Department of Electrical Engineering and Computer Science

7th Annual Engineering & Computer Science Day (Capstone Design Day)

Friday, April 18, 2025
Sponsored by the ATT Corporation

At
Howard University
INNOVATION CENTER
Mackey Building, 2336 Sixth Street, Northwest
Washington, DC 20059

Keynote Speaker

Angela Baskerville
VP, AT&T Corporate Systems

Angela Baskerville is Vice President – AT&T Technology Services Corporate Systems and Talent Enablement. She is a Technologist by Trade, Leader by Choice, and Advocate by Conviction. She has over 25 years of experience in the Information Technology industry, and as an advocate for Diversity, Equity, and Inclusion. Her professional experience includes software development, Agile delivery, program management, product development, cloud migration, operations support, and client engagement. Currently, she is responsible for executing critical business and technology ecosystem transformations in AT&T's ERP space. She also leads AT&T's premier Technology Development Program which provides an immersive development experience for college students pursuing technology degrees. This is the primary pipeline for sourcing and onboarding technical talent across AT&T. In addition to those responsibilities, Angela is a National Advisor for AT&T's oldest employee resource group, The NETwork, which encourages African Americans and other diverse individuals to attain their personal and professional goals, and to promote inclusiveness within AT&T and our communities. She advocates for women and underrepresented communities to gain access to technical job opportunities, and she is in constant pursuit of representation, cultural competence, inspiring and intentional leadership, diversity, inclusion and belonging. Angela is a member of the board for Howard University's Department of Electrical Engineering and Computer Science (EECS) and a proud graduate of Spelman College. In her free time, Angela enjoys traveling, live music, sports, and time with her family.

Schedule of Activities

8:30 am – 9:15 am   **Registration and Breakfast
        Computer Science
   (Innovation Center)**

8:30 am – 9:15 am   **Registration and Breakfast
Electrical & Computer Engineering
       (LKD 2019)**

                           SESSION 1

9:15 am – 12:00 pm   **Capstone Design Presentations in Computer Science
Phase I: (Innovation Center)**

                           SESSION 2

9:15 am – 12:00 pm   **Capstone Design Presentations in Electrical and
Computer Engineering: (LKD 2019)**

12:00 pm – 1:00 pm   **LUNCH
   (Innovation Center)**

1:00 pm – 1:45 pm   **Introduction and Remarks of the Keynote Speaker
Angela Baskerville, VP AT&T Corporate Systems
       (Innovation Center)**

1:45 pm – 3:45 pm   **Capstone Design Presentations in Computer Science
Phase II: (Innovation Center)**

3:45 pm – 4:00 pm   **DEMO/POSTER PRESENATION**

4:00 pm – 4:15 pm   **Awards**

4:15 pm   **Adjourn**

Session 1: Innovation Center
Capstone Design Presentations in Computer Science: Phase I

9:15 am – 9:30 am

Team 1:
Project Title: CareLink
Faculty Advisor:
Team Member(s): Mezisashe Ojuba, Madeling Bumpus, Elei Nkata, Angelica Stewart, Maize Booker

Problem Statement: Over 80% of counties in the United States lack sufficient healthcare access, such as being within a one-hour driving distance to a provider [1]. Similarly, a 2015 ILO report revealed that 56% of the global rural population lacks essential healthcare, compared to 22% in urban areas, largely due to only 23% of healthcare workers serving rural regions and a shortage of 7 million workers, further exacerbated by poor infrastructure and financial limitations [2]. While technological advancements have transformed healthcare delivery in many regions, these improvements have yet to reach areas with unreliable internet and low technological adoption. In many underserved regions, technological infrastructure is limited, with cell phones often being the primary computing device in households.

Project Goal: Our product is a healthcare delivery platform designed to overcome the challenges of providing medical services in regions with limited technological infrastructure. This platform bridges the gap between healthcare providers and patients by offering essential services like provider/patient scheduling and telemedicine consultations even in areas with unreliable internet connectivity. The platform operates through a mobile application optimized for low-bandwidth environments, allowing patients to schedule appointments, receive follow-up instructions, and manage prescriptions while offline. When a stable connection becomes available, the app automatically syncs data with healthcare providers without requiring additional user input. The interface is user-friendly, ensuring accessibility for patients with minimal technological literacy. Additionally, an SMS-based messaging system or chatbot will be integrated, capable of functioning on 2G networks or in areas with no internet connection, ensuring continuity of care in underserved communities where traditional services are lacking.

9:30 am – 9:45 am

Team 2:
Project Title: Cloud Catalyst: Accelerating Small Business Success with AWS
Faculty Advisor: Ezana Debalkew Brandon Coates, AWS
Team Member(s): Asis Johnson, Tolulope Oluyadi, Liliann Ulysse, Foster Ware IV, Khloe Wright

Problem Statement: Small businesses, particularly startups and early-stage companies, struggle with establishing an online presence, engaging customers, managing data, and streamlining operations due to limited technical expertise and resources. As a result, they face inefficiencies in daily operations, difficulty leveraging customer data for insights, and

limited digital engagement, which hinders growth. This contributes to the high startup failure rate, with approximately 90% of startups failing—10% within their first year—due to factors like lack of market demand (34%), cash flow problems (38%), and inadequate teams (23%). Without effective digital tools, these businesses will continue to experience these common issues, leading to an inability to compete with larger, tech-enabled companies

Project Goal: This project aims to design and implement a scalable, cloud-based solution leveraging AWS resources to address the unique challenges faced by small businesses in today's competitive digital landscape. Small businesses often grapple with issues such as establishing a strong online presence, managing operations efficiently, enhancing customer engagement, and effectively handling data. These challenges can hinder their ability to grow, remain competitive, and adapt to the rapid pace of digital transformation. This project seeks to empower small businesses by providing a cloud-based infrastructure tailored to their needs, enabling them to optimize critical processes and improve their overall effectiveness. This project utilized AWS's advanced tools and services suite, such as cloud storage, data analytics, and scalable computing power, to build a solution that prioritizes adaptability, security, and cost-efficiency. The platform integrates features that address key pain points, such as streamlining daily operations, enhancing data security, and offering insights into customer behavior. By focusing on these areas, the project aims to deliver a comprehensive tool that not only mitigates existing challenges but also facilitates the creation of meaningful customer relationships and the development of a strong digital presence. With Cloud Catalyst we aspire to create a sustainable, easy-to-adopt cloud-based solution that aligns with the constraints and ambitions of small businesses. By empowering them to leverage cloud technology effectively, the solution will help small enterprises expand their market reach, improve customer satisfaction, and achieve operational excellence. Through this innovative approach, the project will contribute to the growth and resilience of small businesses, ensuring they are better equipped to succeed in an increasingly interconnected and competitive global economy.

