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Undergraduate Student Poster Abstracts

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Contents

Poster 5001

Crime Prediction Using Machine Learning Techniques

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Crime is a global concern and crime prediction has been a key focus for researchers and policymakers due to its potential to improve public safety and resource allocation. Leveraging machine learning, we can analyze patterns to forecast when and where crimes are likely to occur. Past research has shown promising results in predicting crime using machine learning techniques. This study aims to build a model that can accurately predict crime categories and groups based on different spatiotemporal features, helping law enforcement agencies detect, prevent, and solve crimes more effectively.

The raw data collection used for this study was sourced from the Open Baltimore website and contained nearly six hundred thousand records. In total, seven different machine learning algorithms were applied and four different experiments with slight variations were conducted to perform two prediction tasks. The entire dataset was split into 60% for training, 20% for validation, and 20% for testing. First, exploratory data analysis was performed to delve into the raw data, including examining the inter-relationships among features, detecting outliers and anomalies, and gaining a preliminary understanding of possible associations between features and class labels. The raw data were preprocessed and the categorical features in the raw data were converted into numerical using different encoding techniques. The processed data were then fed into different machine learning algorithms to fit different predictive models that could make predictions.

The experimental results show that the decision tree classifier performs best in the task of predicting crime categories with two different classes, with an accuracy of 85.89%. The random forest classifier performs best in predicting the ten crime groups with an accuracy of 62.96%. Future work will involve improving the performance of the models on both tasks by applying methods to find suitable hyperparameters, and introducing deep learning techniques to perform the tasks.

Poster 5002

Mage Hand: A Virtual Reality Computer Networking Education Solution

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Computer networking labs play a major role in students' experiential learning in computer science education. However, access to physical equipment such as routers and switches can be difficult. Existing equipment can quickly become outdated, compromising the student learning experience. Moreover, upgrading the equipment is usually a lengthy and costly process at most universities. Additionally, with the rise of online education, remote students are left at a disadvantage, missing this critical educational component. Virtual Reality (VR) technology has been used for training and education purposes. Recent studies demonstrate the impact of VR technology on student retention while learning, reporting a higher sense of engagement among the surveyed groups. Therefore, we propose Mage Hand, a virtual reality computer networking education solution that will allow students to access, learn, create computer networks, and simulate data communication in virtual spaces. This solution will be created using the Unity game engine, allowing students to interact with virtual devices. Blender will be used to create 3D models of modern computer networking equipment. Mage Hand will allow instructors to design labs in virtual environments, define a set of virtual equipment, and describe scenarios to help on-campus and remote students meet their learning objectives. Mage Hand will allow students to load and save these virtual environments to support self-paced learning. Our platform aims to provide practical experience to students, bridging the gap between theoretical and practical knowledge, while overcoming the limitations of the physical world. Instructors will monitor student progress, provide feedback, and assess attainment of learning objectives. Future work on this solution aim to integrate group-based collaborative labs, scale and offer access to multiple institutions, and establish a sustainable virtual reality computer networking learning community.

Poster 5003

Predictive Real-time Intelligent Motion Enhancement Virtual Reality (PRIME-VR) Solution

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We are developing PRIME-VR, a Virtual Reality (VR) football simulation that aims to use artificial intelligence (AI) to improve engagement in game film studies. Existing game study techniques are time-consuming, lack interaction, and prone to human error. While other methods such as running mock plays can seem to be interactive replicating other teams' strategies, they increase the chance of personal injury. This project aims to tackle these issues by optimizing time spent on film study while improving engagement with players using VR techniques. Using AI and image processing techniques, we propose to analyze game films, identify, recognize, and classify objects, generate statistics, build VR environments, and allow coaches and players to effectively engage with film study. We plan to provide services through a portal that will use Vue to host the front end and Flask to host the server on the back end. Utilizing OpenCV and a custom-trained YOLO model, the portal will process, detect, and identify players within the film, and generate data. Then, PyTorch will use the data to train machine learning models and generate statistics about the film. Finally, a VR environment will be created and populated using the Unity game engine and digital assets. Users will be able to access and interact with virtual environments across sessions through the PRIME-VR portal. PRIME-VR will advance how football players and coaches approach film study, using rich virtual interactive environments. PRIME-VR is characterized by numerous required technical and subject matter expertise. To overcome these challenges, the project will leverage support from faculty, football coaches, machine learning experts, and software engineering professionals. In the future, we plan to extend PRIME-VR to a range of sports, enhance the immersion of the VR environment by including outside factors such as crowd distractions, and create tools for users to personalize their learning experiences.

Poster 5004

Prototyping an AI-Powered Software to Generate Lab Procedures for Linux and CyberSecurity

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Generative AI (e.g. emergeing large language models) has been transforming many aspects of how humans improve their everyday jobs, including in the field of education. This project aims to harness the power of generative AI to improve the personalized learning experience for those studying Linux and Cybersecurity, while also aiding instructors in creating customized educational content where covering many Linux distributions can be challenging. In particular, we prototype an AI-empowered Linux Lab Generator software. By using AI, the tool helps to generate labs that are contextualized, personalized and customized, allowing learners to dig deep into skill related commands based on their personalized background and gain complementary practical Linux experience. Key features include an integrated chat feature for real-time questions and clarifications, the ability to summarize generated labs for easier understanding, and formatting labs into readable documents. It provides a sharing feature, so if a similar lab has already been created and shared, the platform retrieves it, reducing redundancy, lowering the AI API token consumption, and improving efficiency. Prompt engineering and vectorized databases are used to restrict contextually relevant user input. For educators, the Linux Lab Generator simplifies creating structured tutorials, quizzes, and labs for their students. It encourages collaboration by allowing users to share custom labs within the community, fostering collective improvement of generated content. This dual-purpose design supports both students seeking interactive learning and instructors enhancing their teaching methods. This project highlights the transformative potential of generative AI in creating dynamic, effective, and engaging educational environments. Currently, we have applied Agile Software Engineering methodologies to fast prototype a minimum viable product and increamentally adding more features. The software is running on the cloud. This development of the software is partially supported by a 2024-2025 SUNY IITG project and a SUNY Oneonta student scholarship grant.

Poster 5005

Scaling Memcached: Improving Cache Failures

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We examined the current challenges associated with cache failures. Such failures can disrupt the flow of incoming requests, creating significant issues in distributed systems. Without effective safeguards in place, these failures can result in undesirable outcomes. It is crucial to ensure proper scalability in distribution to support caching mechanisms, as cache failures are inevitable; the question is not if they will occur, but when. It is essential to address these cache failures to provide stability and secure scalability of distributed caching architectures.

We research the challenges associated with scaling memcached's cache failures along with cache failures impact on a system's performance. A key part of designing a resilient caching strategy to combat cache failures is the essential consideration for both transactions per second (TPS) and request per second (RPS). Additionally, we studied the cost implications of maintaining a master list and managing distributed cache regions as they must be accounted into potential solutions. To decide which mitigation strategies affect performance and stability when assessing a system's resilience, simulating a 10% cache failure rate in cache query requests to be evaluated. To strengthen the failure management of a system, we believe integrating Resilient Caching Strategies (RCS) and Cache Transaction Integrity (CTI). RCS Strengthens a system's ability to handle unexpected failures by intentionally triggering small-scale failures, effectively "training" the system to manage sudden load surges and inconsistencies. This proactive approach enhances the system's resilience and adaptability. CTI ensures that cache replicas remain synchronized with the authoritative data source through reliable invalidation handling, minimizing the risk of serving stale data.

Our findings highlight the importance of proactive failure management in large-scale caching systems. Integrating automated monitoring tools to detect early signs of cache failures and trigger real-time mitigation strategies partnered with RCS and CTI would ensure resilient distributed caching architectures and consistent performance.

Poster 5006

Cryptography in the Quantum Era

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Imagine a general devising an infallible battle plan and transmitting it through what is believed to be a secure communication line. When the battle plan is executed, it fails catastrophically because the enemy somehow knows the opposing army's strategy. It is revealed that the enemy used a quantum computer to decrypt the general's communications in seconds, allowing them to evade capture and escape to safety. Quantum computers, leveraging qubits and superposition, can process information exponentially faster than classical systems, making current encryption methods vulnerable. While fully functional quantum computers remain scarce, even limited quantum capabilities provide a strategic advantage in breaking encryption. This raises a critical question: How can we develop cryptographic methods that remain secure in a quantum-enabled world? To address this challenge, we conducted an extensive literature review to explore current solutions and identify promising areas for investigation. Based on our findings, our research focuses on post-quantum cryptographic algorithms that are designed to withstand quantum attacks. We examine lattice-based cryptography, which relies on the hardness of problems like the Learning With Errors (LWE) problem, and hash-based cryptography, which utilizes collision-resistant hash functions. These approaches are considered strong candidates for securing data in a post-quantum world, as they are resistant to Shor's and Grover's algorithms, which could efficiently break current cryptographic systems like RSA, ECC, and symmetric encryption. Our research aims to design and implement quantum-resistant cryptographic protocols. By developing these advanced algorithms, we seek to contribute to the foundation of a secure, post-quantum cybersecurity framework. The implementation of these solutions will be a key step in ensuring the protection of sensitive data and maintaining digital security as quantum computing continues to evolve.

