far reaching applications in business, combat, and public safety fields because it only requires one high powered computer. Our team designed an AI on a much smaller scale to showcase the ability of a distributed AI to successfully direct other AIs. Using a chess variant as a demonstration is effective because chess is a generally familiar context and is used in AI research frequently.

  <u>Presentation</u> | <u>Poster</u> | <u>More information</u>

- **CS UC-16 Autonomous Sentry Gun** (Undergraduate Project)

  by Gustavo Mejia (BSCS, BSSWE), <u>James Bozhkov</u> (BSCS), Merry Nguyen (BSCS),

  Advisor: Dr. Ken Hoganson

  <u>Description:</u> This project is focused on a defensive autonomous sentry gun that will use multiple sensors to gather input data from the target. The output will be translated into motor movement and target tracking as well as shooting the target. Specifically, the input from the camera will center on the target calculating the yaw of the gun, while the input from the ultrasonic range finder will calculate the output pitch to find the correct trajectory the bullet needs to take. The webcam with built-in video & audio is connected to the raspberry pi, which will be taking auditory inputs to confirm an activation code from the target. If the activation code is correct, the sentry gun will show a green light signaling to the user that it is disarmed. If the activation code is incorrect, the sentry gun will show a red light and fire at the target. This project is for anyone who wants autonomous protection, without having to manually control the

gun.

Merit:

[Presentation](#) | [Poster](#)

Session Graduate Research 1

Moderator: Coskun Cetinkaya
Industry Judge: Len Greski
Alumni judge: Corey Harris

[MS Teams guest link](#)

- **CS GR-40 contactless vital measurement** (Graduate Project)
  by [Christopher Regan](#) (MSCS), [Ernst Fanfan](#) (MSCS), Advisor: Dr. Mohammed Aledhari
  Description: Vital measurements would be an asset in the fightagainst covid-19. This paper assessed the possibility of measuringpulse and blood pressure using computer vision without amachine learning model. Specifically, the software will detectimperceptible changes to specific areas of the face caused byblood flow. Transdermal Optical Imaging is perfect for detectingtiny changes in the skin between saturation and desaturation.This algorithm will pass the pulse to a formula using the bodysurface area (BSA) to calculate the subject's blood pressure. Tennormotensive adults volunteered in our study. We will recordtheir pulse, systolic, and diastolic pressure using a blood pressurecuff and facial blood flow. We use this data to determine theperformance of our algorithm. Our algorithm must performwithin 5+-8 mmHg to show potential for use in a medicalenvironment. Our algorithm did not meet the standard formedical use. Our application performed at 0+-2.31 mmHg forPulse, -3.7+-10.03 mmHg for SP and 1.7+-10.18 mmHg. Wepostulated that our pulse averaging method is the cause ofthe inaccuracies. We believe that further investigation wouldbetter understand why the pulse is much more accurate than thesystolic and diastolic pressure. Without meeting the standards formedical application, we proved the feasibility of vital contactlessacquisition. Based on the measurements, we are not far off themark. We believe it is possible to get the accuracy we need tomeet the standards for Blood Pressure Devices. With furtherresearch and fund, this project's focus can be an essential toolmoving forward in the medical industry.
  Merit: This project intended to create an interest in creating contactless diagnostic tools for medical use, and we believe we accomplished that. Based on our results, our algorithm does not meet the ANSI/AAMI/ISO 81060-2:2013 standard for BP measurement devices, but we proved that it is possible.With enough research and investments, we believe contactless diagnostic tools will be an invaluable piece of our medical arsenal. However, these results still set the groundwork for further improvements and do show the future of contactless medical applications have a viable future.
  [Presentation](#) | [Poster](#) | [More information](#)