9:45 am – 10:00 am
Team 3: BPS - Bisons Providing Solutions
Project Title: Enhancing National Security and Infrastructure Resilience with BPS
Advisor: NexGen TV and NAB
Team Member(s): Rickelle Jones, Jordan Thomas, Justin Davis, Emily Jones, Richard Brobbey

Problem Statement: The Global Positioning System (GPS) is fundamental to modern positioning, navigation, and timing (PNT) services that underpin critical infrastructure, financial systems, and national security. However, GPS is inherently vulnerable due to its reliance on low-powered satellite signals that traverse vast distances to reach Earth. These signals are easily disrupted by jamming and interference, which foreign adversaries or natural environmental disturbances can initiate. In addition, the GPS infrastructure itself is at risk of degradation or failure, potentially leading to catastrophic disruptions across multiple sectors. Economic analyses suggest that a significant GPS disruption could incur losses exceeding $1 billion in crucial industries alone.

Project Goal: The Broadcast Positioning System (BPS) is a groundbreaking terrestrial-based alternative to GPS, designed to deliver reliable positioning, navigation, and timing (PNT) services. By leveraging existing television broadcasting infrastructure, BPS provides a robust and resilient backup for GPS. It integrates TV antennas to embed precise timing signals, ensuring extensive coverage and accessibility. The system also incorporates the WHUT radio station to enhance signal strength and reliability, expanding its reach. Offering high-precision timing comparable to GPS, BPS supports critical infrastructure synchronization and financial

transaction authentication. With built-in performance monitoring, it tracks and displays the time delivery accuracy of WHUT's BPS transmission in comparison to GPS. Additionally, BPS seamlessly integrates with Network Time Protocol (NTP) and Precision Time Protocol (PTP), allowing easy adoption across various systems. Its design prioritizes resilience against jamming and spoofing, delivering secure and dependable PNT services. The system also features self-synchronizing capabilities, maintaining accurate timing without external reliance, ensuring continuous operation during GPS outages. BPS serves as a critical backup, bolstering national security and infrastructure resilience while reducing vulnerability to foreign interference and cyberattacks. Leveraging existing infrastructure, it offers a cost-effective, domestically controlled PNT alternative, minimizing dependence on foreign systems and ensuring the continuity of essential services.

10:00 am – 10:15 am	**Team 4:** API Alchemists
	Project Title: HU Marketplace
	Faculty Advisor: Antun Weeks and Lisa Chandler, AWS
	Team Member(s): Felix Eshun, Joseph Sankah, Chukwuemeka Ojih, Jaelen Dixon

Problem Statement: While there is a growing desire among consumers to support minority-owned businesses, many potential patrons face significant barriers that hinder their ability to connect with and patronize these enterprises. A lack of awareness about the existence of minority-owned businesses, insufficient marketing efforts, and limited access to platforms that highlight these businesses contribute to this disconnect. As a result, consumers miss out on valuable products and services, while minority-owned businesses struggle to gain the visibility and customer base they need to thrive. Research highlights substantial disparities that underscore the need for economic support within minority communities. For instance, in 2009, the median wealth of White U.S. households was $113,149, compared to just $5,677 for Black households, demonstrating a stark wealth dividedly, minority representation in corporate leadership remains disproportionately low, with only three Black CEOs in the Fortune 500 as of November 2019, none of whom were Black women. Addressing these visibility and awareness challenges is crucial for fostering a more equitable marketplace. By improving access to information and promoting minority-owned businesses, we can empower consumers to make informed choices that support diversity and inclusion in their communities.

Project Goal: Our application helps bridge the gap between minority-owned businesses and potential customers by creating a web platform where users can easily find and engage with these businesses. The app will allow users to search for businesses based on location, keywords, or even product images, and give them the ability to review and rate their experiences. Business owners can register their companies or claim an existing listing, with added features to track reviews and performance metrics over time. Additionally, the app will implement fraud detection to ensure trust and security in reviews and business profiles. By supporting these businesses, the app contributes to reducing economic disparities and empowering minority communities.

10:15 am – 10:30 am	**Team 5:**
	Project Title: CrossRoads
	Faculty Advisor: Gerard Spivey AWS
	Team Member(s): Courtney Young, Sydney Stokes, Joshua, Wallington, CJ Seigler, Calvin Black

Problem Statement: Many minority-owned businesses face challenges in gaining visibility and attracting customers due to limited marketing resources and lack of exposure. Members of the community often want to support these businesses but struggle to find reliable directories or platforms to identify them. This disconnect is compounded by the fact that many minority business

owners lack the knowledge or tools to effectively market their companies, resulting in reduced awareness and missed opportunities for growth. A recent study highlights the importance of addressing this issue, revealing that "7 out of 10 small business owners agree that without access to technology platforms, their businesses would struggle to survive" (U.S. Chamber of Commerce Technology Engagement Center and Teneo Research). Bridging this gap through innovative technological solutions could significantly boost the success of minority-owned businesses while enabling community members to easily discover and support local enterprises.

Project Goal: Our app is designed to bridge the gap between minority-owned businesses and the communities that want to support them by providing an intuitive platform that connects customers with local businesses. Users can easily search for businesses based on proximity, keywords, product images, or voice search, ensuring that they can quickly find minority businesses that meet their needs. The app offers personalized recommendations based on search history and behavior, making it easier for users to discover new businesses. Minority business owners benefit from increased visibility through customer ratings, reviews, and social media sharing, which help them build awareness and credibility. By allowing customers to post reviews and view ratings over time, the app not only enhances the shopping experience but also empowers businesses to grow through community support and feedback. This solution addresses both the need for accessible business directories and the marketing challenges that minority-owned businesses face.

