THE TECHNOCRACY
STUDENTS' TECHNICAL COMMITTEE, NIT RAIPUR

AAVARTAN 24-25

VIGYAAN
DEPARTMENT OF MCA, CSE, IT

PROBLEM STATEMENTS

MCSIT 01. Real-time Enemy Detection and Localization.

Navigating the chaos of a modern battlefield is a constant struggle. Traditional methods like radar and visual scouting are often limited, leaving soldiers vulnerable to hidden threats. The ability to accurately and instantly identify enemy locations and distances in real-time would be a game changer, offering a critical tactical advantage.

Current Limitations:

- Limited Visibility: Traditional methods like radar and human observation have blind spots and limitations in complex environments.
- Slow Processing: Manual analysis of visual data is time-consuming and prone to human error, especially in high-pressure situations.
- Inaccurate Localization: Traditional methods may struggle to pinpoint the exact location and distance of enemy positions.

Proposed Solution:

We challenge you to develop a deep learning-powered system that can analyze battlefield images (drone footage, camera feeds, etc.) in real time and provide the following critical information:

- Enemy Detection: Identify and classify enemy objects such as soldiers, vehicles, and weapons with high accuracy.

● Real-time Location: Pinpoint the exact coordinates of identified enemies on a digital map or display.

● Distance Estimation: Provide the real-time distance between the user and each identified enemy.

Real-World Impact:

- Enhanced Situational Awareness: Soldiers equipped with this system would have a clear picture of the battlefield, allowing them to make informed tactical decisions and avoid unnecessary risks.

- Improved Combat Efficiency: Faster enemy detection and localization would lead to quicker response times, minimizing casualties and maximizing mission success.
- Reduced Collateral Damage: Precise enemy location and distance information would help prevent accidental harm to civilians and friendly forces.

Expectations:

Create a real-time enemy detection and localization system involving the development of a sophisticated model that can analyze various data sources to provide accurate and timely information.

MCSIT 02. Deep Image to 3D Reconstruction

The world around us is three-dimensional, yet most of our digital content exists as flat images. Reconstructing 3D models from single images has numerous applications in fields like robotics, virtual reality, and cultural preservation. However, creating accurate 3D models traditionally requires specialized equipment or multi-view images.

Current Limitations:

- Limited Data: Traditional methods often require multiple images from different viewpoints, which can be cumbersome or even impossible to capture in certain situations.
- Computational Complexity: Existing single-image 3D reconstruction techniques can be computationally expensive and lack accuracy, especially for complex objects or scenes.
- Limited Detail: Reconstructed models may not capture fine details or textures present in the original image.

Proposed Solution:

Develop a Deep Convolutional Neural Network (CNN) that can generate high-fidelity 3D models from a single input image. The ideal solution should address the limitations above by:

- Leveraging Deep Learning: Utilizing CNNs trained on large datasets of images and corresponding 3D models to learn the complex relationships between 2D and 3D representations.

• Accurate Reconstruction: Generating 3D models that accurately reflect the shape, pose, and texture of objects depicted in the input image.

• Efficiency: Reconstructing 3D models in real-time or near real-time for practical applications.

Real-World Impact:

• Revolutionizing Content Creation: Enabling rapid and efficient creation of 3D models from existing image libraries, fostering innovation in fields like VR/AR and 3D printing.

• Enhanced Robotics and Automation: Providing robots with a deeper understanding of their environment for improved object manipulation and navigation tasks.

• Cultural Preservation: Facilitating the creation of 3D models of historical artefacts and landmarks for virtual exploration and education.

Expectations:

Build a system that turns a single image into a 3D model (point cloud or mesh) using a CNN. The model should be accurate, detailed, and efficient for real-time use.

MCSIT 03. Developing an AI-based solution to transform images and textual descriptions of national heritage sites into a fully interactive VR experience.

● History at Your Fingertips: National heritage sites whisper tales of our ancestors, but static images and videos leave you longing for a deeper connection. You want to touch the weathered stones, explore hidden corners, and unravel the mysteries within.
● Limited Engagement: Traditional media presents history as a spectator sport, leaving you as a passive observer. You crave interactivity, the ability to shape your journey and forge a personal connection with the past.