- **CS GR-42 Federated IoT Botnet Detection** (Graduate Research)
  by Christopher Regan (MSCS), Advisor(s): Dr. Reza Parizi. Dr. Seyedamin Pouriyeh, Dr. Mohammed Aledhari, Dr. Ali Dehghantanha (Assistant Professor of Computer Science University of Guelph)
  Funded by US SunTrust Fellow in Cybersecurity/Information SecurityResearch Funding Program, No. ST20-01.
  Description: Internet of Things (IoT) devices are mass produced, often heterogeneous in nature, updated infrequently, and can remain out of sight on a home or office network for extended periods. Security and privacy are two of the many ongoing research and operational challenges in IoT. To address potential threats to IoT devices, deep learning-based solutions have been largely utilized in recent years. However, as big data is transferred under traditional centralized methods, it is at risk for data privacy issues because the data can be captured. In this paper, we propose a federated-based solution employing a deep autoencoder to ensure that data privacy is maintained and provides a way to detect botnet attacks using on-device decentralized data. Through the suggested federated option, privacy is addressed as data is made more secure since it is not transferred out of the device at all. Instead, the computation itself is brought to where data is born (e.g. the edge layer) providing the sought after results of a traditionally centralized machine learning technique, with the added benefit of data security. The results from our proposed model give up to 98% accuracy of anomaly detection when using many features such as source IP, MAC-IP, and destination IP channel for training. The comparison analysis of the results for a traditionally centralized format, versus our decentralized approach, justifies a significant improvement in the accuracy rate of attack detection.
  Merit: As industries and enterprises begin to expand the usage and diversify the IoT devices on their network, the potential vulnerabilities on new devices yet to be discovered could leave networks exposed to zero-day attacks, botnets, and other forms of cyberattacks. This resulting race to fix and patch devices will leave new and old networks exposed for unknown periods of time. In this paper, presented is a piratical proof of concept, FL is a potential solution for enterprise networks.
  Presentation | Poster
- **CS GR-35 Facial Recognition with DL** (Graduate Research)
  by Honglai Peng (MSCS), Advisor(s): Dr. Selena He, Dr. Meng Han
  Description: Face analysis has received much attention from the Computer Vision and Pattern Recognition communities in the past. Current research progress has promoted us to solve problems about face recognition or face detection for some realistic scenarios, like robot service. As we know, the success of service robotics decisively depends on the ability to extract accurate information just from face images, like identifying gender, age or emotion state. Till now, despite significant recent advances in the field of face recognition, all of the related works or classifiers are merely limited to one specific facial feature, like gender, or age, or emotion. And these models cannot be applied into each other. However, to improve the efficiency and accuracy of face detection, we propose a new deep learning model to do the comprehensive profile

based on the images. In this project, firstly, we will create a new deep learning model which can perform face detection, gender classification, age classification, emotion classification and more in a single integrated profile and lead better performance. Secondly, we will prove that the fused features extracted from individual tasks could perform better performance than individual feature like age, gender, race and more. Merit: In this project, we make several contributions as followed: 1. We created one new deep learning model based on feature fusion strategies and transfer learning and this model can perform age, gender, emotion and race recognition in one single aggregated profile; 2. Our new integrated model have successfully achieved better performance/accuracy than individual models for age, gender, emotion or race classification do; 3. Our researches systematically compare our results with others and find that age features, gender features, emotion features and race features have complimentary relationship; 4. We manually conduct one new dataset which includes 3500 face images with truth labels of age, gender, emotion and race; 5. We have conducted one survey paper related to feature fusion strategies we used in our research and the survey paper is ready to publish; 6. We are conducting one application paper about our research and plan to complete it before the end of this semester.

Presentation | Poster | More information

- **SDSA GR-1 Well-written research papers** (Graduate Research)
- by Srivarna Settisara Janney (Ph.D. in Analytics and Data Science), Advisor: Dr. Ying Xie
  Description: Conventionally, non-native English-speaking students have trouble to get their research papers/reports published in top conferences/journals. It is hard to express their ideas and research results in more grammatically correct sentences that make sense. Our aim is to provide a helping hand using latest state-of-the-art Natural Language Processing tools like GPT2 from OpenAI to generate a well-written academic papers/reports based on the incorrect or rather inappropriate input English sentences. Merit: The proposed research demonstrates an interactive bot to correct not only grammatically errors but also formation of proper meaningful sentences that could be beneficial for students to write papers/reports in more acceptable and professional manner.