10:30 am – 10:45 am	**Team 6:**
	Project Title: RTHA - Real Time Health App
	Faculty Advisor: Cigna
	Team Member(s): Maya Griffin, Lum Kelly Chelsie Choh, Chanelle LeGrand, Damola Quadri, Morgan Thornton

Problem Statement: Patients, especially those with chronic conditions or the elderly, struggle with managing health, leading to missed medications, appointments, and poor communication with caregivers and healthcare providers. Managing chronic conditions in the U.S. is challenging due to fragmented care and inconsistent monitoring, which results in poor treatment adherence and higher health risks for patients. Access to healthcare is often limited, particularly in rural or underserved areas, making it difficult for individuals to schedule appointments, receive timely care, or manage their health effectively. In many cases, individuals with chronic conditions in the U.S. face delays in receiving urgent assistance because they are unable to quickly alert others or communicate effectively during a health crisis. Many elderly individuals and those with chronic conditions struggle to maintain personal autonomy in managing their health, often relying on caregivers.

Project Goal: Our solution is a platform that empowers patients to manage their health efficiently. With features such as medication tracking, refill reminders, emergency alerts, and appointment scheduling, our app fosters real-time communication between patients, caregivers, and healthcare providers. This collaboration drives improved health outcomes, ensuring patients maintain autonomy while receiving the support they need.

10:45 am – 11:00 am	**Team 7:** Inclusifind
	Project Title: Inclusifind
	Mentor/Advisor: AWS
	Team Member(s): Miles Adedjouma, Darnell Love, Christian Batson, Kaleb Berry, Jamar Bailey III

Problem Statement: Investing in minority-owned companies is a practical way to narrow the wealth gap between races. Various minority-owned businesses directly rely on minority customers to thrive. Additionally, minorities often have needs that may be unfulfilled by the larger mainstream market. For instance, mainstream stores often don't sell hair products meant for African American hair, forcing them to rely on Black owned hair salons and haircare businesses. Another example would be members of the Hispanic community seeking out restaurants that serve

authentic Latin cuisine, reflecting their cultural traditions and tastes. These businesses are often underrepresented in mainstream search engines and online directories, making it difficult for potential customers to discover them. This lack of visibility not only limits business growth but also hinders community members from accessing culturally relevant services they need or desire.

Project Goal: Nowadays the internet is the center of gathering knowledge about our interests and surroundings. When seeking out new goods or services, we consult the internet first to find locations that will provide the things we desire. However, businesses without many resources often find themselves drowning under other businesses that have gained more of a technological foothold, thus leading to them being undiscovered regardless of their merit. Our product aims to bridge the technological gap between existing minority owned business and open-minded consumers who are seeking to patronize diverse enterprises. This project will be a web app that will guide prospective customers to existing minority-owned small to medium sized businesses. On our app users will be able to leave reviews, either via ratings or text and leave them on social media.

11:00 am – 11:15 am	**Team 8:** Solutions Inc. **Project Title:** FitGenie **Faculty Advisor:** AWS **Team Member(s**): Jabez Agyemang-Prempeh, Phinehas Fuachie, Donald Echefu, Theophilus Arthur Kofi Agyenim-Boateng

Problem Statement: Fashion trends evolve rapidly, making it difficult for consumers to stay updated or find outfits tailored to their unique preferences and needs. With high online return rates due to visualization issues and fragmented trend data across platforms, the online fashion industry faces significant challenges in personalization, decision fatigue, and customer satisfaction. FitGenie aims to address these problems by offering an AI-driven, fully integrated solution that streamlines fashion discovery, visualization, and shopping, reducing friction in the customer journey.

Project Goal: FitGenie is a mobile application leveraging advanced technologies like AI, 3D modeling, and real-time data aggregation to provide: 1. Personalized fashion recommendations. 2. Real-time trend insights from platforms like Instagram, Pinterest, and TikTok. 3. 3D avatar-based outfit visualization. 4. Seamless shopping with direct retailer integration.

The app bridges the gap between browsing and buying, enhancing user satisfaction while reducing the inefficiencies prevalent in online shopping.

11:15 am – 11:30 am	**Team 9:** **Project Title:** Visual Impairment Service Bot **Faculty Advisor:** Harry Keeling **Team Member(s):** Kamryn Brown, Courtney Mahugu, Ashley Haynes, Violet Edwards, and Jevanie Davis

Problem Statement: The current problem is that visually impaired individuals face significant challenges in achieving independent and safe mobility, often relying on traditional aids like canes and guide dogs which may have limitations. Existing solutions may not always provide comprehensive assistance in diverse environments or offer sufficient real-time information about their surroundings. This can restrict their ability to navigate freely and confidently, impacting their overall quality of life and independence

Project Goal: The Visual Impairment Service Bot aims to address this problem by developing an autonomous service robot that leverages advanced technologies such as cameras, LIDAR, and AI-based navigation1. The purpose of this innovation is to provide a safer, more reliable, and more comprehensive alternative to traditional mobility aids. By enabling visually impaired individuals

to navigate diverse indoor and outdoor environments, detect obstacles, and receive real-time feedback, this project seeks to enhance their mobility, foster greater independence, and ultimately improve their quality of life.