Poster 5007

Beneath the Surface: Cybersecurity in the Human Body

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Imagine a homicide where the weapon is the same thing meant to preserve life. Security researchers have demonstrated the potential to hack medical devices such as pacemakers and insulin pumps, exploiting vulnerabilities that allow attackers to control them and prevent life-saving care. Approximately 10% of Americans rely on Implantable Medical Devices (IMDs), which communicate over wireless networks, making them vulnerable to cyber-attacks. With over 33 million Americans dependent on these devices, ensuring their security is critical. The problem arises from the fact that many IMDs are released with undiscovered vulnerabilities that are later identified. To address these risks, patches are needed. However, the process of applying patches is cumbersome—patients must visit healthcare providers for manual updates, leading to delays and inconvenience. We propose a secure remote update mechanism that enables healthcare providers to apply patches to IMDs remotely, eliminating the need for in-person visits. This solution uses a secure, encrypted communication protocol to ensure the confidentiality and integrity of data during transmission. A public-private key encryption system will be implemented for authentication, ensuring that only authorized devices and healthcare providers can initiate updates. Update files will be encrypted and verified before installation to prevent tampering. A secure communication channel, such as VPN or a dedicated network, will transmit the updates, protecting against interception. The advantages of this approach include enhanced security by enabling timely patch application, reduced patient inconvenience by eliminating the need for clinic visits, cost savings through fewer in-person appointments, and scalability for various IMDs. By addressing the vulnerabilities in IMDs and improving the update process, we aim to ensure the safety and security of these life-saving devices, ultimately benefiting both patients and healthcare providers.

Poster 5008

Using Insights from Game Theory to Combat "Gaming the System" Behavior in CS Education

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I present our research modeling the structure of classroom assignments using concepts from game theory. In the setting of a course that allows students to retake quizzes multiple times without penalty, it was observed that students often engaged in a behavior known as "gaming the system". For a teacher, this kind of behavior works against their interest of encouraging students to learn the course material. In order to combat this behavior, I am trying to balance multiple factors in order to optimize student learning. Such factors include the length of assignments, the weights of questions within an assignment, how harsh of a penalty to apply on retakes, and how many questions to include in a question bank. In order to properly model these elements, I turned to game theory. In our "game", the two players are the student and the teacher, with the student having two possible types: someone who tends to game the system and someone who tends to actually try to learn the material. The student has three possible "actions" to choose from, depending on which type they are: low effort, moderate effort, or high effort. The teacher, on the other hand, only has one type and two possible actions. The actions of the teacher can be altered to model whichever of the aforementioned factors. Using this information, a utility matrix can be created. From there, I used the Lemke-Howson algorithm to find the Nash equilibrium, which would then give us information on how to structure an assignment to optimize student learning. In this poster, I will present our insights from this model by varying the game's parameters.

Poster 5009

Parking Palooza: Avoiding Campus Car-tastropies

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Buffalo State University, home to over 5,000 students and 1,500 faculty members, faces a persistent challenge in managing its limited on-campus parking spaces. The difficulty in finding an available parking spot, especially during peak hours, contributes to congestion, frustration, and inefficiencies in campus transportation. This research project focuses on developing a mobile application that optimizes the use of available parking spaces, leveraging real-time user data and location-based services.

The proposed parking app is designed using JavaScript (JSX) and React Native, ensuring cross-platform compatibility for both Android and iOS devices. It integrates the Google Maps API to provide accurate, up-to-date parking availability information. The app functions by taking the user's coordinates and categorizing them based on their affiliation with the university—either as a student or faculty member. This classification allows the app to tailor parking suggestions based on designated parking areas for each group, ensuring users receive the most relevant and accessible options.

In addition to providing real-time parking availability, the app includes a built-in customizable timer that helps users manage their parking duration. Once a user selects a parking spot, they can set an alarm to notify them before their allotted time expires, reducing the risk of receiving a parking violation from University Police. The app also maintains a database of parking time limits, ensuring users are aware of the regulations associated with different parking zones across the campus.

By combining academic knowledge with practical problem-solving, this project demonstrates the potential of technology to enhance campus efficiency. The implementation of this application can significantly improve parking management at Buffalo State University, reducing traffic congestion and improving user experience for students and faculty alike.

Poster 5010

Digital Etch-a-Sketch: A Web-Based Drawing Experience

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This project explores the development of a browser-based digital Etch-a-Sketch, transforming the classic physical drawing toy into an interactive web application. Instead of using knobs to draw lines on a glass screen, users will drag their mouse to draw on a customizable grid, making it both a creative tool and an entertaining digital toy.

The motivation for this project stems from a desire to apply and enhance my current knowledge of web development, specifically JavaScript, HTML, and CSS. By creating this project, the aim is to strengthen my understanding of front-end programming concepts while creating an engaging and interactive user experience.

The application will be built using JavaScript for functionality, HTML with Flexbox for structuring the grid, and CSS for styling. Users will have the ability to select grid sizes—such as 16x16 or 64x64—and interact with the interface by hovering over squares to change their color, mimicking the effect of an Etch-a-Sketch. Additional features include buttons for erasing the canvas and adjusting the grid size dynamically. The project will be developed in Visual Studio Code, using JavaScript's event-driven programming to enable real-time user input for drawing.

By the end of this project, users will have an intuitive and responsive web-based drawing tool. The final product will demonstrate the possibilities of interactive web design and serve as a foundation for further exploration into JavaScript-driven creative applications.

Poster 5011

Predicting Natural Disasters: Analyzing Trends and Patterns

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In the United States, natural disasters have seriously threatened numerous populations and ecosystems. Better response to disasters, community readiness, and disaster forecasting are all made possible by understanding trends and patterns. Trends in natural catastrophes can be found using predictive analysis, indicating which are rising annually, which are falling, and which are staying the same. With the goal to find trends that can improve preparedness and mitigation tactics, this project will look at past disaster data. FEMA's Disaster Declaration Summaries, which cover recent disaster reports and go back to 1953, are employed in this study. By using such techniques, areas of greatest risk can be properly identified, and people or governments can decide which actions to take to prevent or reduce the harm and losses brought on by disasters. The results of the research could be helpful to the public, responding agencies, and policymakers in creating data-driven disaster management strategies. Policymakers, response teams for emergencies, and the public may find the study's conclusions useful in developing data-driven disaster management approaches. This research utilizes statistical modeling with Pandas, heatmaps for visualization with Vega, trend charts with Matplotlib and Altair, and growth trend analysis with Facebook Prophet, all leveraging JSON for data structuring and processing. The programming will be done with Python and primarily conducted in Jupyter Notebooks within Anaconda Navigator, using a personal laptop as the primary hardware. The long-term objective of this research is to reduce the impact of natural emergencies on the environment and human lives by promoting a more proactive and informed approach to disaster management.

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Poster 5012

Buff State Shuttle : Navigate Campus Life

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This research focuses on developing a comprehensive shuttle management system for SUNY Buffalo State University to enhance transportation accessibility for students. The system aims to provide real-time tracking of university shuttles, supporting students without personal transportation in reaching nearby stores and key locations efficiently. The project will be accessible through an Android application, with the potential for a web version based on demand. Additionally, a separate application will be designed for shuttle operators, enabling them to update shuttle locations and schedules in real time.

The shuttle management system is being developed using React and React Native for the frontend and Supabase for the backend. Supabase, with its scalable PostgreSQL-based backend and real-time capabilities, plays a crucial role in dynamically tracking shuttle locations. The system's architecture ensures robust performance, seamless user interaction, and efficient data handling.
Key areas of focus include optimizing real-time updates to ensure smooth, near-instantaneous location tracking, enhancing the operator dashboard for more intuitive route and schedule management, and deploying the platform to maintain efficiency across various devices. The project is structured into multiple phases, encompassing data collection, feature development, extensive application testing, and final deployment to ensure system reliability and user satisfaction.

Version control is managed through Git repository. Furthermore, the backend is the cloud-based server that ensures scalability. This research contributes to the broader field of smart transportation systems, emphasizing the integration of real-time data management and user-centric design to improve campus mobility solutions.