  Presentation | Poster

- **CS GR-46 Intelligent Checkout System** (Graduate Research)
  by James Bozhkov (BSCS), Jiaming Li (MSCS), Advisor: Dr. Mohammed Aledhari
  Description: The traditional checkout systems are mainly based on scanning the labels attached to the items which require manual labor, and thus inefficient. Nowadays, as deep learning reveals excellent performance towards object detection tasks, this technique has been integrated into assisting the speed of each checkout process. However, most research merely focuses on detecting merchandise, yet overlooked the connection with customers. In this research paper, we are proposing a structured intelligent checkout system that obtains the dexterity of checking a customer's identity and their items embedded by dual cameras. The first camera is installed in front of the customer to determine their identity. The second camera is installed overhead for detecting multiple merchandises according to their appearances by using the state-of-the-art object detection model Mask R-CNN trained on the D2S

supermarket products dataset. In the experiment, the Mask R-CNN model yields a 98.15% mAP when classifying items from 13 categories. The high accuracy and robustness produced from the object detection model make the checkout system integration seamless. The contribution of our work is providing a fully automatic checkout system architecture that utilizes contemporary deep learning and machine vision techniques for accelerating the checkout process and reducing manual labor.

Merit: Due to the COVID-19 pandemic, contact-less services are profoundly divine towards protecting the health of customers and staff. There is an estimation that the use of contactless payments has grown by 20 percent since the start of the pandemic. Nevertheless, big grocery store chains and school stores, where large gathering occurs, the self-checkout system is not yet extensively implemented or integrated using low efficiency. Moreover, a highly efficient and reliable self-checkout system can help avoid the dilemma from large crowd gathering, nevertheless maintain proper social distancing from one another, that may prosper businesses and reduce the labor cost. Furthermore, this can benefit any corporation, despite how large an organization is. Even after the COVID-19 pandemic, the proposed system will still able to improve the efficiency of payment transactions and liberate human beings from tedious work conceived by today's standards.

Presentation | Poster

Session Graduate Research 2

Moderator: Becky Rutherfoord
Industry Judge: Mike Sagneri
Alumni judge: Lloyd Middlebrooks, Sharon Perry

MS Teams guest link

- **IT GR-3 Analyze Risk Communication COVID-19** (Graduate Research)
  by Elaine Harris (MSIT), Maryline Kwa (MSIT), Chelsey West (MSIT), Raviteja Pasumarthi (MSIT), Gabriel Oyebanji (MSIT), Michael Farris (MSIT), Sang Nguyen (MSIT)
  Advisor: Dr. Meng Han; Project sponsor: Dr. Shirley Tian.
  Description: This research project seeks to assess and analyze the relationship between public health advisory statements during the COVID-19 Pandemic and the trends on new infections in Singapore.
  Merit: Use of both traditional statistical methods and state-of-the-art Big Data Analytics to provide fact-based analysis of current events.
  Presentation | Poster | More information
- **CS GR-34 Defensive Federated Learning** (Graduate Research)
  by Hong kyu Lee (MSCS), Jeehyeong Kim (), Advisor: Dr. Junggab Son
  Description: Machine learning (ML) algorithms require a massive amount of data. Firms such as Google and Facebook exploit user's data to deliver a more precise ML-based

service. However, collecting users' data is a risky action because their private data can be leaked through the transmission. As a remedy, federated learning is introduced. In federated learning, a central server distributes a machine learning model to users. Each user trains the model to its data, and send the model back. Later the models are aggregated and distributed again. Federated learning is more secure in that it emancipates users from the risk of sending private data directly. Recently, several researchers have identified that federated learning is vulnerable to inference attacks. The inference attack is an adversarial algorithm that identifies the training data only by inspecting an ML model. A successful attack will allow an attacker to know the private data of users. We proposed defensive federated learning, the federated learning that deters inference attack. The defensive federated learning hardens the inference attack and obfuscates original private data into an unrecognizable form to human eyes. Thus, the success rate of the inference attack decreases, and even if the attack is successful, what the attacker can see is distorted data that is not decipherable. What important is, even if the proposed scheme distorts the original data, it still learns from the distorted data and achieves high classification accuracy. We showed that our proposed scheme achieved higher model performance and stronger toleration than differential privacy, which is the only solution for the inference attack.