11:30 am – 11:45 am	**Team 10:** Pixelated Intellects
	Project Title: Bison Madness Game
	Faculty Advisor: Harry Keeling
	Team Member(s):

Problem Statement: Artificial Intelligence (AI) is revolutionizing industries across the globe, with a market projected to grow to over $190 billion by 2025 . Video games, a $159 billion global industry in 2020 , are on the verge of embracing AI to redefine player experiences. Our project aims to investigate how AI can enhance gaming by creating adaptive environments, intelligent non-playable characters (NPCs) with human-like behavior, and personalized gameplay. These AI-driven systems can transform storytelling, strategy, and player interaction by responding dynamically to player actions, thereby increasing immersion and replayability. Research indicates that 54% of game developers are already incorporating AI into their game design , emphasizing the growing interest in AI's potential. AI is no longer just a tool for automating simple tasks like pathfinding; it has evolved to create complex behavioral patterns in NPCs, craft procedurally generated worlds, and adapt gameplay difficulty based on player performance. For example, games like Middle-Earth: Shadow of Mordor have used AI-driven systems to dynamically adjust the behavior and relationships of NPCs through the "Nemesis System," creating unique narratives for players based on their actions. Our research seeks to explore how AI can further evolve from simply enhancing NPC behavior to being a key collaborator in the development process, helping designers create more complex and organic narratives. Instead of viewing AI as a threat to creativity, our project envisions a future where AI acts as a powerful co-developer, enriching both player engagement and developer innovation. As the gaming industry continues to grow, incorporating AI into game development presents opportunities for innovation that can increase player retention and satisfaction.

Project Goal: Bison Madness is a cutting-edge roguelike adventure that leverages the power of AI to redefine player engagement. In an industry where procedurally generated content is increasingly becoming the standard, Bison Madness takes it a step further by integrating real-time AI systems that adapt to player behavior. This makes each playthrough a unique experience, driven by AI-generated environments and adaptive enemy AI. According to recent studies, players in games with procedurally generated elements are 45% more likely to replay the game , showcasing the value of AI-driven replayability in modern game design.

As you navigate the unforgiving jungle, AI-controlled NPCs will adapt to your actions, learning and evolving based on your strategies. With a character progression system that allows for diverse combat strategies, the game's AI adjusts the difficulty and introduces new challenges based on player skill, ensuring a balanced experience. Inspired by the atmospheric visuals of The Binding of Isaac, the game's haunting visual style coupled with dynamic AI-driven dungeons gives Bison Madness an immersive experience that challenges players in new ways every time they play. Dynamic difficulty adjustment, powered by AI, ensures that both seasoned gamers and newcomers will be challenged appropriately, a feature that 56% of gamers prefer in new releases . Through AI-enhanced storytelling, Bison Madness offers deep lore, interactive NPCs with their own evolving storylines, and environments that react to player choices. Each decision players make influences the world around them, making AI a key player in developing personalized, emergent narratives. As AI continues to change the landscape of game design, Bison Madness represents the future of game development, where developers and AI collaborate to offer richer, more engaging interactive experiences. Creating a game with a similar style to *The Binding of Isaac* but incorporating AI would open up a range of possibilities to enhance gameplay and introduce new mechanics. Here are a few ways you could integrate AI into such a project.

11:45 am – 12:00 am   **Team 11:** RoBits
          Project Title: Automated Package Classifier with Robotic Arm
          Manipulation for Efficient Sorting and Handling
          Faculty Advisor: Harry Keeling
          Team Member(s): Dagmawi Workineh Yemesgen,
          Amir Ince, Biraj Dahal, Suprabhat Rijal, Hrishav
          Sapkota

Problem Statement: As e-commerce continues to grow rapidly, the need for efficient, accurate, and scalable package handling solutions has become more critical than ever. Currently, human intervention is required to pick up, sort, and route packages manually, which can introduce delays, errors, and inefficiencies, especially during peak operational times. This manual process becomes even more cumbersome when dealing with special items such as perishables, hazardous materials (e.g., batteries), or return items requiring specific handling. A study suggests that companies might face a 15-20% increase in operational costs due to improperly identified packages (Weber-Marking, 2024). Another study revealed that mislabeled parcels are 50% more likely to be delayed or lost, negatively impacting customer satisfaction (Couriers, 2021). Automation and robotics are set to play a crucial role in e-commerce fulfillment, with industry experts predicting that at least 80% of the competitive edge in the next five years will depend on these technologies (Parcel Consulting, 2024). This is particularly important for handling special items such as perishables or hazardous materials, where precision and efficiency are paramount. In fulfillment centers, the challenge is to sort and route a high volume of packages, each with distinct characteristics and destinations, in a way that minimizes human intervention while ensuring proper handling of different item types. Without intelligent automation, the process lacks speed, scalability, and adaptability.

Project Goal: The Automated Package Classifier is an innovative solution designed to address the challenges of manual package sorting in high-volume logistics environments. By integrating computer vision, robotic arm manipulation, and intelligent classification algorithms, the system aims to:
• Reduce human intervention in package handling.
• Minimize sorting errors.
• Improve operational efficiency.
• Enhance safety in package processing.
• Provide specialized handling for different package types.
In summary, the primary project goal of Team 11 was to design and implement an automated system using robotics and computer vision to make package sorting more efficient, accurate, and safe in logistics environments.

Capstone Design Presentations in Computer Science: Phase II

1:45 pm – 2:00 pm   **Team 12:** Howard Dynamics
          Project Title: Guardian Bot
          Team Member(s): Saharsha Tiwari, Prasun
          Dhungana, Sameer Acharya, Manish Adhikari,
          Manish Niure

Problem Statement: There's a huge percentage of the population in the United States that faces some sort of health-related risk. About 27% of elderly people are living alone, while over 61 million people are living with some sort of disability. However, less than 1% of this population

currently benefits from having a service dog or such a companion. Acquiring a service dog isn't easy either, costing from around $15,000 to $30,000 or more upfront, and at least $500 to $10,000 a year for food and veterinary care. A 2001 study also concludes that in this group, a significantly high mortality risk arises from late response to medical emergencies. Moreover, about 1.3 million elderly who reside in nursing and care facilities face a significant risk of accidents within or outside the facility.

Project Goal: GUARDIAN BOT is designed to help the elderly and disabled population in care facilities. The primary aim of this project is to improve their safety and provide assistance in emergencies. Key features of the GUARDIAN BOT include medication reminders, alerts to caregivers if a dose is missed. These features directly address user well-being. Companion Mode with calming conversations. This feature addresses mental health support. The GUARDIAN BOT utilizes a TurtleBot as its base, as indicated by the title "GUARDIAN BOT: A TURTLEBOT CARE PROJECT" in the specification document. In summary, the GUARDIAN BOT is a robot designed to enhance the safety and well-being of elderly and disabled individuals in care facilities by providing medication reminders, alerting caregivers to missed doses, and offering calming conversations.

