

College of Computing and Software Engineering / Computing Showcase /
C-Day Winners Spring 2021

C-Day Winners Spring 2021

Assurant Awards

UC-11 Information Recall For Kids With Autism (Undergraduate Capstone) by [Alex J Bechke](#), Elizabeth Burnside, Haiden Gembinski, [Ross Murphy](#), Ryan Taylor, Henok Demisse

Advisors(s): Professor - Dr. Parizi

Client - Spectrum Behavioral Associates Personnel - Hannah Taylor

Topic: Games

Department: Software Engineering and Game Design and Development

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

UC-57 Cultiva- The Plant Companion (Undergraduate Capstone) by [Travis R Hescoc](#), [Kat Branham](#), [Ahsan Jamal](#), [Joseph Henggeler](#), [Erick Reyes](#), [Andy Alcaraz](#), [Momodou Mbye](#)

Advisor: Dr. Ken Hoganson

Topics: IoT/Cloud/Networking

Department: Computer Science

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1st Place

GC-54 COVID-19 Mortality Prediction using Machine Learning Techniques (Graduate Capstone) by Lindsay* Schirato, Kennedy Makina, Dwayne Flanders

Advisor: Dr. Seyedamin Pouriyeh

Topic: Machine Learning

Department: Information Technology

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2d Place

GC-28 Modern Web Scraping (Graduate Capstone) by [Kenny* Randolph](#), [Joselyn Giron](#), [Denise Tucker](#), [Justin B Bridges](#), [Sandhya Bantu](#)

Advisor: Dr Meng Han

Topic: Data/Data Analytics

Department: Information Technology

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3d Place

GC-47 Key Professional Dataset - Dataspider (Graduate Capstone) by [Janell* Westmoreland](#), [Vy Duong](#), [Nyong Nkereuwem](#), [Kajal S Vaghani](#), [Ritu Choudhary](#)

Advisor: Dr. Meng Han & Jing Wang -Project Sponsor

Topic: Data/Data Analytics

Department: Information Technology

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Graduate Research

1st Place

GR-67 Representation Learning for Motion Sequence (Graduate Research) by Saisangararamaleengam* Alagapan, Alexandru Malos, Roshni Kishor, Venkateswara Reddy Mosali

Project Sponsors - Dr. Ying Xie & Dr. Linh Le; Project Advisor- Dr. Meng Han

Topic: Data/Data Analytics

Department: Information Technology

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

2d Place

GR-70 Defending data reconstruction through adaptive image augmentation (Graduate Research) by [Seunghyeon* Shin](#)

Advisor: Dr. Junggab Son

Topic: Security

Department: Computer Science

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

3d Place

GR-44 An efficient intrusion detection framework based on federated learning for IoT networks. (Graduate Research) by [Osama* Shahid](#)

Advisor: Dr. Seyedamin Pouriyeh

Topic: Security

Department: Information Technology

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

Undergraduate Capstone

1st Place

UC-14 TeleClinic (Undergraduate Capstone) by [Jay P* Bhatt](#), [Lucius Burch](#), [Zekai Fei](#), [Bijoy Shah](#), [Hao Zhang](#)

Advisor: Dr. Ken Hoganson

Topic: IoT/Cloud/Networking

Department: Computer Science

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2d Place

UC-15 Malware Analysis Using Reverse Engineering (Undergraduate Capstone))
by [Shamour Jones](#), [Cynthia S Marcellus](#), [Andy Pham](#), [Nathan Rowe](#), [Joshua* Rowland](#)

Advisor: Dr. Hossain Shahriar

Topic: Security

Department: Information Technology

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

3d Place

UC-43 Text Marks the Spot Mobile Application (Undergraduate Capstone) by [Austin T* Hogan](#)

Advisor: Dr. Reza Parizi

Topic: Software Engineering

Department: Software Engineering and Game Design and Development

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

Undergraduate Research

1st Place

UR-48 Using Semantic Segmentation in a Convoluted Neural Network for Vocal Localization in Music (Undergraduate Research) by [Trevor E* Stanca](#), [Noah Trinite](#)

Advisor: Dr. Mohammed Aledhari

Topic: Artificial Intelligence

Department: Software Engineering and Game Design and Development

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

2d Place

UR-31 An Empirical Study of Thermal Attacks on Edge Platforms (Undergraduate Capstone)) by Tyler* Holmes, Justin Duchatellier

Advisor: Dr. Kun Suo

Topic: Security

Department: Computer Science

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3d Place

UR-60 Video-to-Video Synthesis With Semantically Segmented Video (Undergraduate Research) by [Aydan* Mufti](#), [Jordan S Hasty](#)

Advisor: Dr. Mohammed Aledhari

Topic: Artificial Intelligence

Department: Computer Science

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

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Spring 2021 C-Day Program

April 29, 2021

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

Mark your calendar for Fall 2021 C-Day: Thursday, December 2, 5:00 - 7:00 pm

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C-Day Home Page

Return to the C-Day home page.



Spring 2021 Winners

View the Spring 2021 C-Day winners.

TIME	EVENT
Wednesday, April 28, 2021	Links to the recoded presentation and student posters will be posted on this site.
Thursday, April 29, 2021, 11 am	Judging starts. The judges will review posted videos and posters.

Thursday, April 29, 2021, 5:00 pm - 5:30 pm	<p>Introduction of Keynote Speakers (Dean Chastine)</p> <p>Keynote Speakers:</p> <p>Joe Drury, VP, Software Engineering</p> <p>Robert Fortunato, AVP, Infrastructure Products</p> <p>Yola Belisario, Staff DevOps Engineer</p>
Thursday, April 29, 2021, 5:30 pm - 7:00 pm	Judges must attend assigned Q&A sessions. Each session will have five-six projects. The team will have 10 min to present the project (2-3 min) and answer questions (7-8 min).
Friday, April 30, 2021, 11 am	Deadline for judges to submit completed score sheets.
Tuesday, May 4, 2021	<p>Winners of the awards announced</p> <ul style="list-style-type: none"> ◦ Best Undergraduate Project ◦ Best Graduate Project ◦ Best Undergraduate Research Project ◦ Best Graduate Research Project ◦ Assurant Award

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Spring 2021 C-Day Projects

Keynote Speakers	+
Judges & Guests	+
Rubrics and Acceptance Rate	+

Keynote Session

[MS Teams guest link](#)

Session 1

Moderator: Justus Robertson

[MS Teams guest link](#)

- Judges: Lenin Disla, Lori Aakre, Andrew Hamilton **GC-28 Modern Web Scraping** (Graduate Capstone) by [Kenny Randolph](#), [Joselyn Giron](#), [Denise Tucker](#), [Justin B Bridges](#), [Sandhya Bantu](#)
Abstract: This project was developed for the IT7993 Capstone class in the May semester of 2021. The goal of the project is to scrape all names of key professionals of organizations in the open990.org website and insert that information into a structured database for query and analysis. The Key Professionals dataset aims to include global coverage of key investor and consultant professionals, beginning with US-based companies, involved in making an investment decision. The overarching aim of this project is to create a one-stop center for institutional asset management distribution intelligence; the one spot to go for mandates, documentation and profiles of consultants, investors, and managers with key technical contact information by including coverage within the eVestment network for US investors and consultants. From end to end, the key professional database project consists of creating a web crawler to retrieve information from the open990 website, wrangling the data into the desired structure, and inserting it into a database for comprehensive data analysis. The primary data source is the open990.org website. The team was given a list of names of organizations as targets to scrape information. Each organization has a page within the open990 website with the organization information, including names of the key professionals, which is the target data. Scraping data from the open990 website consisted of several challenges. First, the website is coded completely using JavaScript which requires specific techniques to render and scrape. Second, the different organization sites have different data structures, which causes problems for parsing. Third, most of the data is in tables that are delivered through a backend API. Fourth, due to delivery of the tables from a backend API, the HTML tags used for the data are not unique, so that identifying and parsing specific data using HTML tags was not possible. Lastly, by observing the network traffic using the Chrome browser tools, and examining the HAR data returned from Splash, we discovered the website is delivered through Cloudflare servers, which we believe blocked some of our attempts to scrape the data. Cloudflare is a network for content delivery featuring robust security services. The complexity of the webpage is an example of how modern, secure web development will change the landscape and require web scrapers to develop more advanced methods of automation.