Current Limitations:

- Technological Constraints: Current VR technology may have limitations in rendering realistic and detailed environments, which are crucial for creating an immersive experience of national heritage sites.
- User Interaction Design: Designing intuitive and engaging user interactions within the VR environment can be challenging. Ensuring that users can explore the heritage site in a meaningful and interactive way without feeling overwhelmed or lost requires careful consideration.
- Accessibility Concerns: VR experiences may exclude individuals with certain disabilities or those who do not have access to VR equipment. Ensuring accessibility for a diverse audience is a challenge that needs to be addressed.
- Bandwidth and Loading Times: Streaming high-quality VR content, especially for detailed heritage sites, may require significant bandwidth. Slow loading times or interruptions in the VR experience can diminish user satisfaction.

Proposed Solution:

- We challenge you to develop a cutting-edge pipeline that transforms images and textual descriptions of national heritage sites into fully interactive VR experiences.
- Imagine stepping into a meticulously reconstructed virtual world, where you can touch ancient artefacts, manipulate objects, decipher hidden symbols, and even solve historical puzzles.

Real-World Impact:

- Revolutionize Education: Replace textbooks with immersive journeys, where students don't just learn about history, they live it.
- Democratize Access: Make cultural treasures accessible to everyone, regardless of physical limitations or geographic barriers.
- Spark Curiosity and Engagement: Ignite a passion for history in diverse audiences, from children to seniors.
- Boost Tourism: Create virtual tours so compelling that they inspire real-world visits and support local economies.

Expectations:

Design an intuitive and immersive user interface for VR interaction, allowing users to navigate, explore, and interact with the heritage sites naturally and engagingly. Incorporate machine learning algorithms to personalize the VR experience based on user preferences, history, and interactions.

By addressing these key aspects, your AI-based VR experience can successfully transform static images and textual descriptions into an interactive journey through national heritage sites, providing users with a rich and immersive historical exploration.

MCSIT 04. AI-powered Anomaly Detection System for Secure Police Stations.

Police stations are hubs of vital activity, serving as gateways to justice and safety. Yet, within these bustling environments, potential threats can lurk unseen, jeopardizing officer and public safety. Traditional security measures often struggle to adapt to the dynamic nature of police stations, leaving blind spots and vulnerabilities.

Current Limitations:

- Reactive Security: Existing surveillance systems primarily focus on recording past events, limiting their ability to prevent threats in real time.
- Overwhelming Data: The deluge of video footage can be overwhelming for human analysis, leading to missed anomalies and delayed responses.
- False Positives: Traditional methods often trigger false alarms on harmless activities, wasting valuable resources and creating unnecessary alarms.

Proposed Solution:

- We challenge you to develop a cutting-edge computer vision model capable of proactively detecting anomalies in real-time within police stations.
- Imagine a system that analyzes security footage continuously, identifying suspicious behaviour, unattended objects, and potential safety hazards before they escalate.

Real-World Impact:

- Enhanced Officer Safety: Proactive anomaly detection empowers officers to anticipate and neutralize threats before they harm individuals or disrupt operations.
- Improved Public Security: Enhanced monitoring protects not only police personnel but also visitors and the wider community from potential threats.
- Reduced False Alarms: By accurately identifying real anomalies, the system minimizes distractions and allows officers to focus on genuine emergencies.
- Optimized Resource Allocation: Real-time threat detection enables efficient deployment of resources to address critical situations immediately.

Expectations:
Gather diverse and comprehensive data sources, including video surveillance footage, access logs, personnel movements, and other relevant data within the police station environment. Integrate data from various sensors and security systems to provide a holistic view of the station's activities. Implement effective preprocessing techniques to handle the overwhelming amount of video data, ensuring it is ready for model training. Develop a state-of-the-art computer vision model capable of proactively detecting anomalies in real time.

MCSIT 05. Empowering Young Minds - by creating A gaming platform for Children with Cognitive Disabilities.

Millions of children face the daily battles of developmental disabilities, where everyday cognitive functions like attention, memory, and reasoning become daunting challenges. Traditional therapy, while crucial, often relies on manual exercises and lacks engaging experiences, leading to low adherence and hindering progress.