2:00 pm – 2:15 pm	**Team 13:**
	Project Title: Personalized Learning Platform
	Faculty Advisor: Harry Keeling
	Team Member(s): Sariah Adams, Oluwayimika Adeyemi, Devin Griffin, Jennai Jackson, Morgan Martin

Problem Statement: Many educational platforms rely on a one-size-fits-all approach, which often fails to meet the diverse needs of individual learners. This approach overlooks variations in learning styles and paces, leading to disengagement and academic struggles for many students. The demand for personalized platforms offering flexible and tailored teaching methods has grown significantly. A 2022 Wiley survey of MSU students revealed that 55% of undergraduates and 38% of graduate students struggled to maintain focus in their classes. Furthermore, among over 5,000 students surveyed, a substantial portion reported difficulties retaining course material. Our learning platform addresses these challenges by providing a virtual environment designed to keep students engaged and help them retain knowledge more effectively. Supporting this approach, a RAND study on personalized learning found that such methods can enhance student achievement across all levels. The research showed that students in personalized learning programs experienced a 3-percentile point improvement in mathematics compared to peers in traditional learning environments. This evidence underscores the value of tailored educational experiences in fostering academic success.

Project Goal: The goal of this project is to design and implement a Personalized Learning Platform that adapts to individual student progress and preferences, leveraging machine learning, web development, and database systems. The platform is structured around six core components, each contributing to a personalized and data-driven learning experience. First, a user profile system will be developed to capture and manage student information, including personal data, learning preferences, and progress history, with dynamic updates to track user performance over time. Second, a recommendation engine will analyze individual progress and learning patterns to suggest tailored content and quizzes using machine learning algorithms to ensure alignment with each student's needs.The third component is an adaptive quiz system, which dynamically adjusts question difficulty and content based on the user's knowledge level, providing a personalized and appropriate assessment experience. Fourth, the platform will offer real-time analytics for both students and instructors, featuring dashboards that visualize learning progress, performance metrics, and areas for improvement through accessible data visualizations. Additionally, adaptive algorithms will be implemented to adjust the learning pace and style (e.g., visual, auditory, or

kinesthetic) based on user preferences and progress, continuously optimizing the platform for diverse learning needs. Lastly, a content management system (CMS) will be developed to enable instructors to upload, manage, and organize educational resources, quizzes, and multimedia content, ensuring ease of use and support for various content formats.This six-component structure follows an incremental development approach, where each module is designed, implemented, and tested independently before integration into the full platform. This modular strategy ensures flexibility and adaptability in addressing challenges during development. The final platform aims to deliver a highly personalized learning experience for students, adapting to their unique progress and preferences, while providing instructors with actionable insights and efficient content management tools. Powered by advanced machine learning algorithms, this platform will create a dynamic, student-centered educational environment.

2:15 pm – 2:30 pm	**Team 14:** The Snowballers
	Project Title: Snowballers
	Faculty Advisor: Harry Keeling
	Team Member(s): Nikolas Buckle, Myles Block,
	Pernell Leamon, Michael J. Johnson Jr., Matthew
	Getachew

Problem Statement: In heavy snowfall areas like Colorado, Maryland, and Vancouver, snow and ice accumulation significantly disrupts daily routines. For individuals with disabilities or mobility limitations like Salina, these disruptions create severe challenges. Approximately 13% of Americans live with mobility disabilities, and navigating snowy conditions poses significant safety risks and limits independence (CDC, 2022). But this inclement weather doesn't just create issues for those with mobility disabilities, clearing driveways and walkways is physically demanding and time-consuming, often leading to delays for the every-day commuters. For example, the January 1996 storm resulted in 1.8 million absences, and the February 2010 storm caused over 1 million absences (Bureau of Labor Statistics, 2017) signifying that major snow storms can cause over a million workers to miss work entirely. The financial burden of outsourcing snow removal services also remains a concern, as many households hire contractors to clear snow from private properties, in conjunction with certain towns not housing the proper resources to even alleviate inclement weather to its more rural citizens. Given these challenges, there is a pressing need for innovative solutions, a more equitable solution. Which is why we believe an in-home robotic system designed to efficiently clear snow and spread salt could be the change: alleviating physical strain, reducing reliance on third-party resources, and offering an environmentally friendly alternative to traditional snow removal methods. With a total accessible market of $17.92 billion, this newfound solution has the potential to improve safety and convenience while promoting accessibility and sustainability in snow-impacted regions.

Project Goal: The SnowBallers robotic snow removal system is designed to autonomously clear snow from driveways and walkways, while also spreading salt to prevent ice buildup. Using a TurtleBot as the base, the robot is equipped with various sensors, including LIDAR and cameras, for obstacle detection and navigation. It can autonomously plan its path, avoiding obstacles like cars and mailboxes, and adapt to varying snow conditions. The system includes features like real-time weather integration, mobile app connectivity, remote control, and voice command support through platforms like Alexa. It also offers accessibility options, such as a senior-friendly interface and automated maintenance alerts. With its efficient design and smart scheduling, SnowBallers provides a reliable, hands-free solution for s now removal that reduces physical strain and reliance on third-party services.

2:30 pm – 2:45 pm	**Team 15:** The DREAM Team
	Project Title: Disaster Relief Coordination Mobile Application:
	Rescue Hub

Faculty Advisor: Harry Keeling
Team Member(s): Jawad Andall, Ivan Ibhawoh, Andria Joseph, Jamul MacNear, Carleton Williams

Problem Statement: In 2010, Haiti was hit with an earthquake that was measured to have had a powerful magnitude of 7.0, devastating much of the country, leaving hundreds of thousands dead, injured, or displaced. Following the disaster, there was an outpouring of international support, with numerous organizations rushing to provide aid. However, the lack of a centralized system to coordinate the efforts of these organizations led to significant delays and inefficiencies in distributing crucial resources like food, water, shelter, and medical aid. During and after any natural disaster, Survivors are often left in dire situations without access to basic necessities like food, water, and medical care due to poor coordination between relief organizations. This leads to delays in aid distribution, miscommunication, and unequal resource allocation, worsening their suffering. Communication lines are down, infrastructure is damaged, and families are separated. If organized aid does not arrive in time, communities can quickly spiral into disorder, worsening an already catastrophic situation.