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Poster 5013

Evolution of Cryptography: The Importance of CyberSecurity Communication Data

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I present my experience developing a secure client-server communication system using C# language in Visual Studio in the Computer Information systems at SUNY Buffalo State University. Cryptography is the procedure of encrypting data so that only authorized users have access to it. This project aims to develop secure client-server communication in C# implementing RSA encryption to encrypt and decrypt messages during transmission while preserving data security. Secure communication is critical in modern networking, and this project seeks to create a secure messaging and file-sharing system that prevents unauthorized access. Throughout the development process, I experimented with several encryption techniques and networking protocols to discover the most effective approach for securely delivering data. I considered several encryption methods before selecting RSA encryption due to its strength in public-key cryptography and widespread use in secure communications. My project also required creating a client-server model that could handle TCP socket connections, HTTP requests, encrypted messages, and file transfers. To ensure message integrity, I implemented data verification techniques to detect any loss or disruption during transmission. Furthermore, the server keeps a file directory where clients can search and retrieve shared files using a keyword-based system. If a requested file is not available, the server provides a "404 Not Found" error message, providing correct error handling. My presentation will explain why I chose RSA encryption, how we designed and implemented our client-server model, and the difficulties we encountered during development. I will also demonstrate encrypted message exchange and secure file sharing to emphasize the importance of cryptographic security in client-server communication.

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Poster 5014

Ethical Hacking with Kali Linux

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As computers are becoming the norm in every aspect of daily life, the increase in cyber threats over the past years has left many individuals and organizations vulnerable to attacks such as data breaches, ransomware, and system intrusions. The issue is that many systems are not adequately tested for vulnerabilities before an attack occurs and as a result of improper testing many organizations are not prepared when faced with cyberattacks. In this research project I will focus on using Kali Linux, an open-source penetration testing distribution to ethically hack, identify and mitigate common security flaws in computer systems. Kali Linux offers ethical hacking tools like Metasploit, Nmap, and Wireshark, which can simulate cyberattacks and assess the security of networks, applications, and systems. This project will create a controlled test environment where common attacks such as brute force attacks, SQL injections, and cross-scripting (XSS) can be simulated. The goal is to provide security insights, such as patching vulnerabilities, using multi-factor authentication, and encryption. By the end of this project, Kali Linux will demonstrate its role of identifying vulnerabilities and offer solutions to secure systems, improve networks, and protect confidential/sensitive data. The tools and methods will show how organizations can protect themselves from cyberthreats but will also provide roadmap for ethical hacking practices that can be applied to real-world scenarios.

Poster 5015

Combining Classic Cryptanalysis and AI: A Study of Affine and Shift Ciphers

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This research project explores the cryptanalysis of simple symmetric ciphers and investigates the capabilities of various AI tools to break these encryption methods. Symmetric ciphers, fundamental cryptographic systems, rely on the same key for both encryption and decryption. By exploring different cryptanalysis techniques, this study aims to evaluate their effectiveness in deciphering encrypted messages without prior knowledge of the key. We focused on brute force cryptanalysis of shift and affine cipher and letter frequency cryptanalysis of affine cipher. We examined the abilities and effectiveness of AI tools to break symmetric ciphers. We also explored the level of training the AI tools require to break the ciphers effectively.

Poster 5016

Unicon Language Server Extensions

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I present my experience participating in the Unicon Language Server Extensions project at SUNY Brockport. The goal of the project is to further the development of the Unicon Language Server Protocol (LSP) implementation. This project was built upon the work of a previous semester. Unicon is a high-level programming language based on the Icon Programming Language. It adds new features such as objects, networking, databases, threads, and more. LSP is a standardized method for communication between a server and a client, enabling language support features when writing code in an IDE. Unicon's LSP includes many features, such as code completion, jump-to-definition, and hover information. This project aimed to expand upon these features and improve the current system of language support. I took on this project as a challenge to learn as much as possible about modern, team-oriented software development and how to overcome the difficulties associated with it. During the first semester, I focused on developing the Language Server Index Format (LSIF), which works in conjunction with LSP. LSIF provides many of the same features as LSP (and more!) without requiring a language server, making it faster and easier to query information. I also developed an extension for VSCode to utilize LSIF data when available and fall back to LSP when LSIF is unavailable. During the second semester, I worked on refining my previous work and adding new features. This experience was a great introduction to handling large, complex tasks, such as system overhauls. I learned how important it is to stay coordinated, divide tasks appropriately, and maintain communication with team members. My goal for the project is to develop a fully functional, commercially ready product that is available online for anyone to use. My poster will discuss the background, technical details, and results of the project.

Poster 5017

Portable LiDAR System for 3D Mapping: Assembling, Data Collection and Visualization

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This project focuses on assembling a portable LiDAR (Light Detection and Ranging) system to collect and visualize 3D point cloud data for mapping buildings and structures. The primary goal is to design and assemble a portable 3D mapping system by integrating key components a LiDAR scan head, GPS unit, laptop computer, and portable power supply into a single, tripod-mounted unit capable of collecting high-resolution 3D spatial data. This system will enable the collection of geographically accurate 3D datasets for various campus buildings, including the Science and Mathematics Complex, Technology Building, Cleveland Hall, and Rockwell Hall. The reasoning for this project lies in the growing demand for efficient and portable 3D mapping solutions in fields such as geospatial analysis, urban planning, and environmental monitoring. By creating a modular and portable LiDAR system, we aim to provide a flexible tool for real-time data collection and analysis. To achieve this, we will assemble and configure the LiDAR scan head, GPS unit, and power supply into a cohesive system. The GPS unit will feed real-time geographic data into the LiDAR system while remaining detachable for other uses. We will then conduct field surveys to collect 3D point cloud data, which will be processed and visualized using ArcGIS Pro and ERDAS Imagine software. Expected results include high-resolution 3D maps and graphs of the surveyed buildings, demonstrating the system's accuracy and portability. Attendees of the presentation can expect to see the assembled LiDAR system, sample 3D maps, and a discussion of the challenges and successes encountered during the project.

Poster 5018

Gentrification Watch: Using Python to Track Changing Neighborhoods in Buffalo, NY

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Gentrification is an ongoing and complex issue in historically Black neighborhoods, particularly in Buffalo, NY. My entire life I have heard about and witnessed rising rental prices, changing business landscapes, and shifting demographics. These changes often lead to the displacement of long-term residents, altering the cultural and economic fabric of these neighborhoods. As an African American woman from Buffalo who is deeply invested in the well-being of my community, this project holds personal significance for me. My goal is to track and analyze these changes using Python-based data collection and analysis techniques, with the ultimate aim of presenting my findings to the City of Buffalo to advocate for equitable development.

By employing tools such as BeautifulSoup for web scraping, I will gather data from real estate websites to monitor rental price trends over time. Additionally, Yelp reviews, Google Reviews, and business listings will be scraped to track new business openings and closures, reflecting the evolving commercial landscape. Census data will be integrated to observe demographic shifts, including changes in income levels, racial composition, and population density.

Pandas will be utilized for data manipulation and analysis, providing a structured approach to managing large datasets. Matplotlib will be used for data visualization, enabling clear and impactful representation of trends and patterns. Development will be carried out in VS Code, leveraging its extensions and debugging tools for efficient coding. The feasibility of this approach is reinforced by the accessibility of public real estate data and the robustness of Python-based tools in handling and analyzing substantial amounts of information.

Poster 5019

From Chaos to Chiper: The Beauty of RSA Mathematics

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RSA Encryption is one of the most widely used methods to protect data online, using a public and private key system. This project will explore the basic math behind RSA encryption, focusing on how prime numbers, modular arithmetic, and number theory work together to make the system secure. The goal is to better understand how these concepts help generate secure keys and protect sensitive information. Cryptography is the practice of protecting information, and RSA is one of the most trusted systems for encrypting and securing digital communication. RSA relies on the difficulty of factoring large numbers, making it hard to break. This project will dive into how RSA works, from key generation to encrypting and decrypting messages.

Python will be used to build and test the RSA algorithm. The code will handle key generation, encryption, and decryption, with particular attention given to the importance of large prime numbers. An IDE like an online Python compiler or the one installed on my computer, to help with coding and testing. The project will also look at how the algorithm works in practice, checking its performance and security as prime number sizes change.The goal is to create a working RSA encryption system using Python, which will show how encryption and decryption are done in real-time. The project will explain how RSA’s security works and how different key sizes affect its strength. Additionally, it will discuss RSA's strengths and potential weaknesses, especially in relation to new technologies like quantum computing.