Current Limitations:

- Therapists struggle to bridge the gap between in-clinic sessions and home-based training. Lack of real-time progress monitoring leaves them blind to potential setbacks and hinders their ability to tailor support for individual needs.
- Specialized techniques like EEG Neuro-Feedback, which offer invaluable insights into brain activity during cognitive tasks, remain locked away for many families due to high costs and limited availability.
- Proposed Solution: We challenge you to build a game-changing platform that empowers children on their cognitive journey:

- Engaging Adventures: Transform mundane exercises into thrilling quests, tailored to individual interests and strengths. Gamified home training activities keep children motivated and engaged, paving the way for consistent practice and long-term progress.

- Real-Time Insights: Integrate EEG Neuro-Feedback to unlock a window into the brain. Monitor progress in real-time, both during home training and in-clinic sessions, providing valuable feedback for therapists to personalize interventions and celebrate victories.
- Accessible Ally: Shatter the cost and availability barriers. Make this powerful platform accessible to all families, ensuring every child has the tools they need to unlock their full potential.

Expectations:

Design engaging adventures and activities that are gamified to capture the interest of children.
Implement user experience design principles to create an intuitive and enjoyable interface for children with cognitive disabilities. Implement real-time monitoring capabilities using EEG Neuro-Feedback technology.
Develop algorithms to analyze brain activity and provide immediate feedback during gaming sessions.
Enable therapists and parents to access progress reports and insights in real time.

MCSIT 06. Build an IOT system for predictive irrigation of the farm.

Across our planet's vibrant tapestry, landscapes crack with the strain of water scarcity. Traditional irrigation methods, like blindfolded gardeners in a rainstorm, offer little precision, leaving precious resources wasted and crops yearning for life. In the face of growing populations and shifting climates, sustainable agriculture demands a new strategy – one with foresight and finesse.

Current Limitations:

- Blind Watering: Rigid schedules ignore real-time conditions, overwatering some sections and leaving others parched, fostering both waste and stressed crops.
- Weather Blindness: Traditional systems miss the dynamic dance of sun, wind, and rain, failing to adjust watering based on forecasts and optimize resource use.
- Data Deluge, Analysis Drought: Farmers navigate a deluge of data from soil sensors and weather reports, often lacking the tools to translate it into actionable insights for efficient irrigation.

Proposed Solution:

- We challenge you to unleash the power of smart sensors, AI, and long-term weather forecasting to craft the next generation of irrigation systems. Imagine prescient water warriors guarding thirsty fields, not just analyzing real-time data, but also peering into the future, anticipating water needs based on crop types, soil characteristics, and weather patterns.

Real-World Impact:

- Hydration with Precision: AI-powered irrigation delivers the right amount of water to each plant, maximizing yield while minimizing waste, painting a vibrant future for parched lands.
- Weather Whispers: By anticipating droughts and storms, your systems optimize water management, ensuring resilience against weather uncertainties and protecting precious crops.
- Data-Driven Decisions: Transform raw data into actionable insights, empowering farmers with the knowledge to make informed irrigation decisions, optimize resource allocation, and boost their productivity.
- Sustainable Stewardship: Reduce water footprint, minimize environmental impact, and pave the way for a future where agriculture thrives in harmony with our planet's precious resources.

Expectations:

Develop and integrate smart soil sensors to measure moisture levels, nutrient content, and other relevant soil parameters. Include weather sensors for real-time monitoring of environmental conditions such as temperature, humidity, wind speed, and precipitation. Design and implement machine learning algorithms capable of analyzing historical and real-time data to predict future irrigation needs.

MCSIT 07. Ai-powered system for tracking illegal activities in the wild.

Our planet's vibrant tapestry, woven with breathtaking ecosystems and diverse life forms, faces the relentless unravelling of illegal activities. Poachers stalk endangered creatures, loggers carve scars across pristine forests, and traffickers exploit precious resources, leaving a trail of devastation in their wake. Traditional conservation methods often struggle to keep pace, leaving nature's treasures vulnerable and precious lives hanging in the balance.

Current Limitations:

- Reactive Response, Preventable Tragedy: Traditional methods rely on detecting damage after it has occurred, offering little room for preemptive action to stop illegal activities before they inflict lasting harm.
- Data Deluge, Analysis Dilemma: The sheer volume of imagery data from satellites, drones, and camera traps overwhelms human analysts, leading to missed critical insights and delayed interventions.