Project Goal: Our solution is the Disaster Relief Coordination Mobile Application: Rescue Hub, designed to address inefficiencies in disaster response by leveraging mobile technology to streamline emergency efforts. The application focuses on real-time communication and coordination among survivors, first responders, volunteers, and coordinators through features like SOS distress signals with location, supply requests and tracking, emergency family notifications, optimized route planning, volunteer registration and task management, a coordinator dashboard for resource management, and a donation system. The Rescue Hub aims to improve the timeliness and effectiveness of aid delivery by providing a centralized platform for communication, resource allocation, and informed decision-making during and after disasters.

2:45 pm – 3:00 pm	**Team 16:** The Beauty Buddy Team
	Project Title: Beauty Buddy
	Faculty Advisor: Adobe, Inc.
	Team Member(s): Morayo Adeymi, Latanya Khissy Beyniouah, Amari Battle, Ifetayo Spencer, Aayushka Budhathok

Problem Statement: In an era where personal beauty and style play a significant role in self-expression and confidence, individuals often struggle to find tailored skincare and fashion guidance that suits their unique needs. The overwhelming amount of generic advice and products available can lead to wasted time, ineffective skincare routines, and fashion choices that don't align with a person's natural features. This lack of personalized solutions can affect not only skin health but also a person's self-esteem.

Project Goal: Beauty Buddy is a comprehensive beauty and style assistant designed to make skincare and fashion personalization effortless. The application combines a user-friendly interface with AI and facial recognition technology to provide tailored advice to users. Upon logging in, users are guided through a secure onboarding process that ensures their privacy and data security. The app allows users to upload selfies, which are analyzed to identify their unique skin type, condition, and color profile. Users can then receive personalized skin care tips, makeup recommendations, and fashion guidance based on their analysis results. The app supports detailed user profiles where individuals can track their skin health progress and save preferred product

suggestions. This application ensures that users have an intuitive and reliable resource for maintaining healthy skin, refining their style, and boosting their confidence in one platform.

3:00 pm – 3:15 pm	**Team 17:**

Team 17:
Project Title: Safe Travels
Faculty Advisor: Harry Keeling
Team Member(s): Imaan Adam, Uchenna Diana Ekechukwu, Antonia Jaimeson-Shirley, Ivaneisha Lee, Khendra Phillips

Problem Statement: In an increasingly globalized world, minority travelers often face unique challenges, from navigating unfamiliar cultural norms and local biases to finding inclusive accommodations and safe spaces. Traditional travel platforms offer generic information that may not address the specific needs, concerns, and insights of minority communities. Consequently, minority travelers lack a dedicated platform to access and share personalized advice, recommendations, and experiences based on factors like race, gender, sexual orientation, religion, and accessibility. Research highlights a large gap in travel resources tailored to minority travelers' needs, especially regarding safety, comfort, and cultural sensitivity. Black, LGBTQ+, and other minority travelers often prioritize destinations where they feel secure and included, as discrimination is a common concern abroad (Robinson). According to *Allianz Travel Insurance*, Black travelers actively look for destinations that align with racial inclusivity, with a preference for travel providers who openly value diversity. *WHYY* further highlights how Black Americans encounter both benefits and challenges when traveling, from potential exposure to microaggressions to the importance of culturally sensitive destinations (Moselle). A study by the *Black Travel Alliance* reveals that representation and inclusivity remain limited in mainstream travel marketing, making it challenging for minority travelers to find relevant resources. Without dedicated platforms that centralize this information, these travelers often rely on fragmented forums or personal networks to gather insights. Creating a comprehensive, dedicated travel platform that aggregates and personalizes safety and inclusivity data for minority travelers would bridge this gap. Such a resource would empower them with valuable insights, allowing for secure, enriching travel experiences that are culturally affirming and supportive.

Project Goal: Safe Travels is a platform designed to address the unique challenges of minority travelers by providing personalized, community-driven resources for safe and inclusive travel. Users create profiles to specify their preferences such as accessibility, cultural sensitivities, or safety concerns, which feed into a recommendation system. Travelers can upload photos, videos and stories, geotagging their location, while an interactive map - integrated with geospatial APIs- highlights safe neighborhoods, welcoming businesses, and inclusive activities. A built-in rating and review system ensures transparent, reliable feedback, helping users make informed decisions about their travels. To maintain a secure and supportive environment, the app uses two-factor authentication, encrypted data storage, and automated content moderation. Built with a mobile-first design and cloud based scalability, Safe Travels simplifies trip planning and fosters a global community where travelers can confidently explore destinations aligned with their needs and values.

3:15 pm – 3:30 pm	**Team 18:**

Team 18:
Project Title: Mental Health Chatbot
Faculty Advisor: Harry Keeling

Team Member(s): Araj Shah, Aatman BC, Manjil
Rawal, Miles Davis
Problem Statement: Access to mental health professionals is severely limited, leaving millions with unmet needs. According to the WHO, one in four people will experience mental health issues in their lifetime, with depression being the leading cause of disability worldwide, affecting over 264 million people. In the U.S., more than 57 million adults live with mental illness, but nearly 60% do not receive treatment, with barriers like cost, stigma, and geographical limitations playing major roles. The shortage of professionals compounds the issue, with only 30 psychiatrists per 100,000 individuals in the U.S., and fewer than 10 per 100,000 in rural areas. This gap exacerbates conditions like anxiety, depression, and suicidal ideation, with suicide being the second leading cause of death among people aged 10-34 in the U.S. In low- and middle-income countries, the situation is even more dire, where up to 85% of individuals with mental health disorders receive no treatment. Many regions have fewer than one mental health professional per 100,000 people. Globally, untreated mental health issues cost the economy $1 trillion annually in lost productivity and contribute to 14% of the global disease burden. Despite this, mental health receives only 1% of global health funding. Innovative solutions, like telemedicine, show promise, with studies indicating its effectiveness on par with in-person care. Yet, only 42% of U.S. mental health facilities offer telehealth services. Integrating mental health care into primary health systems and increasing investments could yield a $4 return for every $1 spent, improving global well-being and economic productivity. Addressing this crisis is both a moral and economic imperative.