Poster 5020

Evaluating Cloud-Based Vs Private Network Data Storage

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Security and storage of data is gaining prominence and organizations now have a choice to make, whether they would go for cloud-based storage or for private network servers. This project intends to show the differences between the two types of storage by looking at their security, speed of data retrieval, and general efficiency. Threat mitigation is an important and crucial step that must be taken when trying to stop threat actors this is why Kali Linux will be used to evaluate security flaws within both systems, this tool is to be used for penetration testing and security auditing. The importance of transferring data securely and safety is essential for transferring files over a network, the protocol being used to transfer data will be File Transfer Protocol (FTP) which is one of the oldest and widely most used protocol for transferring files. FTP establishes a connection between two systems using a network. The user can either provide credentials to the FTP. Once connected, two types of communication channels are established: the command channel and the data channel. The command channel is used to transfer commands and responses, while the data channel is used to transfer the actual data. Additionally, data transfer speed differences between both systems will be measured and compared to using FTP. The results will inform whether private network storage is a more credible alternative for some cases than cloud-based solutions. The results of this study will help better understand data security and best practices so that organizations make a well-informed decision about alternative storage solutions.

Poster 5021

Promoting Powerful Passwords

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This project's goal is to promote secure password practices through the use of a password manager application that facilitates the generation and secure storage of unique passwords. Despite the widespread use of advanced encryption algorithms to safeguard one's data, both at rest and in transit, a user's password is often the weakest link to their account's security. To shore up this vulnerability, many online platforms enforce a series of password requirements, such as a minimum of 8 characters requiring the use of numbers, special characters, and capitalizations. However, many passwords adhering to these requirements are difficult for a human to memorize. As a result, people often opt for simpler passwords that just meet the minimum requirements. Passwords created from common words or phrases are easy to remember, but are also the first to be guessed by attackers performing "dictionary attacks". Furthermore, when people do create complex passwords, those passwords are difficult to memorize, leading to those passwords being stored insecurely, such as on a sticky note on the person's desk, introducing another vulnerability. Password managers aim to solve both of these issues by generating strong passwords and securely storing them in an encrypted file. Furthermore, the latest NIST (National Institute of Standards and Technology) standards encourage the use of passphrases, the use of multiple words together to create passwords that are both longer and are significantly easier for people to remember. Through two algorithms included within the program, a password generator and a strength checker, the program aims to showcase ideal password creation while providing insightful feedback on potential passwords to enhance users' understanding of strong password practices. By presenting the advantages these tools provide in improving our password practices, we can bolster our digital security, protect our information from unauthorized use, and foster a safer environment online.

Poster 5022

Bengal Bot: Enhancing Students' Experience with Artificial Intelligence

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This research effort is focused on designing and developing a specialized AI-driven chatbot that is targeted to meet the academic demands of Buffalo State University students. Unlike general-purpose AI chatbots, this smartphone application is designed to deliver precise and rapid solutions to questions about academic guidance, test preparation, and research help. The chatbot uses the Gemini AI model, which is chosen for its simplicity of integration and cost-effectiveness, guaranteeing that students receive appropriate guidance without incurring additional fees. The project entails creating a user-friendly interface that is consistent with the university's logo, resulting in an intuitive and seamless user experience. The application is thoroughly tested and optimized to ensure dependability and responsiveness across a wide range of Android devices. While full deployment on the Google Play Store did not meet the project deadline, the application is ready for future release. This initiative marks a huge step forward in AI-powered educational technology, introducing a new idea for using AI to increase student access to academic materials, reduce stress, and improve overall academic achievement. The project's findings give useful insights into the development of mobile applications with integration of AI models, highlight the relevance of User Interface design in user engagement and showcase the significance of testing for optimal user experience.

Poster 5023

Lock It Down: Evaluating and Enhancing Password Strength

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In an era of rising cybersecurity threats, weak passwords remain one of the most frequently exploited vulnerabilities. This project aims to address this issue by evaluating the effectiveness of password strength assessment tools and developing a reliable password strength tester. A key question explored in this study is: How reliable are password-strength testers?

The project will be implemented using Python, with the primary objective of creating a tool that provides users with a quick and straightforward method to assess their password strength. The program will analyze various factors, including length, complexity, and the presence of special characters, to determine password robustness. Additionally, it will offer actionable recommendations for improving weak passwords.

Beyond basic strength evaluation, the project will introduce advanced features such as: Training a neural network to predict how long a password would withstand real-world cracking techniques. Providing a visual representation of password strength, with weak sections highlighted in red and strong sections in green. Suggesting stronger password alternatives based on analyzed weaknesses.

The project will focus on developing an intuitive desktop or web-based application with a user-friendly interface. It will integrate reliable algorithms to deliver precise password strength assessments, helping users make informed decisions about securing their accounts.

By the end of this project, I aim to produce a comprehensive and accurate password strength evaluation tool that not only identifies vulnerabilities but also provides actionable strategies for stronger passwords. The final presentation will feature an analysis of real-world password security trends based on dataset evaluations, along with a live demonstration of the tool in action. This version improves readability, flow, and technical depth while keeping it professional and engaging. Let me know if you need further tweaks!

Reference

"Create a Password Strength Checker Using HTML CSS and JavaScript." GeeksforGeeks, 5 Oct. 2023, www.geeksforgeeks.org/create-a-password-strength-checker-using-html-css-and-javascript/.

Poster 5024

ParcelHub: An Optimized Mail Management System

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SUNY Brockport's mailroom faces challenges with efficient organization and reliance on slow, manual processes. These challenges lead to delays, increased errors, and inefficient space utilization. To address these issues, we developed ParcelHub, a mailroom management system designed to streamline check-in and check-out procedures while integrating hardware solutions to accelerate manual tasks.

Using the Systems Development Life Cycle (SDLC) Agile approach, we designed interactive system prototypes in Figma, ensuring a user-friendly interface tailored to mailroom staff and recipients. ParcelHub incorporates integrated databases, an optimized organization strategy, comprehensive record-keeping, and automated notifications to optimize space utilization and operational efficiency. These features contribute to better tracking, faster retrieval times, and reduced package misplacement.

While this project primarily focused on developing a system proposal and prototypes, our finding suggests that ParcelHub has the potential to significantly reduce processing time and improve accuracy within the mailroom. The system's modular design enables future enhancements, including scalability, advanced automation, and seamless integration with other institutions. By laying a strong foundation for a more efficient and technology-driven mail management process, ParcelHub presents a promising solution for modernizing university mailroom operation.

Poster 5025

Using Order Book Depth to Model Price

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This study explores the relationship between traditional market microprice and a new method for modeling index futures prices using order book dynamics, compared to actual market bid and ask prices. I developed a power law model by analyzing order book excitability via a Hawkes process, which captures self-exciting events like trade arrivals and order walls, and compared it to the conventional microprice approach. Microprice models use bid-ask data for price expectations, while Hawkes processes enhance this by modeling excitability across order book levels. I calculated Hawkes process intensity (Lambda) for each bid and ask level, using historical order quantities, and defined relationships as Lambda differences (bid minus ask) across the top 10 levels, yielding 100 relationships. These were plotted as a 3D surface, with power law parameters extracted via curve fitting. The model scaled price using Lambda differences, signed by prior return direction within a rolling window to avoid lookahead bias. Price was modeled by scaling the midpoint with the bid-ask spread and the hyperbolic tangent of the price impact. Results showed the traditional microprice correlated with actual bid and ask prices at 0.972 and 0.971, while my power law method achieved 0.99 and 0.991, respectively. These higher correlations suggest that modeling excitability differences improves price prediction, especially when bid or ask excitability drives price pressure. This refines prior microstructure studies, with future work potentially optimizing rolling window selection.

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Modeling microstructure noise with mutually exciting point processes E. Bacry∗ , S. Delattre† , M. Hoffmann‡ , J.F. Muzy§,∗ . May 28, 2018

Poster 5026

Tortilla – A Custom Linux Shell

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This project presents the design and development of a Linux based shell. The goal of this project is for the author to learn more about system programming and delve deeper into how he can interact with our operating system.

The shell includes general functionality like core commands and file system manipulation. Some built-in commands include cd, mkdir, mkf, pwd, echo, ls, find, clear, rm, and more. This allows users to create, modify, and navigate through files and directories. Unlike many shells, this implementation focuses on general functionality and does not support external commands and piping yet.

A key feature that is currently in development is user account management. This enables individual user profiles with authentication and privilege levels. Each user will have their own home directory and personalized settings like root or user level permissions.

Development in the future looks to provide file permissions, including read, write and execute. As well as support for external commands and other common features like piping, and a built-in text editor.

Poster 5027

EduAlly: Integrated AI Education Assistant

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We develop EduAlly as members of the Association for Computer Machinery Special Interest Group for Artificial Intelligence (ACM SIGAI) student chapter at SUNY Brockport. Traditional assessment methods often leave students waiting for feedback, delaying opportunities for reflection and improvement. EduAlly was born out of a desire to assist our client, a professor of Special Education Teacher Training, with an AI-driven app to provide quicker and actionable responses to essay-type student answers.