Merit: With the emergence of high-performance mobile devices, various scenarios can be applied using federated learning. Google incorporated federated learning for a query prediction model. Social media and autonomous driving also can implement federated learning. For all those applications, private data leakage will bring a deleterious effect. The proposed scheme defends such an attack to deliver a robust and precise machine learning platform. The platform can be used for various machine learning-based services and can be also used by industries where data privacy is more important.

Presentation | Poster

- **CS GR-36 Energy Saving on Edges** (Graduate Research)
  by Kousalya Banka (MSCS), Advisor: Dr. Kun Suo
  Description: Internet of Things (IoT) comprises a set of devices that are interconnected ranging from our daily used objects to advanced networked devices. It is a constantly evolving phenomenon as the number of devices owned by the regular user is increasing at a rapid rate. These devices are used for various reasons such as social networking, monitoring, performing complex operations and with the increase of advanced technologies, they demand more energy to perform such tasks. Cloud computing enables these communications to seamlessly perform complex tasks in a cloud environment but utilizing these resources properly to perform at the best is the key. In this paper, Energy efficiency and effective functioning of the devices that run on the cloud has been thoroughly analyzed and we have presented the strengths and weakness of various research in each area.
  Merit:
  Presentation | Poster
- **CS GR-37 Privacy for Video Streaming** (Graduate Research)
  by Luke Cranfill (MSCS), Jeehyeong Kim (Post Doctoral Researcher), Hongkyu Lee (MSCS), Victor Youdom Kemmoe (Research Assistant), Advisor: Dr. Junggab Son

Description: MPEG-DASH is a video streaming standard that outlines protocols for sending audio and video content from a server to a client over HTTP. The standard has been widely utilized by the video streaming industry. However, it creates an opportunity for an adversary to invade users' privacy. While a user is watching a video, information is leaked in the form of meta-data, the size and time that the server sent data to the user. This information is not protected by encryption and can be used to create a fingerprint for a video. Once the fingerprint is created, the adversary can use this to identify whether a target user is watching the corresponding video. Successful attack schemes have been proposed based on this leakage of user data using both Machine Learning (ML) and algorithmic approaches. Only one defense strategy has been proposed to deal with this problem: using differential privacy that adds a sufficient amount of noise in order to muddle the attacks. However, this strategy still suffers from the trade-off between the privacy level and efficiency for both the server and the client. To break through the problem, this paper proposes a server-side defense against the attacks with rigorous privacy and performance constraints, creating a totally private scalable solution that outperforms the extant schemes. Our algorithm, No Data are Alone (NDA), is developed based on K-Means clustering and is highly efficient. The experimental results show that our scheme is more than two times as efficient, in terms of excess downloaded video (represented as waste), than the most efficient differential privacy based scheme. Additionally, no classifier can achieve an accuracy above 7.07% against videos obfuscated with our scheme.

Merit: Privacy is of great concern to users today, and video streaming services are used by almost everyone every single day. To be able to provide privacy to users is something that companies often boast about, because it increases a user's trust in that company, making them more likely to support that company. Providing efficient privacy in such a massive industry (video streaming) has many merits. Often companies must trade computational efficiency for more privacy, which is why we wanted to create a scheme to provide both.