Real-World Impact:

- Proactive Guardianship: By analyzing live camera feeds, your AI models can become the first line of defence, instantly identifying suspicious activity and triggering rapid response mechanisms before harm occurs.
- Precise Intelligence: Pinpoint the exact location of illegal activities within the camera's field of view, guiding rangers and authorities to take swift and targeted action.
- Real-Time Insights: Monitor changes in animal populations, habitat health, and human activity patterns continuously, providing invaluable data for adaptive conservation strategies and policy decisions.

- Scalable Protection: Develop a system that can be replicated and deployed across diverse environments, creating a global network of AI-powered sentinels protecting Eden from every angle.

Expectations:

- We challenge you to unleash the power of cutting-edge computer vision, not only through satellite imagery or camera traps but directly from live camera feeds, transforming them into intelligent eyes that monitor the health of our planet in real-time.
- You will be provided access to various live camera feeds capturing diverse environments, from lush rainforests and bustling wildlife corridors to remote logging sites and hidden trafficking routes. Your task is to develop AI models that can analyze these live streams in real-time to detect illegal activities and monitor the well-being of our precious ecosystems.

MCSIT 08. Adaptive and Active Play Through AI-powered Body Movement Games.

Childhood should be a symphony of giggles, leaps, and boundless imagination. Yet, screens often act as siren calls, luring kids into a sedentary world where real-world adventures fade into the background. Traditional active play games, while valuable, lack the personalized touch that keeps children engaged and challenged over time.

Current Limitations:

- One-Size-Fits-All Play: Conventional active games often offer limited difficulty levels, failing to cater to the diverse needs and abilities of children at different stages of development.
- Stagnant Challenges: Repetitive gameplay can quickly become predictable and uninspiring, dampening children's enthusiasm and limiting their learning potential.
- Frustration and Abandonment: Difficulty imbalances can lead to frustration and discouragement, causing children to abandon games altogether, missing out on the joys of active play.

Proposed Solution:

- We challenge you to create groundbreaking AI-powered active play games that adapt to each child like a magic mirror, personalizing difficulty, challenges, and rewards based on their unique age, abilities, and progress.
- Imagine a world where kids dance, dodge, and dive through dynamic adventures, where AI becomes their invisible playmate, adjusting the game's rhythm to perfectly match their growing skills and confidence.

Real-World Impact:

- Sustained Engagement: Dynamic gameplay that evolves with the child keeps them motivated and eager to tackle new challenges, fostering a lifelong love for physical activity.
- Growth Mindset in Motion: Personalized difficulty empowers children to experience the joy of overcoming obstacles and building resilience, nurturing a growth mindset for life.

● Inclusive Fun for All: Adaptive games ensure accessibility for children of varying abilities, promoting inclusivity and shared joyful experiences in the world of active play.

● Learning Through Playful Exploration: Dynamic challenges that cater to individual needs encourage problem-solving, critical thinking, and spatial awareness, turning play into a powerful learning tool.

Expectations:

Developing AI-powered active play games that adapt to each child requires a multidisciplinary approach and attention to various aspects. The expectations from the team for model-making in this context involve creativity, technical expertise, and a focus on creating a positive and personalized experience for children**.**

MCSIT 09. Real-Time, Resource-Efficient Speech-to-Speech Translation for a Global Stage.

Our world is a vibrant tapestry of languages and cultures, yet communication across these borders often stumbles at the hurdle of translation. Traditional methods like written text or human interpreters lag behind the rhythm of conversation, leaving us lost in translation and yearning for true connection.

Current Limitations:

- Slow and Cumbersome: Written translations and interpreters, while valuable, can be slow and inaccessible to those with visual impairments or literacy challenges.
- Connectivity Deprived: Dependence on internet connectivity restricts translation to urban areas, leaving those in remote regions without a voice.
- Heavy Footprints: Existing speech-to-speech systems often require substantial computing power and resources, limiting their reach and accessibility.

Proposed Solution:

- We challenge you to create a revolutionary speech-to-speech translation system that empowers real-time conversations across languages, even in the absence of the Internet, and operates with remarkable resource efficiency.
- Imagine a world where you can seamlessly converse with anyone, regardless of their native tongue, across borders, in remote villages, and amidst bustling markets, all powered by an AI whisperer that bridges the language gap without draining resources.