Project Goal: The objective of this project is to create an AI-driven chatbot that can bridge the gap between mental health needs and access to professional care. The chatbot will serve as an accessible first point of contact for individuals experiencing mental health issues, offering conversational interactions, directing users to appropriate resources, and escalating crisis situations to human professionals when necessary. By leveraging artificial intelligence and natural language processing (NLP), the chatbot will provide immediate, empathetic support, helping users navigate their emotions and access relevant resources. Moreover, it will be capable of detecting and escalating critical mental health crises, such as suicidal ideation or severe distress, which require urgent human intervention. This AI chatbot can significantly alleviate the burden on overextended mental health services, providing immediate assistance to users in need while reducing the load on human professionals. By acting as a triage system, the chatbot can prioritize users based on urgency and direct them to appropriate resources or professional care.

3:30 pm – 3:45 pm   **Team 19:** The CareLink Crew
Project Title: CareLink: Connecting Doctors and Patients
Faculty Advisor: Harry Keeling
Team Member(s): Jamiliah Eubanks, Caitlyn Lynch,
Rabia Mamo, and Kristian Morgan

Problem Statement: Access to quality healthcare remains a significant challenge for individuals living in rural and remote communities. These areas often face a shortage of healthcare professionals, medical facilities, and necessary treatments. As a result, residents are 23% more likely to face healthcare access issues compared to their urban counterparts, leading to increased rates of untreated conditions and preventable deaths. Furthermore, the digital divide exacerbates this problem: approximately 39% of rural Americans lack reliable broadband internet, which limits their ability to access telemedicine services that require stable connectivity. The inability to receive timely medical attention often leads to the progression of otherwise manageable conditions, such as chronic diseases, maternal health issues, and mental health disorders. Rural areas have a 40% higher rate of preventable deaths than urban regions, a gap that highlights the need for innovative solutions tailored to these underserved populations.

Delivering effective healthcare in these regions requires a system that not only addresses the scarcity of medical professionals but also operates under the constraints of limited or unreliable internet access. Without such a system, healthcare disparities between rural and urban communities will continue to grow, leaving vulnerable populations without the care they urgently need. This project aims to identify innovative ways to deliver effective and competent care to these underserved populations through the integration of technology, medicine, and a community of doctors ready to serve. We want to help bridge the gap in healthcare accessibility to ensure better health outcomes for those who need it.

Project Goal: Our solution is CareLink - a telemedicine platform designed specifically to address the healthcare challenges faced by rural and remote communities. The platform facilitates real-time video consultations between patients and healthcare providers, enabling timely diagnosis and treatment. Key features of the platform include:

• Real-Time Video Consultations: Patients can engage in live consultations with medical professionals, receiving the necessary guidance, diagnoses, and treatments for various health conditions.

• Prescription Management: The platform includes a built-in system for prescription management, allowing doctors to issue prescriptions that patients can access locally or receive by mail.

• Appointment Scheduling: Patients can easily schedule and manage appointments that fit their needs and availability.

• Simplified Health Tracking: Patients will have one-click access to medical records, medication lists, and recent lab results.

A unique aspect of our platform is its ability to function effectively in areas with constrained internet connectivity. We leverage adaptive streaming technologies that dynamically adjust to available bandwidth, ensuring uninterrupted communication between doctors and patients, even in regions with inconsistent or slow internet. The platform's resilience to network limitations makes it particularly well-suited for rural environments where broadband infrastructure may be lacking. By bridging the gap between patients and medical professionals, this telemedicine platform empowers healthcare providers to deliver accurate, timely, and reliable care. It reduces the risk of untreated conditions and lowers the rate of preventable deaths in underserved areas. The system enables seamless communication and secure data sharing between doctors and patients.

Session 2: LKD 2019
Capstone Design Presentations in Electrical and Computer Engineering

9:15 am – 9:30 am
- **Team 1:** AEMD
- **Project Title:** AEMD (Autonomous Environmental Monitoring Drones)
- **Mentor/Advisor**: Marley Belot
- **Team Member(s):** Masia Wisdom and Richard Coaxum
- **Project Goal:** The project focuses on providing sustainable, safe, and efficient solutions for lunar operations, contributing to a long-term human presence on the Moon. The company's vision includes establishing a foundation for lunar colonization and resource utilization, ultimately supporting future missions to Mars and beyond.
- **Problem Statement:** Lunar surface technologies face significant challenges due to harsh, ever-changing conditions, necessitating reliable environmental monitoring, communication, and long lasting power for autonomous drones assisting astronauts. Our approach leverages space enabled technologies such as LiDAR, high-frequency radio, and optical communication to ensure essential functions like environmental monitoring and continuous data transfer between drones, bases, and Earth. By providing autonomous monitoring and real-time data analysis, our project enhances astronaut safety and improves mission efficiency, enabling more informed and secure lunar exploration.

9:30 am – 9:45 am
- **Team 2:** BisonBots
- **Project Title:** BisonBots
- **Mentor/Advisor:** Harry Keeling
- **Team Member(s):**Jorden Hill, Alexia Dixon, and David Toler
- **Project Goal:** To engineer a product within 8 months that will enhance a consumer's everyday life through innovation. The project will be designed with user-friendly interfaces and efficient use of technologies to ensure a high-quality deliverable.
- **Problem Statement:** Upon entering LKD, a newcomer may feel overwhelmed and lost when it comes to finding classrooms and offices due to the lack of directions and maps in the building. The Bison Bot will have google voice adjacent commands, sensor driven mobility, and an easy to use interface in order to navigate consumers efficiently and quickly. Ultimately resulting in the students being able to find their destination quickly and with confidence

9:45 am – 10:00 am
- **Team 3:** CoPilots
- **Project Title:** CoPilots
- **Mentor/Advisor:** Fadel Lashhab
- **Team Member(s):** Abigail Battick, Boluwatife Osanyinbi, and Loren Otoo
- **Project Goal:** To establish vehicle-to-vehicle communication, where the QBot2 sends its

location coordinates to the QDrone, which follows the leader by determining the appropriate trajectory to take.