EduAlly evolved from an AI bot developed by a team member called Study Buddy AI, which summarized articles, provided active reading prompts, and generated review questions for more engaging studying. EduAlly embodies the philosophy that AI should enhance learning, that it should assist, not replace. AI should act as a tutor, helping students learn and bridge gaps in understanding rather than providing direct answers. EduAlly's workflow begins when students submit their first exam attempt. The AI then provides personalized feedback based on course materials. Students review this feedback, make improvements, and submit a second attempt, which determines their final grade. Reports for professors include students' answers, AI feedback, and final grades.

A pilot study with 31 students and one Education department instructor showed positive user experiences, with students finding the feedback helpful for identifying strengths and areas for improvement and appreciated the streamlined submission process. Based on this positive response, we are now developing a full-scale EduAlly web application. The system's backend is built with Flask and Python, providing RESTful APIs, while the frontend is being developed with React and TypeScript. Following an AGILE development process, we aim to have the first version ready for user testing by May 2025, with further enhancements scheduled to take place during the 2025-2026 academic year.

Poster 5028

Trend of waste

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The creation of a user-interface (waste dashboard) using the React JavaScript framework was done to illustrate the waste issue in society, this project also included a Machine Learning application. The project is centered around waste specifically since it is an area of high priority when it comes to a thriving city. Also, waste is a common problem in the US since a lot of it is often not recycled, leading to mass waste on our planet and country. This led us to explore the problem. We selected Philadelphia for wastage data comparison purposes. The first program is a waste calculator that allows for user input, it calculates the user's waste distribution and the user's recycling rate. The user's hypothetical recycling rate percentage was then compared to Philadelphia's (2018), the national level in the US (2017), and the US's national recycling rate goal in 2030. Generated visualizations were made to inspect and compare data. The second program includes a ML (Linear Regression) model that predicts Philadelphia's recycling rate in the future. The purpose was to see if the city could meet the national goal by/in 2030, and the purpose for comparing rates as well. We also added the Mean Squared Error metric in our M.L. model because of how much more accurate it was due to the nature of our variables/ dataset, error distribution was more even. Additionally, we assessed Philadelphia's recycling practices so we could conclude where/ how improvements should be made. We completed a user interface so that people can gain perspective on waste with our programs hands-on. One goal that we will work towards in our UI-dashboard soon is to create a ML/DL model that can classify whether an object (user-input) is either recyclable or is an organic type of waste product based on the given image.

Poster 5029

Debugging the Gender Gap

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We present our experience developing a customizable web application to introduce coding concepts to young girls, with the goal of increasing female interest in the computer science field starting from a young age. Research shows that the gender gap begins in elementary school impacting future female participation in the field. After considering various ways to engage young students, especially young females, in the computer science field, we chose web development focusing on the ability to customize learning towards the students' interests without the teacher needing in-depth coding knowledge. The application allows educators to input step-by-step instructions to everyday activities, such as making a bracelet, where students will then identify computing concepts like error handling and repetition. We selected this approach to make computing concepts accessible to all genders, particularly addressing research suggesting women seek purpose-driven engagement with technology. The web application was chosen over other educational tools due to its accessibility and security, especially when considering its use in school environments, as well as the ability to create an engaging interactive platform appealing to various student interests. Our poster will discuss the technical implementation of this application including the backend development using Java Spring Boot and the frontend development using React. The poster will address the challenges faced as we considered both the student and teacher objectives. We will present the methodology for testing the application at local elementary schools in the Brockport area. The final project entails a functional web application with premade templates and the ability to create new templates ultimately aiming to promote female interest in the computer science field.

Poster 5030

Designing an Accessible Programming Education Platform: Integrating Accommodations for Children With Disabilities to Promote Inclusive Learning and Development of Computational Skills

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As technology has continued to advance, so has the number of people that are becoming engaged and involved with it. For many young learners, the first step is understanding the foundational principles of computer science. Many existing coding platforms fail to accommodate young children, particularly those with disabilities. This project aims to design an accessible web-based programming education platform that tailors to children of all abilities. This project follows a user-centered design, focusing on making decisions that prioritize the needs and preferences of the users. To begin, extensive research was conducted with planning to establish a foundation for the overall design. The project uses TypeScript and React for developing the front end and TypeScript and Node.js for the backend.

The final project involves a well-designed website that teaches elementary aged students how to program by learning the basics of HTML and CSS. This website will include interactive lessons, descriptive content, and even mini games to help maintain engagement, motivation, and comprehension. It will feature accessible tools such as screen readers, high-contrast color schemes, and other accommodations to support students with disabilities.

Poster 5031

Retinal OCT Image Classification Leveraging AI with Pytorch

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A study on classification for Optical Coherence Tomography or OCT images, a non-invasive diagnostic technique used to detect early cases of Age-Related Macular Degeneration or AMD. Manual detection from professionals is prone to errors and time-consuming. This project explores a deep learning approach as an automatic classification for OCT images. This study includes comparing two models, a fine-tuned EfficientNetB0-v2 transfer learning model and a custom-build Convolutional Neural Network to evaluate their effectiveness in distinguishing between normal and pathological cases. Since medical images are commonly scarce on clean labeled data, pre-trained models often have higher performance.

The project utilizes Pytorch for neural network development and OpenCV for image preprocessing and augmentation. The dataset used is the 2018, large 3 class dataset from Kaggle including labeled normal, CNV, and Drusen images. Applying preprocessing techniques such as contrast enhancement and noise reduction applied to improve model performance. Data is loaded using Pytorch dataset libraries, and visualization tools like Matplotlib and Tensor Board is used to analyze training progress. Two models are implemented, a pre-trained EfficientNetB0-v2 fine-tuned on the dataset, and a custom CNN built from scratch, leveraging insights from existing architectures. Each model's performance will be compared to determine more effective methods for medical image classification and improve future models. Techniques and methods were implemented from multiple research papers and GitHub repositories were reviewed to guide model selection and implementation strategies.

The primary objective of this project is to gain hands-on experience in deep learning by implementing, training, and evaluating a neural network for multi-class OCT image classification. By experimenting with different architecture and preprocessing techniques, this study aims to enhance understanding of convolutional networks while developing a classification model for medical image analysis.

Poster 5033

Simple Firewall

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This project focuses on developing a dynamic firewall system to enhance network security by providing real-time monitoring, filtering, and logging of network traffic. Traditional firewall models often struggle to adapt to evolving cyber threats, making static firewalls inadequate for modern security needs. This project aims to address these limitations by implementing a rule-based system that allows users to define and enforce custom traffic filtering policies. The firewall is designed to inspect incoming and outgoing packets using Python and Scapy, blocking unauthorized access based on predefined rules for IP addresses and ports. By enabling users to configure specific security policies, the system enhances protection against malicious activity while maintaining flexibility. The project is developed using Visual Studio Code, providing an efficient environment for writing, testing, and refining firewall functionality. Logged data will help analyze traffic patterns and detect potential threats, offering insights into network security challenges. The expected outcome is a functional, customizable firewall that can adapt to different security requirements. By attending the presentation, participants will gain an understanding of key cybersecurity concepts, real-time traffic filtering, and the practical implementation of packet inspection using Python. The project also explores challenges in implementing packet filtering, the effectiveness of rule-based security controls, and potential enhancements to network security protocols. This study contributes to the ongoing effort to develop more adaptive security solutions, demonstrating the importance of user-defined rules in strengthening network defenses against unauthorized access and emerging threats.

Poster 5034

AI-Driven Socratic Dialogue: The Impact of Questioning Styles and AI Personas on Critical Thinking in Education

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As Generative Artificial Intelligence (GenAI) becomes increasingly integrated into education, researchers and educators seek innovative ways to leverage its capabilities to foster deeper learning. One promising approach is incorporating the Socratic method into AI assistants to enhance critical thinking. The Socratic method promotes learning through guided questioning, encouraging students to reflect, analyze, and reason more effectively. This research project seeks to answer the following questions: *"When using the Socratic method, which type of questioning effectively aligns with the Socratic pedagogical approach and enhances critical thinking skills in students?", "Does assigning distinct personas to AI assistants improve student engagement and the effectiveness of Socratic dialogue?"*. We have implemented multiple Socratic AI assistants using OpenAI's API and prompt engineering techniques. Each assistant employs a different Socratic questioning style and is assigned a unique persona, such as Shakespeare. To evaluate the effectiveness of these Socratic assistants, we have designed structured experiments from which we will collect and analyze conversation data, as well as assess student comprehension. Questions and responses from the experimental conversations will be categorized to determine which questioning approach best aligns with the Socratic pedagogical method. Additionally, we analyze student feedback to determine whether assigning personas improves student engagement and learning outcomes. Our findings will provide valuable insights into optimizing AI-driven Socratic dialogue for education. The results will help educators and developers design AI tutors that effectively promote critical thinking, engagement, and deeper learning experiences for students. Furthermore, our research may contribute to developing more personalized AI learning experiences, where assistants adapt their questioning style and persona to match individual student preferences and learning needs.