Presentation | Poster | More information

- **CS GR-41 IoT Botnet and Nw Intrusion Detect** (Graduate Research)
  by Madhuri Gurunathrao Desai (MSCS), Advisor: Dr. Yong Shi
  Description: In the present-day world, there are different types of attacks being launched on computing devices. The world is experiencing more and more cyber-attacks, and the types of attacks are also increasing. For example, an IoT device in a home network can act as a botnet attacking other devices or there could be Man in the Middle attack. As time goes by more and more devices are being connected within any given network. All these devices will be vulnerable to attacks if any one of the devices is compromised within the network. This complicates Intrusion Detection in any given network. Manual detection and intervention are nearly impossible. Hence it is quintessential to detect different types of attacks with more confidence and with less computation complexity and time. In this research, the focus is on detecting intrusions including IoT botnet attacks and other types of network attacks. To achieve this, we built a multiclass classifier model using supervised learning algorithms along

with the dimensionality reduction technique. Numerous studies on ML-based IDS have been using KDD or the upgraded versions of KDD dataset. In this study, we used a new dataset, the IoT network Intrusion Detection dataset.

Merit: Internet of Things (IoT) technology has been utilized in many areas including health monitoring, energy management, transportation, home automation, or manufacturing. However, IoT devices are prone to various physical, network, and application-layer attacks which may lead to business interruptions, privacy violations, or even physical injuries. The implications of these attacks are not limited to the users of these systems; they create significant problems for all other information systems as the compromised devices enormously increase the damage capacity of botnets. So, it is very important in the current world to have an effective Machine Learning model that can be utilized to detect any intrusions. Moreover, these ML models need to be explainable so that admins can take proper actions. Here the proposed research demonstrates that classification algorithms and reduced features can effectively distinguish normal traffic from different attack traffic (both IoT and Other attacks). This project envisions the generic explainable model which can be deployed to all IoT networks with whose, help attacks can be detected and prevented in near real-time.

Presentation | Poster | More information

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Session Undergraduate Research 1

Moderator: Bill Forsyth
Industry Judge: Darin Morrow
Alumni judge: Harrison Wittenbrook

MS Teams guest link

- **CS UR-44 Diagnosing ALL with Computer Vision** (Undergraduate Research)
  by Dasarath Katragadda (HS Intern), Advisor: Dr. Dan Lo
  Description: I have been programming a neural network capable of detecting Acute Lymphoblastic Leukemia in a microscopic image of a patient's blood sample. My neural network can detect individual cells, segment images so that each image contains a single cell, and then detect whether each cell is infected.
  Merit: While it may be possible to monetize my project, I am much more focused on its intellectual and humanitarian aspects. This project can save many lives, and I hope it can help future researchers build on my work and save lives as well. My project's main merit is the contribution that it will have on future research regarding the rapid and automated diagnosis of diseases. I believe that this will be the future of disease diagnosis, and I hope that my research will help achieve that goal.
  Presentation | Poster
- **CS UR-52 Motion Prediction for self-driving** (Undergraduate Research)
  by Nihad Kalathingal (BSCS), Raleigh Barden (BSCS), Advisor: Dr. Mohammed Aledhari
  Description: Predicting the motion of agents in an autonomous vehicle's (AV)

environment is imperative step in the trajectory planning system for an AV. The term agent refers to vehicles, bicycles, pedestrians, and other actors in the environment of the AV. The agent which the AV aims to predict the motion of is termed a target agent (TA) in this study. A major part of the challenge is that the TA behaves with some level of uncertainty according to the behaviors of other agents. The design considerations are shaped by the hardware and other software systems present in the AV. The hardware and the real-time nature of the problem sets limits on the inference time of the model to allow for motion prediction of all agents in the AV environment at an acceptable frequency. Most importantly, the performance and accuracy of such a system is crucial to the overall safety of the AV and the agents in its environment. Additionally, the motion prediction relies on sensors and other software systems, like object detection systems, in order to infer the motion of agents. This study explores the current methodologies that solve the motion prediction problem and the differences in these techniques. We iteratively improve on a baseline model, a Convolutional Neural Network (CNN) which predicts one trajectory for an agent, to produce a multimodal motion prediction model which is performant and accurate. The model produces three trajectory predictions for each agent with confidences associated with each trajectory.