Advisors(s): Dr Meng Han

Topic(s): Data/Data Analytics

IT 7993 Department: Information Technology

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

- Judges: Lenin Disla, Lori Aakre, Andrew Hamilton **GC-47 Key Professional Dataset - Dataspider** (Graduate Capstone) by [Janell Westmoreland](#), [Vy Duong](#), [Nyong Nkerekwem](#), [Kajal S Vaghani](#), [Ritu Choudhary](#)
Abstract: The purpose of this project is to build a Web Crawler to extract personal information from a public website like Reddit and LinkedIn. We completed the Instagram crawling as a bonus for the project. The team will be using MySQL or any other open source relational database to organize the data and conduct a quantitative data analysis on it.
 Advisors(s): Dr. Han - Professor IT7993 Capstone Jing Wang -Project Sponsor
 Topic(s): Data/Data Analytics
 IT7993Department: Information Technology
[Presentation](#) | [Poster](#) | [More Information](#)
- Judges: Lenin Disla, Lori Aakre, Andrew Hamilton **GC-52 KSU Spring Capstone - IT Security Solution for Small Business – Group 1** (Graduate Capstone) by [William Simmons](#) (other members are not registered on CMT3: Olajumoke Giwa, Beau Beard and Collin Peters)
Abstract: For this project, we decided to use the nopCommerce open-source eCommerce solution for our simulated small business. Leveraging the pre-configured web server provide to our group, we installed the nopCommerce solution package and built our security program around the web site. Our security program consists of nginx configured web server and load balancer, SSL certificate for encryption, firewall and a secure backend SQL server.
 Advisors(s): Project Sponsor: Dr. Lei Li Course Professor: Dr. Meng Han
 Topic(s): Security
 IT 7993Department: Information Technology
[Presentation](#) | [Poster](#)
- Judges: Michael Hoefel, Frank Ziller, Jayson Franklin **GR-1 Compare Two Off Angle Normalization** (Graduate Research) by [Emily Ehrlich](#)
Abstract: This work investigates different iris normalization techniques to compare their performance including elliptical normalization and circular normalization after frontal projection of off-angle iris recognition. Elliptical normalization samples the iris texture using elliptical segmentation parameters. For circular unwrapping, we first estimate the gaze deviation using ellipse parameters and the image will be projected back to frontal view using perspective transformation. Then, we segment the transformed image and normalize using circular parameters. We further investigate if: (i) elliptical normalization or circular unwrapping recognition performance is higher, and (ii) the two segmentations methods in circular unwrapping increase the recognition efficiency. Based on the preliminary results, the elliptical normalization method shows slightly better recognition performance in off-angle iris images with 2.2% decrement in the equal error rate. The motivation of this research is to provide guidance in the construction of a recognition framework for off-angle iris images with the analysis and comparison of different normalization methods. MATLAB was used to calculate the hamming distance and accuracy of each normalization method and to construct the plotted graphs for display. Based on the preliminary results, the elliptical normalization method shows slightly better recognition performance in off-angle iris

images with 2.2% decrement in the equal error rate. In addition, perspective projection shifted the distributions of intra and inter class Hamming distances to left where its average intra-class and inter-class Hamming distance are 0.3070 and 0.4891, respectively compared with 0.3082 and 0.4900 for elliptical normalization.

Advisors(s): Dr. Mahmut Karakaya mkarakay@kennesaw.edu

Topic(s): Security

Department: Computer Science

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

- Judges: Michael Hoefel, Frank Ziller, Jayson Franklin **GR-29 Wrist Intent Recognition for Stroke Rehabilitation** (Graduate Research) by [Suman Bharti](#)
Abstract: Abstract Hand mentor robotic device is beneficial for stroke patients . This is rehabilitation technique used in stroke therapy. It strengthens and improves the range of motion which ultimately improves the quality of life for severely impaired stroke patients. It is easy to use without assistance and most importantly stroke survivors able to use independently. Usage of hand mentor device is quite expensive for stroke patients on hourly basis . Coming up with most efficient deep learning algorithm for sensor data is motivation to cut down the cost and easy availability usage for stroke patients. EMG signal is recorded using relevant sensors which provides useful information to infer muscle movement. In this study, we utilized publicly available EMG signal datasets recorded from upper limb of human subjects to develop a neural network based model for the prediction of wrist motion intention. Research Question or Motivation The Motivation of this study is to train a simple neural network model to accurately predict three basic wrist motions (extension, flexion and no motion) using optimum number of EMG sensors. This model can be further deployed to augment the capabilities of commercially available robotic-assistive rehabilitation devices. Materials and Methods Sensor-based continuous hand gesture recognition activity requires profound knowledge about gesture activities from multitudes of low-level sensor readings. There are two ways to provide the solutions either to go by handcrafted features from sensor data or use deep learning techniques. The advantage of using deep learning technique is to utilize the automatic high-level feature extraction with outstanding performance. However, sensor data requires signal pre-or post-processing such as feature selection, dimension reduction, denoising, etc. Based on the literature review of many research papers, we found that 1D Convolutional Neural Network have recently become the state-of-the-art technique for crucial signal processing applications. 1D CNN is very effective when we aim to extract features from fixed-length segments of the overall dataset and where the location of the feature within the segment is not of high relevance. In addition to this, real-time and low-cost hardware implementation is feasible using 1D CNN. After a successful literature review on 1D CNN knowing its advantages and benefits of using over signal. We decided to use 1D CNN on raw EMG signal data. Preliminary results: Since it is an application-based project, we planned to work in phases to achieve the long-term goal of benefitting stroke patients using deep learning techniques. In this initial phase of the study, we utilized publicly available EMG dataset for hand gestures from UCI Machine

Learning Repository to test the performance of the 1D CNN algorithm on gesture classification. We used only 3 labels (hand at rest, wrist flexion, wrist extension) out of 8 labels in the dataset for our particular application requirement. This dataset contains 8 EMG channels collected from commercial MYO Thalmic bracelet device. We first performed an initial analysis to investigate the optimum number of sensor/channels based on the highest gesture classification accuracy using KNN, Decision Tree and Naïve Bayes algorithms. As a result of this analysis, we obtained the optimum channel combination (Ch1, Ch4, Ch5, Ch8) data which generates the best classification accuracy. We used these 4 sensor datasets to train a 1D CNN with 78/22 train/test split. Dataset contains total 36 subjects. Data with subject number less than or equal to 28 is considered as training set and data with subject number greater than 28 is considered as test set. We also performed an optimization study on finding the optimum time signal window and overlap sizes of 100 ms and 50 ms . We achieved test accuracy of 97% for the classification accuracy of 3 gestures (hand at rest, wrist flexion, wrist extension).

Advisors(s): Supervisor : Dr. Coskun Tekes Email id : ctekes@kennesaw.edu

Topic(s): Artificial Intelligence

CS7992 Department: Computer Science

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

- (not judged) **CR-33 Efficient yet Robust Privacy Preservation \for MPEG-DASH Based Video Streaming** (Graduate Research) by Luke A Cranfill

Abstract: MPEG-DASH is a video streaming standard that outlines protocols for sending audio and video content from a server to a client over HTTP. 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. After a fingerprint of this data is created, the adversary can use this to identify whether a target user is watching the corresponding video. Only one defense strategy has been proposed to deal with this problem: differential privacy that adds sufficient noise in order to muddle the attacks. However, that strategy still suffers from the trade-off between privacy and efficiency. This paper proposes a novel defense strategy against the attacks with rigorous privacy and performance goals creating a private, scalable solution. Our algorithm, No Data are Alone (NDA), 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.

Advisors(s): Dr. Junggab Son

Topic(s): Security

Department: Computer Science

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

Session 2

Moderator: Kun Suo

[MS Teams guest link](#)

- Judges: Fernando Pujol, Jaspal Sagoo **GR-40 Design and Implementation of a Microservices Web-based Architecture for Code Deployment and Testing** (Graduate Research) by Soim Abdoul Kassif Baba M Traore

Abstract: Many tech stars like Netflix, Amazon, PayPal, eBay, and Twitter are evolving from monolithic to a microservice architecture due to the benefits for Agile and DevOps teams. Microservices architecture can be applied to multiple industries, like IoT, using containerization. Virtual containers give an ideal environment for developing and testing IoT technologies. Since the IoT industry has exponential growth, it is the responsibility of universities to teach IoT with hands-on labs to minimize the gap between what the students learn and what is on-demand in the job market. That can be done by using containerization. There are many approaches in the containerization field, but they can be difficult to use without depth knowledge in virtualization and code encapsulation. After a deep analysis of the containerization challenges, we came with an idea of a microservice infrastructure based on Docker, which is an open-platform for developing, testing, and running applications using containers, to solve the virtualization and code-encapsulation problem. Our infrastructure will provide a code development and testing web-based platform that allows users to securely go in the process of containerization without spending research time in learning virtualization. So, students and researchers can focus more on the development and testing of algorithms and codes. For example, it will be easy to develop containers that allow sensors to connect to an external server in few cliques, or to run a python code in a total isolate process in minutes without downloading any containerization software.