Poster 5035

Higher-Ed Course Registration Web Application

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This presentation describes the development of a web-based course registration system at a hypothetical higher education institution. The application was built using JavaScript and React for the front end, while a Docker container using PLpgSQL managed persistent data storage on the back end with capabilities in place to launch the application using Neon Serverless Postgres.

The system supports three user roles: administrators, who manage users and majors; teachers, who create and manage courses; and students, who can register for or drop courses. Key functionalities include role-based authentication, real-time course availability updates, and a responsive user interface (UI). Teachers can activate or deactivate courses, while students can only register for active courses with available seats. The system ensures database consistency by maintaining enrollment records even when courses are deactivated.

The team followed an Agile development approach with iterative sprints, focusing on modular design and scalability. Challenges included handling asynchronous API calls for real-time updates, optimizing UI performance and consistency, and maintaining a consistent workflow while team members worked on different aspects of the application simultaneously. Solutions involved implementing efficient state management with React Hooks, proper error handling mechanisms, constant team communication, and keeping an up-to-date Kanban-style backlog using GitHub.

This project provided valuable experience in considering some of the challenges in the development of a course registration web app as part of an academic student information system, more specifically, in setting up user authentication to safeguard the database information and ensuring the authenticated users have access to only the data and views appropriate for their roles. The app serves as a practical demonstration of modern web development using React, Node, and database integration, offering a scalable solution for educational institutions.

C.H. and D.L. were the team leads on this project.

Poster 5036

MENACE: the Rudimentary Tic-tac-toe AI

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MENACE was developed in 1961 using nothing more than matchboxes and colored beads. Through an extremely simple reward and punishment policy, MENACE's matchboxes would emerge with the optimal play for every situation the Tic-Tac-Toe board could be in.

MENACE is different from modern Neural Networks. Neural Networks are generalizable to new data. For example, Neural Networks trained on many images of dogs and cats are able to tell new images of dogs and cats apart with high accuracy. The AI "learned" what a dog and a cat looks like. MENACE does not generalize, this unique Machine Learning strategy "learns" a move for every state it encounters. If we relate back to the dog/cat recognizer, MENACE would not be able to recognize a dog it has never seen before, despite being perfect at recognizing dogs and cats it has been trained on.

My poster will discuss how MENACE learns, breaking down the data structures and algorithms under the hood of MENACE into an easy-to-understand flow-chart. The poster will also discuss the problems with alignment I had while developing MENACE, making this agent play tic-tac-toe in a timely manner was a challenge of iteration and experimentation

Poster 5037

An exploration of cybersecurity intrusion detection

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As online and network threats grow more complex and widespread, effective intrusion detection systems are essential for network security that evolves along with the threats. This project examines predictive modeling techniques for analyzing and detecting cybersecurity intrusions using the *Cybersecurity Intrusion Detection Dataset* to explore intrusions across diverse systems. The dataset contains various network traffic attributes that help differentiate normal activity from potential threats to classify the various attack methods. I employ multiple modeling techniques to classify network intrusions and spot possible anomalies. The goal of this analysis is to develop a model that can identify potential intrusions before they inflict damage. Insights gained from this study could be an interesting avenue to enhance real-time security monitoring and improve proactive strategies for harm mitigation.

Poster 5038

Enhancing Real-Time Object Detection with Semi-Supervised Learning in Plants vs. Zombies

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Through advancements in deep learning, computer vision has revolutionized various fields, including medical imaging, autonomous systems, and surveillance. However, challenges such as the demand for large, labeled datasets, computational costs, and adaptability in dynamic environments persist. Traditional supervised learning techniques require significant human effort for annotation, limiting scalability. This project explores how self-supervised learning techniques can enhance computer vision models for real-time automation, reducing the need for extensive labeled datasets while improving detection accuracy and adaptability.

We aim to develop an automated system that interacts with visual data in real time using machine-learning techniques. We aim to enhance object detection performance while minimizing the need for manually labeled data. We implemented a module capable of identifying and labeling objects within the game *Plants vs. Zombies* using a custom-trained YOLO object detection model. Since implementing full self-supervised learning was more complex than we could currently handle, the system was trained using PyTorch, leveraging semi-self-supervised learning techniques to improve efficiency and adaptability. By incorporating pseudo-labeling and iterative training, we aim to demonstrate how these techniques can accelerate training while maintaining or improving detection accuracy.

The implementation leveraged PyTorch and YOLOv8 for object detection, OpenCV for image processing, and PyAutoGUI for automation. The initial dataset comprised 35 manually annotated images, requiring an hour for labeling, and training for 50 epochs resulted in an average confidence level of 0.60 with inconsistent detection. Extending training to 100 epochs improved confidence to 0.97 but failed to generalize to new enemy types. A semi-semi-supervised learning approach was introduced, utilizing a teacher model to generate pseudo-labels for an additional 50 images, improving training speed and maintaining a confidence level of 0.95. Some false positives persisted, with incorrect bounding boxes appearing at a confidence level of 0.35, highlighting the need for further refinement. Future work will focus on exploring additional self-supervised techniques, experimenting with larger datasets, and refining the model architecture to minimize false positives while improving object detection accuracy and efficiency.

Poster 5039

Bridging the Digital Divide: Teaching Empathy Through Accessibility in Computing Education

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Approximately 16% of the global population, including individuals with visual and hearing impairments, face barriers when using technology that lacks accessibility. This digital divide impacts education, employment, healthcare, and social engagement, emphasizing the need for inclusive design practices. At Siena College, we address this issue through the Human-Empathy Accessibility Learning (HEAL) model, which fosters empathy-driven accessibility education. Instead of relying on traditional disability simulations, which can reinforce stereotypes, our HEAL interventions integrate real-world narratives from individuals with disabilities, offering students a deeper, ability-based learning experience.

This interdisciplinary team is designing new educational interventions that embed accessibility-focused activities into computing curricula. These interventions teach students to develop inclusive technologies while enhancing their understanding of the lived experiences of people with disabilities. This project extends HEAL's reach beyond computing majors by integrating accessibility education into general education courses, ensuring all students recognize accessibility as a foundational design principle. By working with diverse student populations, we analyze whether exposure to accessibility-centered design fosters empathy and encourages long-term commitments to inclusive technology development.

We evaluate the impact of these interventions through qualitative and quantitative research, measuring students' evolving perceptions of accessibility and their ability to apply inclusive design principles in digital solutions. At CCSCNE, we will present our experiences implementing HEAL interventions, sharing insights on student engagement, curriculum integration strategies, and preliminary findings on empathy development. By integrating accessibility education across disciplines, we strive to foster a more inclusive approach to technology design, ensuring that future professionals embed accessibility as a core principle from the outset.

Poster 5040

Designing a Trauma-Informed Website to support the well-being of Ukrainian children

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The war in Ukraine has deeply affected children, many of whom have lost family members, pets, and their sense of security. To support them, an interdisciplinary service-learning project at Siena College unites psychology and computer science students with Ukrainian pre-service teachers to develop an accessible, trauma-informed website providing research-backed stress management techniques for K-12 educators in Ukraine.

In this project, psychology students collaborate with Ukrainian teachers to design trauma-sensitive strategies that help children process grief, regulate emotions, and build resilience. Simultaneously, computer science students apply trauma-informed UX principles to create a Figma prototype and functional website that delivers these techniques in a user-friendly, culturally responsive format.

Key Features of the Website:
- Minimalist, calming interface to reduce cognitive overload
- Clear categorization of techniques by age group and activity type
- Multilingual support (English and Ukrainian) for broader accessibility
- Trauma-informed design principles ensuring ease of use and emotional safety

This project underscores the power of human-centered computing in addressing global challenges through technology. By integrating trauma-informed UX principles with social impact-driven software development, students gain hands-on experience in designing inclusive, purpose-driven digital solutions.

Our CCSCNE presentation will highlight the iterative design process, lessons learned in trauma-informed UX, and the broader implications of using technology to foster resilience in children affected by war. Through this work, we demonstrate how computing can serve as a tool for social impact and healing.

Poster 5041

A Comparative Analysis of UINL and HTML/CSS for Web Application Development

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This study explores alternative frameworks for efficient web development, focusing on User Interface Object Notation Language (UINL) [1] by evaluating its utilization as one of the languages "intended to strip away the clutter of implementation details that frequently obscure interaction properties"[2] and focus on its ability to prioritize task execution over extensive styling.