Merit: A good solution to the motion prediction problem in autonomous vehicles will pave the way to fully autonomous self-driving cars that are safe for both the passengers on-board the AV and the other traffic agents. Achieving level five autonomy is the future of providing safer and more accessible transportation for everyone.

Presentation | Poster

- **CS UR-53 Motion Prediction for Vehicles** (Undergraduate Research)
  by Neel Patel (BSCS), Matthew Korpi (), Shivank Rao (), Advisor: Dr. Mohammed Aledhari
  Description: The idea of a self-driving car is one that makes us think more of a science fiction movie than a plausible addition to real life. While we have not come close to perfecting street legal autonomous vehicles by any means, over the past few years significant progress has been made. Autonomous vehicles need to be able to constantly perceive what is happening in their environment and be able to react accordingly. This study aims to improve upon the accuracy of previous motion prediction models, thus allowing the autonomous vehicle to better understand its surroundings. Building upon Lyft's baseline model, we will implement a model with multi-modal prediction that will generate possible paths that are likely to occur. After training the new model and reviewing the results, the multi-modal approach handles complex intersections well. The baseline model had some instances where a predicted path would ignore the geometry of the road or would cut across an intersection. With the new model, ResNet50 was also implemented. Being a form of deep residual learning, ResNet50 helps give context awareness to the model. The implementation of ResNet50 helped eliminate errors where the predicted path did not follow the geometry of the road, as well as predictions in intersections.

Merit: The purpose of this study is to examine and improve the accuracy of vehicle motion prediction models. The main goal is to achieve a motion prediction algorithm that can perform quickly and accurately when interpreting all surrounding traffic agents inside the given data set. While innately humans can interpret the context of an intersection and estimate what direction vehicles will travel, it can be more difficult for a model to fully understand the context of a scene and what should happen. Our model addresses issues of multiple path possibilities and scene context awareness. The proposed model here is a reactive and multimodal motion prediction model that predicts three trajectories with assigned confidence for each. Reactive models are faster to compute since the predictions are in short increments over intervals of a couple seconds, as opposed to other models that predict a path over a longer time interval. The results of this approach reflect improvement when interpreting a large intersection and acknowledgement of the possible paths that a vehicle could take.

Presentation | Poster

- **CS UR-45 Detecting Schizophrenia - ML** (Undergraduate Research)
  by Rohan Shiknis (HS Intern), Advisor: Dr. Dan Lo
  Description: I want to use Machine Learning, deep networks, and neural networks and research whether these three tools can help diagnose mental disorders at an earlier age. Schizophrenia affects over 1.1% of the world's population, and it is a severe personality disorder that if left untreated, can lead to self harm and catastrophic mental health issues. Constructing various deep learning algorithms, this research project sought out to use this application of machine learning to help those who are struggling to find ways to detect this debilitating disorder.
  Merit: I plan to integrate this model into an app called SchizDetect. The app will give users a list of symptoms that they or someone they know is exhibiting. If the quiz results indicate that schizophrenia could be possible, the app would take the users MRIs as an input and let the patient know if they are schizophrenic or not. This could play a large role in neurology, as it takes a lot of time for one specialist to detect schizophrenia (typically seen by an enlarged frontal lobe)
  Presentation | Poster | More information

- **IT UR-57 Cyber-Physical Systems** (Undergraduate Research)
  by Wesley McDonald (BSIT), Austin Mascarenas (BSIT), Ryan LeBlanc (BSIT), Scott Lilly (BSIT), Adam Block (BSIT), Advisor: Dr. Ying Xie
  Description: This project simulates an ad-hoc wireless network used to represent a theoretical network between self-driving vehicles and waystations. In addition, we are able to conduct spectrum analysis on the network through the use of a deep-learning algorithm built directly into the system.
  Merit: We believe our project has more intellectual than business merit at the moment; the results are best used to direct further research.
  Presentation | Poster