Advisors(s): Dr. Maria Valero mvalero2@kennesaw.edu Dr Hossain Shahriar hshahria@kennesaw.edu

Topic(s): IoT/Cloud/Networking

Department: Information Technology

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

- Judges: Fernando Pujol, Jaspal Sagoo **GR-44 An efficient intrusion detection framework based on federated learning for IoT networks.** (Graduate Research) by [Osama Shahid](#)

Abstract: There are abundant number of IoT devices that are connected on over multiple networks. These devices can be exposed to multiple different types of network threats. Though, these devices do have security and software that does act as a wall of protection we purpose a Federated Learning (FL) approach that would allow detection of threats of a network for IoT devices. Federated Learning can be best described as decentralized training. Adhering to the GDPR rules that prevent data from being distributed, FL addressed the challenge by bringing the ML model to the data rather than the traditional method where the data had to be extrapolated and taken to the ML model. This type of setting is ideal for IoT devices (Client) that are connected to the network and can download the FL model that would allow them to keep their devices

more secure. FL is different from on-device training. Once the Client(s) download the model and train on their individual local data, the updated model is shared on a central server. The central server as all the individual models shared by each client on the federated network. The central server aggregates all these models as one new global model. For our project we believe this is an ideal setting for IoT devices that are susceptible to network threats. In our Federated Network we have four clients, and we create a FL framework that allows each client to train a FL model on their local data. The model(s) are then aggregated to create a new global model. It is worth noting that each client has its' own distinct type of threat. So, when all the models are aggregated, they have the knowledge of each of these individual models and this new model is capable to testing and detecting threats that are posed across all the devices.

Advisors(s): Dr. Seyedamin Pouriyeh

Topic(s): Security

Department: Information Technology

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

- Judges: Fernando Pujol, Jaspal Sagoo **GR-64 How could IoT assist healthcare system during COVID-19 or future pandemics?** (Graduate Research) by [Mohammad](#)

[Nasajpour Esfahani](#)

Abstract: The Internet of Things (IoT), a technology built upon sensors and devices, has shown great applicability among various domains, especially healthcare. This pandemic has critically impacted all parts of society including people, health centers, businesses, authorities, etc. Researchers are attempting to adopt different technologies to mitigate this virus faster and save more lives. Regarding the great benefits that Internet of Things (IoT) has brought into different areas within the healthcare domain, this technology has been performing several main tasks including diagnosing, monitoring, tracing, disinfecting, and vaccinating to combat this virus. Our research is conducted of the possible IoT solutions to mitigate the COVID-19 or even future pandemics. We have demonstrated the applicability of IoT technologies in three main COVID-19 phases including “early diagnosis, quarantine time, and after recovery.” Along with such applications, we also review the proposed IoT applications for the main tasks of IoT, which could be exponentially helpful for fighting against this virus.

Advisors(s): Prof. Seyedamin Pouriyeh: supervisor Prof. Reza Meimandi Parizi: second supervisor

Topic(s): IoT/Cloud/Networking

Department: Information Technology

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

- Judges: Joel Hagans, Charles Chidi Igwilo **GR-34 Defensive Neural Network** (Graduate Research) by [Hongkyu Lee](#)

Abstract: 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.

Advisors(s): Dr. Junggab Son

Topic(s): Other (explain in the comments section)

N/A Department: Computer Science

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

- Judges: Joel Hagans, Charles Chidi Igwilo **GR-38 Energy Cost and Efficiency on Edge Computing: Challenges and Vision** (Graduate Research) by [Kousalya Banka](#)
Abstract: The Internet of Things (IoT) has been the key for many advancements in next-generation technologies for the past few years. With a conceptual grouping of ecosystem elements such as sensors, actuators, and smart objects connected to perform complex operations to perform environmental monitoring, intelligent transport system, smart building, smart cities, and endless other possibilities. Edge computing helps the IoT's reach even further and be more robust by connecting multiple censored devices through the internet and forming powerful computational capabilities. Unfortunately, this computation level comes at a cost as the devices are constantly being used to communicate and perform specific actions. Energy efficiency has focused on finding the optimal way to utilize the latest technologies while retaining the battery power's longevity. In this paper, we present an outline of the difficulties engaged with planning energy-efficient IoT edge devices and depict recent research that has proposed promising answers that address these challenges. First, we analyze the challenges that IoT devices bring in terms of energy consumption. Next, we discuss the different approaches such as computation offloading, modifying the IoT devices' designs, and the number of algorithms that help reduce energy consumption and few latest technologies. Finally, we will look at the case study that outlines the energy-saving techniques in smart grids, smart cities, electric vehicles, smart home devices, and VR/AR in real time to apply the concepts proposed.

Advisors(s): Dr. Kun Suo

Topic(s): IoT/Cloud/Networking

Department: Computer Science

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

- Judges: Joel Hagans, Charles Chidi Igwilo **GR-45 Framework for Collecting Data from specialized IoT devices.** (Graduate Research) by [MD SAIFUL ISLAM](#)
Abstract: The Internet of Things (IoT) is the most significant and blooming technology in the 21st century. IoT has rapidly developed by covering hundreds of applications in the civil, health, military, and agriculture areas. IoT is based on the collection of sensor data through an embedded system, and this embedded system uploads the data on the internet. Devices and sensor technologies connected over a network can monitor and measure data in real-time. The main challenge is to collect data from IoT devices, transmit them to store in the Cloud, and later retrieve them at any time for visualization and data analysis. All these phases need to be secure by following security protocol to ensure data integrity. In this paper, we present the design of a lightweight and easy-to-use data collection framework for IoT devices. This framework consists of collecting data from sensors and sending them to Cloud storage securely and in real-time for further processing and visualization. Our main objective is to make a data-collecting platform that will be plug-and-play and secure so that any organization or research team can use it to collect data from any IoT device for further data analysis. This framework is expected to help with the data collection from a variety of different IoT devices.
Advisors(s): Dr. Maria Valero, Dr. Hossain Shahriar
Topic(s): IoT/Cloud/Networking
Department: Information Technology
[Presentation](#) | [Poster](#)

Session 3

Moderator: Dan Lo

[MS Teams guest link](#)

- Judges: Cheryl Coleman, Veanne Smith **GR-50 Predicting Users' Engagement During Interviews with Biofeedback, Voice, and Supervised Machine Learning** (Graduate Research) by Thaide Huichapa
Abstract: Studies show that the quality of the information collected during an elicitation interview, and consequently the quality of the software product that needs to be developed, highly depends on the interviewee's engagement. Because of social expectations, interviewees tend to hide if they are bored or not engaged. To overcome this problem and support the analyst during the interviews, this research uses biometric data and voice features, together with supervised machine learning algorithms, to predict the interviewee's engagement. We built our solution on an experiment consisted of interviewing 31 participants. We collected the data using an Empatica wristband and a default recorder from a laptop. After preprocessing the data and segmented them into single question/answer segments, we used part of them to train different supervised machine learning algorithms and the remaining to test the algorithms in order to evaluate their effectiveness and select the one that performs better. Our results show that both biofeedback and voice, considered individually, and

machine learning can be successfully used to predict participants' engagement. The results of our work, in addition to being used to help the analyst conduct better interviews by steering the interview based on the participant's engagement, can also be used to prioritize requirements.

Advisors(s): Dr. Paola Spoletini

Topic(s): Software Engineering

Department: Software Engineering and Game Design and Development

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

- Judges: Cheryl Coleman, Veanne Smith **GR-53 An Investigation on Non-Invasive Brain-Computer Interfaces: Emotiv Epoc+ Neuroheadset and Its Effectiveness** (Graduate Research) by [Md Jobair Hossain Faruk](#)

Abstract: Neurotechnology describes as one of the focal points of today's research around the domain of Brain-Computer Interfaces (BCI). The primary attempts of BCI research are to decoding human speech from brain signals and controlling neuro-psychological patterns that would benefit people suffering from neurological disorders. In this study, we illustrate the progress of BCI research and present scores of unveiled contemporary approaches. First, we explore a decoding natural speech approach that is designed to decode human speech directly from the human brain onto a digital screen introduced by Facebook Reality Lab and University of California San Francisco. Then, we study a recently presented visionary project to control the human brain using Brain-Machine Interfaces (BMI) approach. We also investigate well-known electroencephalography (EEG) based Emotiv Epoc+ Neuroheadset and present experimental studies to identify six emotional parameters using brain signals by experimenting the neuroheadset among three human subjects.