UINL [3] utilizes a JSON-based syntax, simpler code, and offers potentially accelerated development. We implemented a to-do list application in UINL and HTML/CSS to assess their practicality and make preliminary comparisons between the two. UINL's advantages include simplified syntax, reduced code lines, and a consistent API. However, it presents a steeper learning curve and is derived from HTML/JavaScript schemas. HTML/CSS, while offering robust design and content organization, suffers from redundant structure and increased code complexity, particularly when integrating JavaScript.

The initial challenge was in translating HTML to UINL due to syntax unfamiliarity. However, similarities with JavaScript schemas facilitated the transition. A significant finding was UINL's ability to define reusable content "views" [3], enabling more efficient code modifications.

Our research concludes that UINL [3] reduces code complexity compared to HTML/CSS [4], owing to its JSON structure that facilitates dynamic rendering. However, UINL is still under development and lacks the maturity and widespread adoption of HTML/CSS. Future research will explore UINL's application in more complex web applications.

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Poster 5042

Analyzing the Creator Economy: Growth, Monetization & Engagement

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Today creators have a significant influence in the digital sphere, with their creativity and skills that help them reach and monetize social capital across various platforms. According to a 2022 survey, there are more than 300 million creators across nine large nations, including more than 85 million Americans. This accounts for a market valued at $104.2 billion. Youtube's Creator economy alone has contributed over $25 billion to the U.S. economy in 2021, supporting 425,000 full-time jobs, as per an Oxford Economics study.

To better understand content strategies and audience engagement, we analyzed the content of *The Samir and Colin Show*, which is a channel that interviews well-known creators to unravel hidden dynamics of the creator industry. We collected 53 hours of video transcription from interviews of 39 creators across various categories such as entertainment, tech, business, entrepreneurship, lifestyle, personal growth, comedy, pop culture, podcasts, talk shows, education, science, analysis, music, creative arts, gaming, esports, news, commentary, and social issues. Our focus was on their monetization strategies, upload frequency, and subscriber growth.

This study aims to use text analytics techniques to analyze frictions in the creator market and explore relationships between different stakeholders of this landscape, namely creators, platform, sponsors, and audience perception. We develop a framework to gather data-driven strategies for different stakeholders.

Poster 5043

We are watching : Intrusion Prevention Systems

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Millions of cyberattacks occur daily, threatening the security of private networks and putting sensitive data at risk. To help protect against these threats, organizations use Intrusion Detection Systems (IDS) to monitor network traffic and identify suspicious activity. IDS can detect threats using two main methods: signature-based detection, which recognizes known attack patterns, and anomaly-based detection, which identifies unusual behavior. However, while IDS alerts administrators to potential breaches, it does not take action to stop them. To address this limitation, Intrusion Prevention Systems (IPS) expand on IDS by not only detecting threats but also blocking or mitigating them in real time. IPS actively analyzes traffic and can prevent attacks before they cause harm. However, traditional IDS and IPS solutions may struggle to keep up with evolving threats, requiring more adaptable security measures. This project focuses on developing a hybrid IDS/IPS system that combines detection and prevention to improve cybersecurity. By integrating real-time threat analysis and automated responses, this system can better defend against both known and emerging attacks. Additionally, it will be designed to scale across different network environments, making it useful for businesses of all sizes. By combining IDS and IPS into a single, adaptable security solution, this project aims to create a stronger defense against cyberattacks, helping to protect data and maintain network integrity.

Poster 5044

Plagiarism detection in Computer Programming assignments using behavior tracking

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Plagiarism is an increasing concern in computer programming education, exacerbated by the rise of AI-generated code [1]. Detecting plagiarism in introductory programming assignments is particularly challenging, as traditional methods primarily focus on code similarity [2]. This study explores behavioral tracking as an alternative means of identifying plagiarism. We analyze coding assignment records collected via the LectureAssign VS Code extension [3]. Key behavioral metrics, including total actions, cursor movements, and file sizes, were extracted. A Random Forest Classifier [4] was trained on this behavioral data to classify assignments as plagiarized or original. The dataset was split into 80% training and 20% testing data, yielding the following model performance results:

Accuracy: 87.5%
Precision: 100%
Recall: 67%
F1-Score: 80%

The model effectively identified non-plagiarized work but exhibited limitations in recall, meaning some plagiarized cases were missed. A strong correlation was observed between high log activity (cursor movements, keystrokes) and original work. Plagiarized assignments showed significantly lower log activity. While precision was 100%, recall at 67% indicates the model could benefit from additional behavioral indicators. This study demonstrates the potential of machine learning in plagiarism detection for coding assignments. Future research will expand the dataset, incorporate additional behavioral markers (e.g., time spent on tasks, time between keystrokes), and explore alternative models such as XGBoost and deep learning.

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Poster 5045

Spanish Speaking Confidence AI Tutor

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Speaking a new language can be daunting, particularly for learners who struggle with confidence in verbal communication. This project aims to develop an AI-driven Spanish-speaking tutor that provides a low-pressure, interactive environment where users can practice conversation without fear of judgment. Unlike traditional language-learning tools that focus on rigid grammar rules or multiple-choice exercises, this system emphasizes fluid, real-time dialogue tailored to the learner's proficiency level.

The AI tutor is built using Python and integrates Ollama to deploy a LLaMA 3 model optimized for natural language processing. LangChain is utilized to manage contextual memory, allowing the AI to maintain coherent, ongoing conversations and track user progress over time. The model is fine-tuned with a structured prompting system to adapt its responses dynamically, ensuring that interactions remain engaging and appropriately challenging. The AI begins at the user's assessed fluency level and gradually introduces more complex vocabulary, grammar structures, and cultural context as their skills improve.

For accessibility and ease of use, the system is deployed via a Flask-based web application, providing a simple interface where users can interact with the AI in text or speech. Future enhancements may include speech recognition and pronunciation feedback using Whisper or Deepgram APIs, allowing for real-time spoken conversation assessment. The system aims to reduce speaking anxiety by fostering a conversational learning experience that builds both confidence and fluency.

This research contributes to the field of AI-assisted language learning by demonstrating how personalized, adaptive dialogue systems can improve spoken fluency in a foreign language. By leveraging state-of-the-art NLP techniques, the project explores the intersection of machine learning and education, making language acquisition more engaging, interactive, and accessible.

References:
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Poster 5046

Adapting Sensor Data Transplantation from Autonomous Rovers to Autonomous Drones

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We present our research on autonomous drone resilience in the Math, Computer Science, and Statistics Department at St. Lawrence University. The goal of the research is to reduce security vulnerabilities and software defects in autonomous vehicles. With the increase in autonomous vehicle use in recent years, the need for trust in autonomous vehicles has grown. Given previous research that forces software to terminate prior to repairs, we introduce a method that allows a mission to be completed while repairs are deployed. We implement redundant computers to enable hardware switchover mid-mission. Using sensor data transplantation, we plan to counter software vulnerabilities by seamlessly switching control between computers while simultaneously making repairs to flight software. This would circumvent the need to pause a mission in the case of a software deficiency or security breach. At this time, we have successfully fitted and tested a hardware multiplexer to enable hardware switchover following a transplantation. This, along with our prior research that designed the data transplantation algorithm, allows a full transplant and control switch for a drone while it is flying. Further work is needed to automate the sensor data transplantation as well as the hardware switch. Our poster will discuss the challenges we faced during the project as well as the performance of the hardware mux. The software and hardware decisions will be presented in their entirety.

Poster 5047

Computing Education Using Experiential Labs

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In modern development, ensuring software inclusivity is essential. Yet, many developers and students lack the experience to create this software. This often stems from insufficient exposure to such topics early in education on topics such as accessibility, but also artificial intelligence, ethics in computing, machine learning, and cybersecurity. The Accessible Learning Labs (ALL) within the Golisano College of Computing and Information Sciences at the Rochester Institute of Technology seeks to address this gap through open-access experimental labs. These labs are designed to provide an active learning experience to expose users to the various challenges and impacts lack of accessibility and exposure can have within computing.

ALL has created a wide range of labs focusing on these crucial topics. This poster will provide an overview of two key labs: Lab 10, Neural Networks, and Lab 11, Accessibility in Literacy. Lab 10 delves into the intricacies of Neural Networks within machine learning. The lab starts with building the user's knowledge of core concepts and progressively building their knowledge through an interactive game demonstrating how neural networks for machine learning are implemented and trained. Through reinforcement of core topics and the opportunity to retrain the artificial intelligence in order to attempt to eliminate bias from AI, Lab 10 provides users with a comprehensive introduction to neural networks along with bias within AI.