- **Problem Statement:** This project in the Autonomous Vehicle Robotics and Control Laboratory focuses on developing a leader-follower system between an autonomous ground robot and an aerial vehicle. The aim is to enhance understanding and practical knowledge of vehicle-to-vehicle communication in autonomous systems. The project utilizes Quanser's QBot, a ground robot, as the leader and the QDrone, an air vehicle, as the follower. As the QBot sends its location coordinates to the QDrone, communication is established and the appropriate trajectory to take is determined.

10:00 am – 10:15 am
- **Team 4:** CtrlB
- **Project Title:** CtrlB
- **Mentor/Advisor:** Charles Kim
- **Team Member(s):** Clarice Yekeh, Trey Wilson, and Ryan Haynes
- **Project Goal:** A portable braking mechanism for non-motor vehicles that has the ability to detect and respond to objects within its projected path.
- **Problem Statement:** Non-motor vehicles have limited visibility and it is difficult to timely locate pedestrians/ objects to prevent collisions. Consumers will have a portable device that assists them in braking when approaching an object with a fast response time. This device when attached to a non-motor vehicles will reduce the likelihood of collisions when experiencing limited visibility.

10:15 am – 10:30 am
- **Team 5:** EMF Detector
- **Project Title:** EMF Detector
- **Mentor/Advisor:** Su Yan
- **Team Member(s):** Chima Nwughala, Lance Hinds, Darnyieh Brewer, and Antonio Jackson
- **Project Goal:** A working EMF sensor device that can detect electromagnetic fields and their strength with a graphing mechanic.
- **Problem Statement:** While RF waves are used in most of our everyday lives, large amounts of RF power can cause radiation which can lead to damaged tissue and overheating. Using an antenna and a microcontroller, the RF detector would be able to pick up all ambient RF waves and detect the power density from the signals. The final product should be capable of detecting RF waves in a surrounding area and alert the user when harmful RF levels are reached.

10:30 am – 10:45 am
- **Team 6:** Drone Sense
- **Project Title:** Drone Obstacle Avoidance System
- **Mentor/Advisor:**
- **Team Member(s):** Jeremy Guy, Jayden Guy, Anna Anaryu, and Angeline Doya
- **Project Goal:** To develop a fully functional drone equipped with an obstacle avoidance system
- **Problem Statement:** Controlling a drone requires quick reflexes, especially if pilots are unfamiliar with the environment. Improper control causes accidents, injury, and property damage. The drone system will enable autonomous obstacle avoidance, allowing the drone to detect obstacles and adjust its speed and trajectory each time it encounters an obstacle.

The system will allow drones to work in more complex environments and improve safety by reducing drone accidents.

10:45 am – 11:00 am
- **Team 7:** Glow Garments
- **Project Title:** Glow Garments
- **Mentor/Advisor:** Charles Kim
- **Team Member(s):** Kayden Graves, Malia Hollins, and Justin Smith
- **Project Goal:** The project aims to design and develop a line of sustainable fashion garments that incorporate LED technology to enhance visibility, safety, and aesthetic appeal.
- **Problem Statement:** The fashion industry faces a pressing need to incorporate light art into costumes and clothing, facilitating explicit expression through message-delivering light patterns while enhancing consumer safety by merging technology with fashion. This approach involves the seamless integration of flexible LED arrays into fabric, maintaining comfort and wearability, alongside a small, rechargeable battery pack that is removable for washing, and a pre-programmed microcontroller for dynamic light displays. The innovation promises to elevate fashion to new creative heights, allow unique consumer self-expression in various projects, and open a new market at the intersection of technology and fashion.

11:00 am – 11:15 am
- **Team 8:** IdealB
- **Project Title:** Injury Prevention Device
- **Mentor/Advisor:** Charles Kim
- **Team Member(s):** Michael Agoha, Brady Souma, and Anuoluwapo Soneye
- **Project Goal:** Development of a portable device to prevent injury in exercise
- **Problem Statement:** People are unaware of their physical limits which cause unforeseen injuries and fatigue. Our approach involves a portable device leveraging physiological signals to identify the exercise inconsistencies of users which can be attributed to their fatigue level and inadvertently lead to injury. Our device enables people to exercise freely, with a reduced risk of overdoing and injuring themselves.

11:05 am – 11:30 am
- **Team 9:** Rescuer
- **Project Title:** Ground target identifying drone
- **Mentor/Advisor:** Danda Rawat
- **Team Member(s):** Keon Augustine, Jaden Samuels, Leule Bantywalu, and Tehya Gaines
- **Project Goal:** Development of a drone which autonomously identify tagged ground target
- **Problem Statement:** Many pet owners struggle to find lost pets, which can cause prolonged searches and distress. A scouting drone with an integrated camera equipped with image processing and recognition capabilities could help efficiently locate missing animals, because the drone would scan a wide area over a short amount of time, identifying animals based on their size, color, and other distinct features. Integrating this technology would reduce the time and effort that would be required for physical searches, provide faster reunions, and alleviate the emotional and financial burden associated with lost pets.

11:30 am – 11:45 am
- **Team 10:** Smart Sensor

- **Project Title:** Signal Sensing and Classification
- **Mentor/Advisor:** Eric Seabron
- **Team Member(s):** Timothy Ford, Lamont Syrreal Watson, and Derrick Boston
- **Project Goal:** Develop a system that applies machine learning techniques to detect and classify signals and implement it using Intel NUC hardware
- **Problem Statement:**   Existing RF signal classification systems are too large, power hungry, and unsuitable for real time, portable applications due to reliance on GPUs and bulky hardware. We are designing a compact power efficient RF signal classification system using Intel NUC and FPGA integration, optimized with OpenVINO and a CNN model for efficient classification. This solution will enable real time high accuracy RF signal classification, meeting SWAP constraints and opening new opportunities for scalable and adaptable signal detection applications.

11:45 am – 12:00pm   **Project Demonstration**