Advisors(s): Prof. Maria Valero Prof. Hossain Shahriar

Topic(s): Other (explain in the comments section)

Department: Information Technology

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

- Judges: Cheryl Coleman, Veanne Smith **GC-54 COVID-19 Mortality Prediction using Machine Learning Techniques** (Graduate Capstone) by Lindsay Schirato, Kennedy Makina, Dwayne Flanders

Abstract: In late 2019, SARS-CoV2 also known as COVID-19 was first identified in the city of Wuhan, China. This virus can infect a person and without showing any signs of sickness, can spread of COVID-19 unknowingly. The World Health Organization declared it a global pandemic in March 2020 because of its far-reaching effects in every part of the world. Scientists have been working to leverage technology to prevent spread, detection and vaccine development. With machine learning, models can predict which patient will most likely have a higher mortality rate. Using WEKA, a machine learning tool and a data set based on 95,000 Mexican patients with 20 clinical features, our research applies models to determine which has the most accuracy.

Advisors(s): Dr. Seyedamin Pouriyeh

Topic(s): Other (explain in the comments section)

Machine Learning Department: Information Technology

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

- Judges: Rosie Belisario, Juan Huaca **GR-23 Machine Learning Techniques for Malware Network Traffic Detection** (Graduate Research) by Jermaine Cameron
Abstract: Persistent malware variants are a constant threat to computing infrastructure across all regions and business sectors. Traditional detection systems focus primarily on signature-based analysis but this approach cannot adequately keep pace with the velocity and volume of new malware variants that are continuously deployed onto the internet. Most network traffic detection techniques are focused on analyzing raw packets and have not deterred the surge of persistent malware. Therefore, it is important to develop new research techniques that are focused on optimized metadata from malware network traffic to effectively identify an ever-increasing expanse of malicious software. Recent research efforts by Letteri et al. have produced a quality data set (MTA-KDD'19) that is utilized for this research project. New information in the area of malware network traffic detection is pursued through this research proposal. Specifically, I seek to find a defensible answer to the following question: Can machine learning techniques produce highly accurate classification models for malicious network traffic detection based on analysis of a statistically optimized data set? I believe that an affirmative answer to this research question provides a beneficial contribution to the academic community. The principal tool utilized to analyze the optimized data set for this research project is the Waikato Environment for Knowledge Analysis (WEKA). There are 64,550 instances and 33 features in the MTA-KDD'19 data set that are analyzed along with cross-validation and percentage split alternatives. The classification experiment performed by the authors of the MTA-KDD'19 data set is used as a baseline. The following machine learning classification models have been applied for this research investigation: Multilayer Perceptron, Decision Tree, Support Vector Machine, and K-Nearest Neighbors. The preliminary settings for these machine learning models include 10-fold cross-validation and 80% train 20% test data split. The Decision Tree classifier produced the best preliminary result with 100% accuracy when set to run an 80% training 20% test split and 99.9954% accuracy when set to run 10-fold cross-validation. This preliminary result has outperformed the results observed in the experiment presented by the authors of the MTA-KDD'19 data set. Other preliminary metrics illustrate that the selected models exhibit consistent and highly accurate performance. The multilayer perceptron classifier produced a preliminary result of 99.3649% accuracy when set to run an 80% training 20% test split and 99.3416% accuracy when set to run 10-fold cross-validation. The K-Nearest Neighbor classifier (K=1) produced a preliminary result of 98.9311% accuracy when set to run an 80% training 20% test split and 99.0024% accuracy when set to run 10-fold cross-validation. The Support Vector Machine classifier produced a preliminary result of 97.8081% accuracy when set to run an 80% training 20% test split and 97.7755% accuracy when set to run 10-fold cross-validation. The final stage of this research project will include implementation of additional machine learning methodologies. These methods will include feature selection techniques and ensemble learning models.

Advisors(s): Dr. Seyedamin Pouriyeh

Topic(s): Security

CYBR 7240 Department: Information Technology

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

- Judges: Rosie Belisario, Juan Huaca **GR-67 Representation Learning for Motion Sequence** (Graduate Research) by Saisangaramaleengam Alagapan (other students are not registered on CMT3)

Abstract: This research project proposes a new deep learning architecture that is used to align human poses to be used in an exercise assistant system. In short, the assistant system takes a video feed of a user doing exercise, then provides visual feedback by comparing the user's current pose to a professional trainer's pose that is stored in the system. We design a new deep architecture to accomplish this task and show better accuracy and efficiency.

Advisors(s): Project Sponsors - Dr. Ying Xie & Dr. Linh Le Project Advisor- Dr. Meng Han

Topic(s): Data/Data Analytics

IT 7993 Department: Information Technology

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

- Judges: Rosie Belisario, Juan Huaca **GR-70 Defending data reconstruction through adaptive image augmentation** (Graduate Research) by [Seunghyeon Shin](#)
Abstract: In this paper, we introduce a data augmentation-based defense strategy for preventing the reconstruction of training data through the exploitation of stolen model gradient. The collection of training data to a centralized server has been required for the training of neural networks in traditional machine learning. However, as privacy becomes a significant concern, the concept of Federated learning is introduced. In federated learning, a centralized server shares the well-trained neural network and participating end-users send the gradient back to the server after training without sharing the sensitive data itself. As the concept of federated learning does not share the original data that might include sensitive information, it is believed to be safe against privacy threats. However, several types of research showed that sharing gradient is not safe for privacy as the data can be reconstructed from the shared gradient. Model inversion is an exemplary threat against privacy in deep learning that reconstructs training data from model parameters. Differential privacy is known as a way to prevent stealing gradient for this type of attack in machine learning, however, adding noise in the optimization process to preserve privacy generates significant accuracy loss, so balancing the privacy and utility is required. Our proposed method provides better performance than the traditional differentially private classification method through the usage of grid search that finds the optimized augmentation scheme for each data class. In our research, We found the best augmentations for each class of CIFAR-10 that guarantees similar or better accuracy exists compared to differentially private stochastic gradient descent optimization in deep learning. Our research provides model accuracy and attack accuracy for comparison, which indicates the accuracy of an augmented dataset and the dataset consists of recovered images with augmentation applied. We aimed to secure the higher model accuracy and lower attack accuracy than differentially private

classification results. For example, airplane class in CIFAR-10 dataset has 62.33% of model accuracy and 34.67% of attack accuracy, and it is better than DPSGD results with 56.78% model accuracy and 44.73% attack accuracy with $\sigma=0.5$ and $l2_clip_norm=1.0$. Our research guarantees a better balance between privacy and utility and also show that adaptive augmentation can be used in various type of dataset in further researches.

Advisors(s): Dr. Junggab Son

Topic(s): Security

Department: Computer Science

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

Session 4

Moderator: Laura Howell

[MS Teams guest link](#)

- Judges: Alexander Mohamed, Trevor Sands **UC-7 Software Engineer – Clarity LLC** (Undergraduate Capstone)) by [Amy Mullins](#)
Abstract: Clarity makes an app called CaptionMate that does closed captions for phone calls.. During the internship, a website was made to visualize metrics that are collected on users such as calls made, minutes used, time active, region, age, theme, font, and platform used. Bar charts are used to show minutes and calls used on days of the week. 100% bar charts are used to show how much a day contributes to the usage of the app; a user contributes to minutes, calls and platform usage; and show calls incoming vs. outgoing. Line graphs were created to show growth in app usage and number of new users over time. All the data is displayed in tables too. Who used the CaptionMate app, how much and when? Where are these users located? what age group do they fall into? what themes and fonts do they use? What platforms are they on? Visual studio with C# .NET Core, SQL Server, and ChartJS were used in the making of the website. C# was used for the backend of the website; it executed queries and stored results in lists. SQL Server was used to write queries. These results are displayed using HTML tables. ChartJS was then used to make visualizations after retrieving necessary data from the HTML tables. Many results were found. Users use more minutes and make more calls during the week than on weekends. Users use IOS more than any other platform. They like the gray theme most out of all themes and are located all around the US. The number of users has been growing slowly since the app was released. Some users stop using the app after some time of using it while other users do not try to make calls or make only unsuccessful calls.

Advisors(s): Prof. Dawn Tatum dtatum7@kennesaw.edu

Topic(s): Data/Data Analytics

CSE 4983 Department: Computer Science

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

- Judges: Alexander Mohamed, Trevor Sands **UC-14 TeleClinic** (Undergraduate Capstone)) by [Jay P Bhatt](#), [Lucius Burch](#), [Zekai Fei](#), [Bijoy Shah](#), [Hao Zhang](#)

Abstract: TeleClinic is a telemedicine web application that provides ease of access and a medium for interaction between patients and their respective doctors and administrators. In particular, this web portal includes a chat feature, an area for medical reports, an area for appointment requests, and an area for video recordings. Additionally, TeleClinic meets the requirements prescribed by the Health Insurance Portability and Accountability Act (H.I.P.A.A.) via upholding data privacy and safeguarding medical information. To maximize its overall utility, TeleClinic utilizes the React and React Redux libraries for its front-end and a NoSQL database in Google Firebase for its back-end.