Lab 11, on the other hand, emphasizes the significance of Accessibility in Literacy particularly through inclusion for various literacy levels and website readability. Users engage with performing a hands-on implementation of the Fog Index Formula, gaining practical skills in order to analyze the readability of a provided email. By widening user's perspective to the varying levels of readability, and enforcing said knowledge through reinforcement tasks and quizzes, users grasp both the theoretical and practical implications of both artificial intelligence and accessibility.

Poster 5048

Strong Passwords In CyberSercuity

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In today's digital world, cybersecurity is more important than ever. As technology advances, so do the threats that put sensitive data, systems, and networks at risk. Cybersecurity is the practice of protecting digital information from unauthorized access, attacks, and damage. This project explores three critical aspects of cybersecurity: security measures, threats, and vulnerabilities. To apply these concepts practically a Password Manager project, using Python programming language, will demonstrate how to enhance digital security. To protect data and systems, different security measures are used. Encryption scrambles data so only authorized users can read it. Firewalls block harmful traffic from entering a network. Multi-Factor Authentication (MFA) adds extra security steps, like a code sent to a phone, to prevent unauthorized access. Access control limits who can see or change information. To reduce risks, organizations should update software, use strong passwords, and train employees on security. For the current project a Password Manager will be created using Python. This tool will: 1) store and encrypt passwords securely; 2) generate strong passwords and 3) let users retrieve stored passwords safely. Python is the choice of language because it supports encryption through libraries like Cryptography. This research project will help improve security by ensuring passwords are protected from hackers.

Poster 5049

Co-Design for Edge Intelligence: Binary Neural Networks

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We present a replication and ablation (component removal) study done on the Edge Intelligence architecture BTHOWeN, orginally presented by Susskind et al. [1]. Edge Intelligence is the intersection between embedded computing and machine learning, in which machine learning models are deployed to low-power devices with limited computational ability. Realization of Edge Intelligence is ideal when use of cloud computing poses a security or privacy risk, or has unacceptably high latency, e.g. in autonomous vehicles. Binary neural networks (BNNs) implemented on field-programmable gate arrays (FPGAs) are ideal for Edge Intelligence purposes due to the low computational requirements of BNNs combined with the low latency and power efficiency of FPGAs.

BTHOWeN is an architecture for Weightless Neural Networks, a type of BNN, for implementation on FPGA. It presents several technical innovations for minimizing model size while maintaining accuracy, such as Gaussian Thermometer encoding and Bleaching, and its open source nature allows for detailed analysis, such as our study. We trained our own BTHOWeN models and modified the original code to train modified models that either did not use Gaussian encoding, did not use Bleaching, or both, and recorded the accuracy change. We also attempted to implement BTHOWeN models onto a Zybo Z7 FPGA.

Our replication of model training successfully verified the original accuracy metrics, and our ablation study revealed the impact of different innovations varied substantially with the dataset used. Additionally, testing different hyperparameter combinations revealed that a model without Bleaching could achieve equivalent accuracy to normal models at the cost of greatly increased model size. Our model implementation on FPGA successfully verified the original latency and power use metrics, but our accuracy replication attempt was unsuccessful.

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Poster 5050

Cyber Ethics

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To analyze the specified areas of cybersecurity ethics, I would be taking an inventory of malicious activity in the cybersecurity world of today. This allows for consideration of an approach to cybersecurity ethics that is optimized and cohesive. In taking inventory of the kind of decryption attacks that are utilized in gaining sensitive information from internet users, we need to look to the cybersecurity attacks themselves. What is indicative in our cyber landscape is that decryption is advancing. With the evolution of decryption using more complex cryptographic algorithms that allow URL Certificates to be cyphered. There are so many dangers in the cybersecurity world that we are trying to prevent. This research aims to explore and contrast different cryptographic algorithms. (examples, RSA, Caesar, Transposition/ Permutation cipher) and to find vulnerabilities in their counterparts for example, Lucky 13 and Birthday Attacks.

These Man in the Middle attacks will be compared. To conduct this research, writing simple cryptography codes that will insulate the typical vulnerabilities in SSL or RSA protocol. In doing so, I elaborate on examining SSL vulnerabilities in which proactive measures can be assessed and applied to solve the complexity and multitude of attack/decryption variants. There is a steep increase in cryptographic attacks such as MITM attacks. These attacks are dangerous because they can move past certain TLS padding, considering the discreteness of the algorithms used. They are highly mathematical and subversively designed to outlive even DoS attacks. The C++ programming language will be used for this study.

Poster 5051

EaglePass: A Digital ID to Improve Campus Security

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Advancements in digital authentication technologies have the potential to improve campus security and operational efficiency. This project examined the feasibility of implementing a mobile-based authentication system as an alternative to traditional physical ID cards at SUNY Brockport. We examined the existing infrastructure supporting student and faculty identification, evaluating both its strengths and weaknesses. A key focus was identifying security risks associated with magstripe technology, which remains widely used despite its susceptibility to unauthorized access and duplication.

To address these concerns, we investigated modern authentication methods that could integrate seamlessly with existing campus systems. Technologies such as QR codes and Near Field Communication (NFC) were evaluated for their security benefits, ease of implementation, and user accessibility. By leveraging smartphones—devices already owned by most students and faculty—our proposed system aims to enhance convenience while maintaining robust security measures. We analyzed the technical, organizational, and financial aspects and considerations involved in transitioning to a digital authentication system. This included assessing the cost of infrastructure changes, potential challenges in user adoption, and the administrative policies required to ensure a smooth deployment. A prototype application was developed to demonstrate how authentication functions could be implemented within a mobile platform. Our findings indicated that a well-designed mobile authentication system could offer significant security improvements while providing a seamless user experience. With careful planning and investment, institutions like SUNY Brockport can modernize their authentication processes, creating a more secure and efficient campus environment.

Poster 5052

A Data-Driven Approach to Exploring Retention of Women in Computing Using Machine Learning

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We are conducting a multi-part data analysis to understand the factors influencing women's retention in STEM majors URM institutions. Despite various initiatives to promote diversity in computing fields, still, women continue to be significantly underrepresented, especially at the community college level. In research studies, persistence in computing programs has been tied to factors like validation of competence, belonging, and access to supportive communities. At our diverse institution, understanding these retention patterns is crucial for developing a targeted support system. By analyzing accessible datasets with student demographics, academic performance, and program completion rates, we aim to identify key variables that influence women's persistence in computing education within our system. We utilize multiple datasets from an urban community college to provide descriptive statistics and data visualizations on the state of women's success rates in STEM majors at our institutions. We aim to integrate this statistical analysis with advanced machine learning to determine key decision points and risk factors in students' academic paths. We develop machine learning models such as decision trees, random forests and clustering to uncover patterns in student demographic data and academic records that help predict future passing grades and retention rates for women in STEM majors and courses. We additionally develop a gradient boosting model on a women-only subset of data to derive feature importance for predicting academic success from input data including academic progress, financial-aid status, full-time status, and first-generation status. Our findings suggest there are multiple social and academic determinants of success in STEM based on the variable we had access to. Our models help uncover barriers to degree completion and suggest areas for future intervention strategies such as structured peer mentorship programs, targeted academic support, and proactive outreach programs for students showing early warning signs of academic struggle to improve retention rates for women in computing.

Poster 5053

A Blockchain-Based Framework for Ensuring Data Integrity and Regulatory Compliance in Healthcare 5.0

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The transition from Healthcare 4.0 to Healthcare 5.0 introduces new challenges in ensuring data integrity, security, and interoperability, as healthcare systems become more decentralized, patient-driven, and reliant on real-time data exchange. However, existing blockchain-based solutions designed for Healthcare 4.0 struggle with scalability, efficiency, compatibility with legacy systems, and evolving privacy regulations. Given the increasing intersection of cybersecurity and healthcare, this research builds on ongoing work in security at RWU, particularly in undergraduate-driven projects under Dr. Bai's supervision, and aligns with a broader interest in developing robust digital infrastructure for sensitive data environments. In response, this research proposes a blockchain-based framework designed to enhance data security and integrity while maintaining efficient performance in a Healthcare 5.0 environment. We hypothesize that a more optimized blockchain infrastructure, incorporating advanced cryptographic techniques and improved data verification mechanisms, can secure medical records against tampering and unauthorized access while ensuring compliance with regulatory standards. To evaluate this framework, we will conduct comparative analysis and performance testing through simulations to assess its effectiveness against existing systems. Expected outcomes include a scalable and privacy-preserving approach to healthcare data management that strengthens patient data security, reduces vulnerabilities in digital health records, and establishes compliance with laws such as HIPAA and GDPR. By addressing key limitations of current blockchain-based healthcare systems, this research will contribute to the development of a more resilient and efficient approach to managing medical data in the era of Healthcare 5.0.