Session Undergraduate Research 2

Moderator: Dawn Tatum
Industry Judge: Jason Milliken
Alumni judge: Shelby Silcox

MS Teams guest link

- **CS UR-49 Thermal Attacks on Edge Platforms** (Undergraduate Research)
  by Justin Duchatellier (BSCS), Tyler Holmes (BSCS), Advisor: Dr. Kun Suo
  Description: This project was the result of our undergraduate research while
  supervised by Prof. Suo at Kennesaw State University. We analyzed the effects of
  thermal attacks on edge devices. The Raspberry Pi 4 Model B was used in several
  experiments, and its performance was compared to its expected results for normal
  workloads.
  Merit: Businesses may use our research to prevent unexpected thermal attacks. They
  could implement system logging policies to monitor average resource consumption,
  and use these statistics when unexpected resource spikes occur. Appropriate
  countermeasures would allow for all attacks to be terminated before the system's
  temperature became unstable. Keeping a record of average temperatures, power
  consumption, and other performance metrics could keep operating costs minimized
  and maximize the system's availability.
  Presentation | Poster
- **SDSA UR-50 Is Hockey Still Canada's Game** (Undergraduate Research)
  by Jon-Paul Faix (GEOG), Advisor(s): Prof. Michael Frankel, Dr. Joe DeMaio
  Description: The Montreal Canadians earned the National Hockey League's 1993
  Stanley Cup, which would be the last time a Canadian team won. The purpose of this
  research is to explore the potential relationship between the Soviet Union's 1991
  collapse and the Stanley Cup's winning teams by comparing National Hockey League
  (NHL) players from former Soviet states on American versus Canadian teams between
  the 1990-91, 2007-08, and 2018-19 seasons.
  Merit: I am trying to determine if the current phenomenon of Canadian's teams not
  winning a Stanley Cup in almost three decades can be explained through simple
  reasoning, or more complex rationale. The comparisons of salaries, and the signing of
  players from countries previously in the Soviet Bloc could allow for determining what
  these Canadian teams could do to improve their probability of winning and ending an
  unprecedented streak that is difficult to explain.
  Presentation | Poster
- **CS UR-51 MorDNN** (Undergraduate Research)
  by Jordan Hasty (BSCS), Carlos Guerrero (BSCS), Advisor: none n/a n/a
  Description: MorDNN is a deep neural network that learns to play the game Mordhau, a
  skill-based competitive melee game, by replicating human playstyles. The game
  features a complex combat system and MorDNN demonstrates its intelligence
  through complex, dynamic behaviors that are indestinguishable from human players
  by making decisions within a continuous state and action space. Additionally, the
  creation of MorDNN introduces a unique method for creating advanced AI for real-

time games.

Merit: The project demonstrates a unique method for creating complex game AI and proposes a neural network structure that can learn to play games within continuous state and action spaces. By demonstrating the methodology, it may be implemented by game developers to create better AI opponents.

Presentation | Poster | More information

- **IT UR-8 Visual Survey in 3-D Spaces** (Undergraduate Research)
  by Clint Williams (BASIT), Jason Buckner (BSIT), Oscar Perez (BSIT), Amir Butcher (BSIT), Kacy Coulombe (BSIT), Advisor: Dr Ying Xie; Project Sponsor: Dr. Sumit Chakravarty

  Description: Using video to monitor and analyze humans observing social distancing.

  Merit: Determing different processes for visual video processing

  Presentation | Poster | More information

Session Other

- **CS GR-33 PCA embedded Random Forest** (Graduate Research)
  by Charles Gardner (MSCS), Advisor: Dr. Dan Lo

  Description: This study proposes a new architecture for the random forest algorithm. This architecture attempts to improve the Random Forests algorithm's ability to recognize feature interdependencies. An improvement performance is produced by creating a PCA model within each tree. This PCA model creates new additional features containing information from multiple input features. These new features are not used for feature reduction but instead appended to the existing feature set. With this approach, the tree can make separations based on information from more than one of its input features. We use PCA feature construction to improve the Random Forest algorithm's performance.

  Merit: This project allows for both more options for optimizing fraud detection models and improves random forest performance in fraud detection. A small improvement in financial fraud detection can result in large amounts of money saves.

  Presentation | Poster

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