Advisors(s): Dr. Ken Hoganson

Topic(s): IoT/Cloud/Networking

CS 4850 Department: Computer Science

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

- Judges: Alexander Mohamed, Trevor Sands **UC-15 Malware Analysis Using Reverse Engineering** (Undergraduate Capstone)) by [Shamour Jones](#), [Cynthia S Marcellus](#), [Andy Pham](#), [Nathan Rowe](#), [Joshua Rowland](#)

Abstract: The motivation for this project is driven by evaluation of the different tools on the market that allow for breaking down executables or binary files, and understanding what the malware is doing. By reverse-engineering the malware, we can understand its impact and how to protect against it. Our focus is to understand where different tools are stronger than others, as well as understand the evolving landscape of malware and security overall. For this capstone project, we utilized two different tools and many sample malware files. The methods used to debug the malware are detailed in our milestone two report and will be expanded upon in our final presentation. At this point, we've found the tool WinDbg to be the most versatile for binary and executable debugging. We also evaluated IDA Pro, and understand the many ways in which its graphical display of data and relationships, equips a researcher with the necessary tools and information to walk through an executable. Our focus in milestone 3 is to expand our documentation and guide on malware debugging to the point that it provides a user the full breadth of information and steps needed to start from scratch and end with a broken apart piece of malware. We provided much of this as part of the milestone 2 presentation and report, but we will continue to build on it so it's a useful how-to guide for anyone trying to debug a piece of malicious code.

Advisors(s): Dr. Ying Xie yxie2@kennesaw.edu and Dr. Hossain Shahriar hsahria@kennesaw.edu

Topic(s): Security

IT 4983 Department: Information Technology

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

- Judges: Yingying Kang, Tammy Schopf **UC-6 Covid-19 Data Analysis - Regression** (Undergraduate Capstone)) by [Noah Druss](#)

Abstract: Covid-19 has been arguably the most impactful event in the past century. SARS-Cov-2 is a viral respiratory illness discovered in late 2019 that has spread to almost every country in the world. It has directly or indirectly affected just about everybody in

the world greatly, causing over 117 million cases and 2.59 million deaths as of March 2021. This project has focused on the use of different types of linear regression to both analyze and predict Covid-19 infection data based on different features. First, simple linear regression was used to predict total deaths based on infections both globally and by country. Globally, the R^2 score was .946, while depending on the country, the R^2 score .984 which shows a very effective line of best fit. Second, polynomial regression (with a degree of 3) was used to predict total deaths based on total infections by country. This was much more effective, with R^2 scores up to .9998. Finally, multiple linear regression was used with 9 features to find the best features to dive into with more detail. The four features selected from this analysis were GDP, Stringency Index, Median Age, and Life Expectancy. These features were analyzed for three countries in each continent to find patterns. It was found that in the three richest continents GDP and Stringency Index were all positive, while in the three poorest continents, the coefficients of these features were negative. This paper assumes basic conceptual knowledge of machine learning and should be readable by any upper level computer science undergraduate student.

Advisors(s): Dr. Mohammed Aledhari maledhar@kennesaw.edu

Topic(s): Data/Data Analytics

CS 4267 Department: Computer Science

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

- Judges: Yingying Kang, Tammy Schopf **UC-11 Information Recall For Kids With Autism** (Undergraduate Capstone)) by [Alex J Bechke](#), Elizabeth Burnside, Haiden Gembinski, [Ross Murphy](#), Ryan Taylor, Henok Demisse
Abstract: Description: Our project "Information Recall For Kids With Autism" also known as the product name given by the client "Safe Kid" is an app to help children with autism understand basic contact information such as phone numbers, addresses, and names. This app is being created for our client Spectrum Behavioral Associates who specialize in helping kids and young adults who have autism, learning development delays, or other behavioral challenges. Motivation: To teach kids who have autism basic contact information in case of an emergency. Materials and Methods: The app we are creating is a local based app made within Unity. The coding language we are using is C# and we are incorporating user centered design to best fit the target audience. Preliminary Results: To change a life for someone who has autism or a friend/family member of someone who has autism. Intellectual or Business Merit: To teach kids basic contact information through sequences and other methods or recalling information. Also for us it would be implementing what we have learned through the years as software engineering students via documentation, user centered design, testing, consulting, and implementing. Actions That Enhance the Potential of Our Projects Benefit to Society: We feel as it is very important to learn basic contact information in case of an emergency. Some kids with autism or other behavioral delays may have a hard time vocalizing the contact information but have no problem writing it down. This could change the lives of many kids and family members of children with autism.

Advisors(s): Professor - Dr. Parizi Client - Spectrum Behavioral Associates Personnel - Hannah Taylor

Topic(s): Games

SWE 4724 Department: Software Engineering and Game Design and Development

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

- Judges: Yingying Kang, Tammy Schopf **UC-12 Comprehensive Security Solution for small E-commerce Business** (Undergraduate Capstone)) by [Patrick McCollums](#), [Hristo Bakalov](#), [Philinda Morse](#), [Tyler Phillips](#), [Watson Day](#)

Abstract: Project Description: Create an e-commerce server and a comprehensive security program to protect a web server for a simulated small business. This server will include security tools such as intrusion detection, firewall, and network monitoring. The installation and maintenance of this solution will be documented as part of the final documentation package. The server will be reviewed for exploitation from other teams while we attempt the exploitation of their server(s). Research/Motivation: How to research, install, configure, and integrate various open-source software packages for information security, e-commerce, web hosting, and database. Our motivation for this project was to create and secure an e-commerce website that allows the team to explore, learn, and gain knowledge to become better real world IT professionals. Materials/Methods Our team leveraged the use of their own virtual machines and online documentation to test various software packages on the Ubuntu operating system. We leveraged the NIST cybersecurity framework to integrate industry standards and best practices to create risk assessment and information security documents. Preliminary Results: We have created a secure Internet facing e-commerce solution with supporting documentation. We are currently awaiting other teams to begin penetration testing and results from of our server. Intellectual or business merits of our project: Our team gained real world knowledge and skills during the research and implementation of the server and security project. Our documentation details the steps taken throughout the implementation of the project and allows us to hand off the ongoing maintenance to an e-commerce business. Actions that we'll take to enhance the potential of the project to benefit society: Our documentation of the project could be published to allow e-commerce businesses to create a low cost, secure e-commerce store.

Advisors(s): Project Sponsor: Dr. Lei Li Professor: Dr. Ying Xie

Topic(s): Security

IT 4983 Department: Information Technology

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

Session 5

Moderator: Becky Rutherford

[MS Teams guest link](#)

- Judges: Piyush Dhawan, Fabio Valbuena, Daniel Omuto **UC-16 Understanding the Drivers of Medication Nonadherence in the United States** (Undergraduate

Capstone)) by Roman A Schwieterman, Austin Poole, Austin Kay, Usman Mustafa, Issifou Ali

Abstract: Medication nonadherence is generally defined as a patient's inability to take their medications correctly as prescribed by their doctors. Medication nonadherence adversely affects patient outcomes and increases healthcare costs. Prior research found that health system-, condition-, patient- (older age is one factor), therapy- and social/economic-related factors have been identified to show effect on non-adherence. Our goal is to analyze the NHIS data to understand the sociodemographic and health causes of medication nonadherence, as well as answer the following questions about our selected topic: What variables are the most relevant drivers of nonadherence? Does the direction and strength of the associations between these variables and medication nonadherence vary over time? If so, how? Are trends getting better or worse? Do the results of your analysis suggest that social inequality factors may be linked to medication nonadherence? If so, how? What are the implications of your analysis for various stakeholders? How does this vary depending on whether medication nonadherence is intentional or unintentional?

Advisors(s): Advisor/Instructor: Ying Xie | yxie2@kennesaw.edu Project Owner/Sponsor: Dr. Chi Zhang | czhang4@kennesaw.edu

Topic(s): Data/Data Analytics

IT4893 - IT Capstone (W01) Department: Information Technology

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

- Judges: Piyush Dhawan, Fabio Valbuena, Daniel Omuto **UC-19 Comparison of Active and Passive Attention Based Tasks Using EEG with Convolutional Neural Network** (Undergraduate Capstone)) by Jasmine Hemphill, Alyssa Myers, Matt K Warman

Abstract: When considering a student's attentiveness while taking online courses, it is known that they tend to lose focus or get distracted at some point during the lecture. It is said that as humans we are supposed to learn in active environments. Watching a lecture from a screen is considered a passive task. Combining that with another factor like being tired decreases attention even more. Conducting active and passive attention-based trials will reveal varying results in different states of attentiveness. This project compares active and passive attention trial results in two states, wide awake and tired. This has been done in order to answer the questions: Do subjects perform better (as in maintain concentration and attentiveness) on active tasks while both tired and awake? And do they perform worse on passive tasks when tired and better when awake? The data analyzed was collected from electroencephalogram (EEG) waves, and then later processed through a 3D Convolutional Neural Network (CNN) to produce results. Three passive attention trials and three active attention trials were performed on seven subjects, while they were wide awake and again when they were tired.

Advisors(s): Dr. Ying Xie

Topic(s): Data/Data Analytics

IT 4983 Department: Information Technology

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

- Judges: Piyush Dhawan, Fabio Valbuena, Daniel Omuto **UC-20 Analyzing Concentration Levels in Online Education Using Machine Learning** (Undergraduate

Capstone)) by [Gray Daugherty](#), [Rachel W Lawson](#), [Kyle Ensley C Ensley](#), [Michael Chann](#), [Tobi Adams](#)

Abstract: These past few years have introduced the most important time in history to study new facets of online learning. Due to COVID's impact, online learning became a staple in millions of homes across the country. Guided by the research question, "Can a machine learning model be created and trained to detect student concentration level based on eye and facial data?", we set out to contribute to society's understanding of online learning under the guidance of Dr. Ying Xie and Dr. Linh Le. Our process involved recording ourselves participating in online classes to gather eye and facial data. Each student recorded data while they were staring directly at the screen and focused while also recording data from when the student was distracted and looking elsewhere. Next, deepfake technology was used to swap our faces with celebrity images to protect our privacy while also generating a large pool of data. Finally, we created, trained, and tested different machine learning models to try and find settings best suited for our needs. Preliminary results indicated our top constructed models hovering around 65-75% accuracy. This was all completed using open source software, and we believe that if access was granted to even more accurate eye tracking/deepfake technologies, the accuracy of the model would increase even further. Overall, our results indicate that it would be possible to develop a model that could indicate whether a student was concentrated or distracted based on eye and facial data while implementing a process that could protect the student's identity, which could be useful data for either the student to review their own performance in class or for a teacher to see at what point students become distracted during an online session.

Advisors(s): Dr. Ying Xie (Co-sponsor) Dr. Linh Le (Co-sponsor)

Topic(s): Data/Data Analytics

IT 4983 Department: Information Technology

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

- Judges: Stephanie Herring, Suneel Mendiratta **UC-25 Woodline Interiors Project**

Planning Application (Undergraduate Capstone)) by Benjamin Costea, Iram Nawaz, Natan Beraki, Daniel Lopez, Carter Richter, Yeonkuk Woo

Abstract: Meeting with the client regularly, we've established one of the many solutions to their requirements. The client, WoodLine Interiors, needs a well-designed system that can solve product management, client communication, and project management. The main issue that the company is facing is in the area of managing multiple projects and tracking project progress. Their issue is commonly addressed by a large number of companies that create software solutions, but it's not personalized for their appropriate needs in the field of cabinetry. As a result our solution created the perfect stages and states of the project so there is no more confusion to where the project is situation at.

Advisors(s): supervisor : Dr. Reza Parizi project owner : Woodline Interiors (client)

Topic(s): Software Engineering

SWE 4724 Department: Software Engineering and Game Design and Development

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

- Judges: Stephanie Herring, Suneel Mendiratta **UC-26 Pose Extraction for Real-time Workout Assist_Capstone Group_W01_Spring Semester** (Undergraduate Capstone)) by [Royce Camp](#), [Zach Christmas](#), [Jonathon Segars](#), [Amanda Mead](#), [Cameron Page](#)
Abstract: Motion Intelligence Research Project We installed and tested many existing pose extraction technologies in many situations. We provided reports on the different software solutions and decided on a single solution that performed the best. We will extract key-points and track the movements across multiple dimensions. We will demonstrate the X and Y movements of everyone for our chosen software solution in a Business Intelligent tool (PowerBI). Given the current epidemic, we are not going to be able to compare against the professional KinaTrax software on campus. Although, Dr. Xie has given us other software packages to compare our given software solution against. We will compare the accuracy, speed, and performance of these solutions against ours and demonstrate the differences in our Business Intelligent tool (powerBI). We will then compile all our findings in a PowerPoint presentation and Final Project Package. We hope our findings will assist in Motion intelligence and body tracking research and development.
Advisors(s): Dr. Ying Xie & Dr. Linh Le Dr. John Johnson – Exercise Science
Topic(s): Artificial Intelligence
IT4983Department: Information Technology
[Presentation](#) | [Poster](#)
- Judges: Stephanie Herring, Suneel Mendiratta **UC-30 Malware Analysis Using Reverse Engineering** (Undergraduate Capstone)) by [William K Pharr](#), [Kelton Reid](#), [Icyss M Strong](#), [Michael R Lewis](#), Momodou Mbye
Abstract: Cybercrimes are a billion-dollar industry that is rapidly growing by the day. One of the biggest threats faced by companies is the infection of malware. New forms of malware are created daily and ever evolving to evade detection methods. Understanding how malware infects your system and how it eludes detection is crucial to keeping a company's network and devices safe. During this project we will be using reverse engineering methods to better understand the functionality of malware, as well as how it eludes detection. We will be using IDAPro and WiDbg to perform the reverse engineering. Using this knowledge, we will create a set of security standards to help companies to protect themselves from these infections. We will also create a document on how to secure a virtual machine for malware analysis. This will help future students who also are interested in analyzing malware themselves. Our preliminary results include understanding some of the most used forms of malware evasion techniques. These techniques include stalling delays, which is when a piece of malware remains idle to defeat time-based antivirus scans. Another technique is action required delays, which is when a piece of malware will only execute once an action or group of actions are performed this will trigger the malware to execute. Another way that malware is able to evade detection is fragmentation. In this technique the malware will split into multiple different fragments, which alone do not raise flags as suspicious, then rejoin and execute.
Advisors(s): Dr. Hossain Shahriar
Topic(s): Security

IT 4983 Department: Information Technology

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Session 6

Moderator: Dawn Tatum

[MS Teams guest link](#)

- Judges: Joe Spalla, Robert Fortunato, Yola Belisario **UC-35 Development of an Automated Software Packaging Solution for Linux** (Undergraduate Capstone) by [Robert D Ryan](#), [Samantha R Figueroa](#), [Dylan Parker](#), [Blair Hill](#), [Bishwo R Marhatta](#)
Abstract: The main problem with using Linux software in the science and Bioinformatics community is because Linux has a large number of distributions and dependencies. This hinders researches and science students with the problem of tracking down dependencies for software which could then further break the existing system dependencies. Our team looked to solve these problems by creating a BASH script that could quickly mass package ApptImages and contain Linux software with all dependencies. Our team worked through the last ten weeks and researched all components of ApptImage and discovered all means to more easily package and have a repeatable process for batch software processing. Our group was able to identify challenges and problems and produced working scripts to solve our problems. Our results also led us to reach out to the creators of ApptImage and prompt them for future roadmap items and shortcomings of the runtime software solution. We met our current objectives by producing a BASH script for automated packaging and proposed ideas for future research in this process. This project will ultimately contribute to easier consumption of science software for students and researchers.

Advisors(s): Capstone Course Instructor: Dr. Ming Yang, myang8@kennesaw.edu

Project Sponsor: Dr. Tsai-Tien Tseng, ttseng@kennesaw.edu

Topic(s): Software Engineering

IT 4983 Department: Information Technology

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

- Judges: Joe Spalla, Robert Fortunato, Yola Belisario **UC-36 Using Machine Learning Techniques to Predict RT-PCR Results for COVID-19 Patients.** (Undergraduate Capstone) by [Bradley T Durden](#), [Mathew Shulman](#), [Andy Reynolds](#), [Thomas A Phillips](#), [Demontae Moore](#), [Indya Andrews](#)
Abstract: With the COVID-19 pandemic still a threat, healthcare professionals and medical industries keep searching for better ways to mitigate the spread of COVID-19. While Machine Learning has been applied in many other domains, there is now a high demand for diagnosis systems that utilize Machine Learning techniques in the healthcare domain and in particular combating COVID-19. In this project, we explore the role of Machine Learning models in combating COVID-19, using WEKA as the main

tool for analysis.

Advisors(s): Dr. Ming Yang - IT 4983 Capstone Professor Dr. Seyedamin Pouriyeh - Project Owner

Topic(s): Data/Data Analytics

IT 4983 Department: Information Technology

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

- Judges: Joe Spalla, Robert Fortunato, Yola Belisario **UC-39 Journalistic Integrity vis Artificial Intelligence** (Undergraduate Capstone)) by [Dylan Dalton](#), [Ray Martin](#), [Duy Nquyen](#), [Yesse Quezada](#), [Brian Dominguez](#)

Abstract: We are developing a web app to recognize and rate political bias in online journalism using artificial intelligence. All human writing inherently contains bias ,however bias is less harmful if it is transparent to the reader because they can now make informed decisions about what they read. We've collected articles and and reactions to them from online sources, and then used Neural Networks trained for natural language processing to determine bias. The project can predict bias labels on a news articles with 82% accuracy.

Advisors(s): Reza Meimandi Parizi - course instructor Asher Nuckolls - project owner

Topic(s): Artificial Intelligence

SWE4724 Department: Software Engineering and Game Design and Development

[Presentation](#) | [Poster](#) | [More Information](#)
- Judges: Will Tartak, Bob Cole **UR-31 An Empirical Study of Thermal Attacks on Edge Platforms** (Undergraduate Research) by Tyler Holmes, Justin Duchatellier

Abstract: Cloud-edge systems are vulnerable to thermal attacks as the increased energy consumption may remain undetected, while occurring alongside normal, CPU-intensive applications. The purpose of our research is to study thermal effects on modern edge systems. We also analyze how performance is affected from the increased heat and identify preventative measures. We speculate that due to the technology being a recent innovation, research on cloud-edge devices and thermal attacks is scarce. Other research focuses on server systems rather than edge platforms. In our paper, we use a Raspberry Pi 4 and a CPU-intensive application to represent thermal attacks on cloud-edge systems. We performed several experiments with the Raspberry Pi 4 and used stress-ng, a benchmarking tool available on Linux distributions, to simulate the attacks. The resulting effects displayed drastic increases in the temperature and power consumption. The key impact of our research is to highlight the following risks and mitigation plans: the vulnerability of cloud-edge systems from thermal attacks, the capability for the attacks to go unnoticed, to further the understanding of edge devices as well as the prevention of these attacks.

Advisors(s): Dr. Kun Suo

Topic(s): Security

Department: Computer Science

[Presentation](#) | [Poster](#)
- Judges: Will Tartak, Bob Cole **UC-43 Text Marks the Spot Mobile Application** (Undergraduate Capstone)) by [Austin T Hogan](#)

Abstract: A user-to-user location-based messaging mobile application. Ever wanted to leave a location-specific message to a friend or family member? Leave a grocery list at

your local grocery store for your spouse? Text Marks the Spot provides that functionality for these use cases & many others. The application will be available for both iOS & Android mobile device users.

Advisors(s): Dr. Reza Parizi - SWE Capstone Course Instructor

Topic(s): Software Engineering

SWE 4724 Department: Software Engineering and Game Design and Development

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

- Judges: Will Tartak, Bob Cole **UC-56 Rendevieu** (Undergraduate Capstone)) by James C Noltimier, Gyasi Igyan, Barrett Rose, Niyi Adekunle, Ashley Lowe

Abstract: Rendevieu is a mobile application designed to allow users to find a physical meeting location equitable for 3+ people, taking into account drive time and traffic conditions.

Advisors(s): Dr. Reza Parizi

Topic(s): Software Engineering

SWE 4724 Department: Software Engineering and Game Design and Development

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

Session 7

Moderator: Adriana Clark

[MS Teams guest link](#)

- Judges: Bruce Skillin, Harrison Wittenbrook **UR-41 The Accessibility of the Mobile Gaming Platform for the Visually Impaired** (Undergraduate Research) by Christian Thomas Jansen
Abstract: The motivation for this project is to research mobile gaming interfaces with the goal of conceptualizing practices in game design that would create more accessible interfaces for the visual impairment community. Thus far, the project has focused on practices that mobile game designers can use to make their games more accessible to the visually impaired. These includes the use of plain text rather than graphics to be scannable by screen readers, the inclusion of audio-oriented support and instruction, the use of contrasting colors to make options more recognizable to those with partial visual impairments, and the implementation of game mechanics that can be learned and operated either partially or entirely through non-visual means.
Advisors(s): Professor Nicholas Murphy
Topic(s): Games
CGDD 3103 Department: Software Engineering and Game Design and Development
[Presentation](#) | [Poster](#)
- Judges: Bruce Skillin, Harrison Wittenbrook **UR-66 Image Segmentation with Machine Learning** (Undergraduate Research) by [Kedar A Johnson](#)
Abstract: An experiment-based analysis of the performance of machine learning

algorithms in image segmentation. The experiment is organized to test three experimental groups representing supervised, unsupervised and reinforcement machine learning. The three experimental groups are exposed to three datasets of images for training and testing. They're performance results are recorded and compared for a statistically significant difference in mean performance values. These results are assumed to identify a trend in differences in performance if a statistically significant difference in performance statistics is discovered between any of the three groups. This experiment will follow a quasi-experimental design because of the absence of a control group.

Advisors(s): Dr. Dan Lo

Topic(s): Artificial Intelligence

n/a Department: Computer Science

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

- Judges: Bruce Skillin, Harrison Wittenbrook **UC-37 Interactive PDF File Editing for Online Classes** (Undergraduate Capstone)) by [David J Hall](#), [Chris J Stubbs](#), [Justin Masters](#), [Dalton G Parker](#), [Rosendo Lopez](#)

Abstract: This system aims to create an interactive environment for teachers to view/grade/edit student submission in virtual classes. Objectives for this project are to create independent component or logic model that includes the following functions. This component should be integrated with a .net core application easily. -Upload pdf files to the system and save files to the server; -Record audio online and save audio to the system; also, the audio can be played online; -Upload and play video or video link (YouTube); -Split file. When uploading a PDF file, the system will allow to split or crop the file (partial file content) and upload the file; -PDF edit: be able to view the pdf file and leave comments;

Advisors(s): Yang Ming - Capstone Professor Derek Shi - Project Sponsor

Topic(s): Software Engineering

IT 4983 Department: Information Technology

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- Judges: Joe Drury, Amer Uttamchadani **UC-57 Cultiva- The Plant**

Companion (Undergraduate Capstone)) by [Travis R Hescoc](#), [Kat Branham](#), [Ahsan Jamal](#), [Joseph Henggeler](#), [Erick Reyes](#), [Andy Alcaraz](#), [Momodou Mbye](#)

Abstract: The goal of this project is to improve the lives of gardeners or everyday people with a green thumb by providing them with a planter that will not only hold their plant of choice, but also give them information about the health and growth of their plant without them having to interact with it directly. This project will provide the user with a planter containing sensors that communicate with an application from which the user can monitor the environment of the plant. This project can serve a wide range of people from first-time gardeners to seasoned veterans. Users will no longer have to guess about the health and conditions of their plant, all of this information will be available to them through a web application. The plant companion will collect data using sensors that monitor soil moisture levels, light, water reservoir level, water reservoir pH, and environment temperature. If water, moisture levels, sunlight exposure, or temperature are outside of the optimal range, the user will be notified both through the web application. The planter will water the plant through a pump, if

there are sufficient levels in the water reservoir, whenever moisture levels are too low. Upon logging into their account, users will be greeted with a dashboard where they can view the data collected by their Plant Companion.

Advisors(s): Dr. Ken Hoganson

Topic(s): IoT/Cloud/Networking

CS 4850 Department: Computer Science

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- Judges: Joe Drury, Amer Uttamchadani **UC-62 Machine Learning: Twitter Bots in Disguise** (Undergraduate Capstone)) by [Matthew Joseph Scheer](#), [Nicolas Vasquez](#), [James C Andersen](#), [Joshua Tiangco](#), [Justin Van](#), [Cody R Walicek](#), [Daniel Rimmel](#)

Abstract: This project was designed to help fight against misinformation spread by bots (computers), the goal assigned to us was to find and inform Twitter users of bots that follow and are being followed by the user.

Advisors(s): Dr. Reza Parizi

Topic(s): Artificial Intelligence

SWE 4724 Department: Software Engineering and Game Design and Development

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- Judges: Joe Drury, Amer Uttamchadani **UC-69 Team 10B BChain: secure peer to peer file sharing** (Undergraduate Capstone)) by [Jonathan D Lashgari](#), [Carlos A Diaz](#), [Jeffery Erhunse](#), [Caleb T Goff](#), [Giang T Nguyen](#)

Abstract: BChain is a new P2P file sharing system that is fully private, anonymous, globally self-verifying, and utilizes an automatic peer-maintained network of trust in data, accomplished through new methods of routing content over the whole network, encrypted, rather than per torrent download. Verification is done by adding file metadata to a blockchain giving the network consistent knowledge of each file it can transfer, and how to verify file received against the network. This enables a policy of zero trust against peers. This system is implemented by an app that interfaces with the network using the protocol, using it for upload, download and file discovery. The interface is built using web technologies, which allows for flexible use across native platforms.

Advisors(s): Prof. Ken Hoganson

Topic(s): IoT/Cloud/Networking

CS 4850 Department: Computer Science

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Session 8

Moderator: Bill Forsyth

[MS Teams guest link](#)

- Judges: Ryan Taylor, Leonard Greski **UR-46 BreastNet**; (Undergraduate Research) by [Cora L Meador](#), [Ryan Deem](#)
Abstract: In the United states, 13% of women are diagnosed with breast cancer in their lifetime, and it is the second leading cause of death by cancer in women. Early detection and screening can result in an increase of life expectancy by 10 years on average. Unfortunately, breast cancer can be challenging to detect, since it can appear anywhere in the breast. Cancer that is detected in its early stages can give patients more options and save thousands of dollars in medical costs. Some of the most recent developments in computer science and machine learning are in the biomedical field, especially individualized healthcare. There is also an increase in the demand for telehealth options, reducing healthcare costs. With the help of computational technology, medical practitioners will be able to process data more quickly, which will allow more patients to have access to reliable treatment. Besides, systematic processes for interpreting various data types (such as clinical features, genetic information, and medical images) can identify trends that a human eye would not detect. This project aims to design and implement an artificial intelligence-based model called BreastNet to classify breast cancer into high and low-risk categories based on a combination of MRI images and clinical data. BreastNet uses a convolutional neural network (CNN), a type of machine learning methodology that imitates how the human brain learns information. Neurons fire in a connected pathway, reinforcing the relationship between a stimulus and the correct outcome. In this case, the CNN identifies characteristic features within the MRI that correspond to different life expectancy outcomes, which are notated in the clinical data. The clinical data serves as a loss function, which allows the network to identify how well the current model performs on images. We will evaluate the model by dividing the dataset into three partitions: training, validation, and testing, and then uses the evaluation metrics of Accuracy, Loss, F1 Score, Precision, Recall, Specificity, and Sensitivity.

Advisors(s): Dr. Mohammed Aledhari

Topic(s): Artificial Intelligence

CS 4267 Department: Computer Science

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- Judges: Ryan Taylor, Leonard Greski **UR-48 Using Semantic Segmentation in a Convoluted Neural Network for Vocal Localization in Music** (Undergraduate Research) by [Trevor E Stanca](#), [Noah Trinite](#)
Abstract: I. PROJECT OVERVIEW A. Research Question In this project, the question was asked: "Is there an easier way to extract vocals from music?" Many other works are able to extract vocals with Deep Neural Networks using Multitask Learning, which are large and take a long time to train. To rival this, we wish to present a method to identify vocals with a Convolutional U-Net (U-Net) for Semantic Segmentation of audio files. B. Project Description This project differs from other works by identifying vocal locations by converting audio files in Short Time Fourier Transforms(STFT), and treating them as images in the UNet. By treating these as images, the U-Net is able to identify the location of "vocal features" the same way a U-Net would identify desired features within an image. The object detection is what sets this project apart from similar works. Many of these other works treat each song as an audio signal with real and

imaginary components which means these algorithms treat the issue as a signal processing problem. However, by looking at the STFT of the song as a graph, we are instead able to approach this as an image processing problem instead, which offers more tools within the realm of Deep Learning—such as Semantic Segmentation. II. EXPERIMENTATION A. Materials and Methods All Materials used were a form of software. Firstly, the U-Net was created and ran in python on the CCSE Cluster for High Efficiency. A U-Net is a Convolutional Neural Network that has the ability to output images by Convoluting the original image to allow only the prominent features to be shown and Deconvoluting the Output to display these features in the original image resolution to be used for further processing. This gives the U-net its "u" shape when drawn out. Secondly, the data created for the project were music files converted into Short Time Fourier Transforms(STFT) and processed as image files, where the input into the U-Net was an entire song's STFT and the labeled data was the vocal audio file STFT for that same song. A Short-Time Fourier Transform can be considered the heatmap of the amplitudes of the song across frequency and time. B. Results The initial Results from the U-Net show a high level of accuracy for vocal location predictions. As the output from a U-Net is an image, these images are the initial song's STFT with a mask applied to show the location of Vocal Waves. These trials have an accuracy greater than 80% which is a very good result this early in the processing. The vocals have been identified and located in this study, however the next step is to pull the vocals out and convert them back into a song wave. III. MARKETABILITY For the last 20 or so years, large record labels have been attempting to "Remaster" old music, which is the process of digitizing old analog tracks of songs, mixing them on a new sound board, and releasing the remastered work at a marked up price. As recording methods, pre-computers, relied on tape, often times tracks were record over each other to save space on the real. When the song has this issue, a computer program has to pull out all of the pieces of the song so that the engineer can remaster it. This project shows the initial steps to a simpler audio extraction, where handling this issue as an image processing problem instead of a signal processing problem, we are able to create a more efficient Neural Network.

Advisors(s): Dr. Aledhari

Topic(s): Artificial Intelligence

CS 4267 Department: Software Engineering and Game Design and Development

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- Judges: Ryan Taylor, Leonard Greski **UC-59 Analyzing Concentration Levels in Online Learning with Facial Values** (Undergraduate Capstone)) by [Elliott J Witherell](#), [Jakeira Askew](#), [Jonathan R Dicks](#), [Steven C McGuire](#), [Jacob A Walton](#)
Abstract: Can deep learning models accurately predict whether an individual is focused or distracted on a task in order to improve learning efficiency? In the context of online learning with the use of a webcam, this project is aimed at detecting concentration levels of students to potentially assist with improving learning efficiency. Machine learning technologies have been utilized to evaluate students' facial expression and eye movements to identify whether a student is focused or distracted.

The machine learning branch that is employed is a supervised learning model. This supervised learning model makes predictions based on given input features. A total of 6 different models were employed. 4 of those models employed collected eye data. The other two models employed the use of facial and eye data to predict concentration. Ultimately, the eye model accuracy hovered between 50% and 56% accuracy in prediction, with a significant amount of loss. The eye models with attention provided the best accuracy and loss rates out of the four eye models. Secondly, the facial and eye models also hovered right around 50% accuracy with significant loss of around 3.8 and 3.7. The reported results suggest that the data was inaccurate or insufficient in some models to accurately predict concentration levels in an individual. Given a larger collection and more consistent data, the reported results would provide to be more accurate at predicting concentration.

Advisors(s): Dr. Linh Le (Sponsor/Project Owner) Dr. Ying Xie (Sponsor/Project Owner)

Topic(s): Artificial Intelligence

IT 4983 Department: Information Technology

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- Judges: Bill Forsyth, Abdul Wahab **UR-60 Video-to-Video Synthesis With Semantically Segmented Video** (Undergraduate Research) by [Aydan Mufti](#), [Jordan S Hasty](#)

Abstract: Our project involves studying the usage of generative adversarial networks (GANs) to translate semantically segmented video to photo-realistic video in a process known as video-to-video synthesis. The model is able to learn a mapping from semantically segmented masks to real-life images which depict the corresponding semantic labels. To achieve this, we employ a conditional GAN-based learning method that produces output conditionally based on the source video to be translated. Our model is capable of synthesizing a translated video, given semantically labeled video, that resembles real video by accurately replicating low-frequency details from the source.

Advisors(s): Dr. Mohammed Aledhari

Topic(s): Artificial Intelligence

CS 4732 Department: Computer Science

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- Judges: Bill Forsyth, Abdul Wahab **UR-63 Low Cost High Impact Fall Detection At The Edge** (Undergraduate Research) by Dylan SIRNA

Abstract: ML models have become more accurate, powerful and portable in recent years, the purpose of this project is to explore how these advances can be applied towards fall detection for less cost than before possible. This project explores the application of micro controllers which have become cheaper and stronger along with emerging machine learning models that can be trained on a traditional computer with greater resources and then port the model to be interpreted on a micro-controller such as a raspberry pi. These two factors lead to the reason to revisit the problem of fall detection, a problem that plagues the elderly can likely be solved cheaper and more accurately than ever before, and that is the challenge that this paper aims to explore.

Advisors(s): Professor Mohammed Aledhari

Topic(s): Artificial Intelligence

CS 4267 Department: Computer Science

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- Judges: Bill Forsyth, Abdul Wahab **UR-65 CNN CIFAR Image**

Identification (Undergraduate Research) by Matteo L Staciarine

Abstract: Reducing the learning rate of a CNN can positively affect the validation accuracy of a machine learning model. Dropping out nodes from different layers can further delay overfitting from happening. Validation loss decreases over more epochs, but it must be cut when it reaches its minimum value.

Advisors(s): Dr. Dan Lo

Topic(s): Artificial Intelligence

Department: Computer Science

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