Real-World Impact:

- Global Village, Connected Voices: Break down language barriers for businesses, fostering international collaborations and expanding markets, even in underserved regions.
- Inclusive Education for All: Enable knowledge sharing and cross-cultural learning for students and educators worldwide, irrespective of their spoken language, even in areas with limited infrastructure.
- Empowered Travelers: Empower travellers to connect with local communities, embrace cultural nuances, and forge unforgettable memories in every corner of the globe, whether online or offline.

- Bridging Divides for Peace: Connect different communities, fostering empathy, understanding, and collaborative solutions to conflicts, even in remote areas with limited resources.

Expectations:

Develop a real-time, resource-efficient speech-to-speech translation system for a global stage. The model must involve a combination of technological innovation, efficiency, and a commitment to inclusivity. Develop speech-to-speech translation models with a high level of accuracy to ensure effective communication between speakers of different languages. Minimize translation latency to make conversations flow naturally and in real-time.

MCSIT 10. Future of Drones- Gesture Control Drones.

Trapped in the confines of joysticks and screens, drone control today feels robotic and detached. We imagine soaring through the skies, commanding our drone as an extension of ourselves, but current methods limit us to clunky interfaces and brittle connections.

Current Limitations:

- Joypad Tango: Traditional remote controls restrict movement to joystick commands, hindering our natural ability to interact with the world in 3D space.
- Electromagnetic Walls: Interference and limited range constrain drone operation, leaving vast areas and environments inaccessible.
- Screen Dependency: Staring at screens to control drones severs the physical connection and diminishes the immersive experience.

Proposed Solution:

- We challenge you to revolutionize drone control by developing a gesture-based system that allows you to command your drone with the intuitive power of your movements.
- Imagine waving your hand to take off and to land, tilting your head to adjust direction, all without the need for clunky controllers or restrictive screen time.
- The solution should have a high response time.

Real-World Impact:

- Intuitive Flight: Experience unprecedented freedom and control, commanding your drone with the same naturalness as you move your own body.
- Unleashing Drones' Potential: Access previously inaccessible environments, conduct rescue operations in tight spaces, and capture breathtaking aerial footage with pinpoint accuracy.
- Enhanced Safety: Gestural control minimizes reliance on radio frequencies, reducing signal interference and potentially increasing safety in complex environments.
- Revolutionizing Industries: Transform fields like search and rescue, disaster relief, construction, and filmmaking with a more intuitive and immersive drone experience.

Expectations:

Developing a gesture-based system for controlling drones requires a combination of cutting-edge technology, responsiveness, and user-friendly design. Develop highly accurate gesture recognition models capable of interpreting a wide range of gestures with precision. Implement algorithms that respond quickly to user gestures, creating a seamless and immersive control experience.

MCSIT 11. Secure AI developing an AI solution to find threads in the network.

The Evolving Shadows: Our world runs on the invisible currents of digital infrastructure, powering vital systems from healthcare to finance. But in the shadows, agile adversaries weave ever-shifting attack patterns, exploiting unknown vulnerabilities and leaving a trail of disruption in their wake. Traditional security methods, armed with static defences, stand vulnerable to the chameleon-like agility of these threats.

Current Limitations:

- Static Defenses: Reliance on known Indicators of Compromise (IoCs) leaves blind spots for novel attacks and zero-day threats, allowing breaches to escalate before static defences can even blink.
- Fragmented Visibility: Disparate security tools across diverse devices (systems, firewalls, routers, networks) create siloed insights, hindering the ability to detect coordinated attacks across the interconnected landscape.
- Reactive Response: Overburdened security teams struggle to sift through a deluge of alerts, often reacting to breaches only after damage has been inflicted.

Proposed Solution:

- We challenge you to develop AI-powered sentinels capable of continuous threat hunting, evolving alongside the adversary. Imagine agile guardians of the grid who proactively scan for novel attack patterns and emerging threats, not just known vulnerabilities. These digital hunters will analyze system behaviour, network traffic, and resource utilization in real-time, sniffing out even the faintest traces of malicious activity before it can evolve into a full-blown attack.

Real-World Impact:

- Preemptive Protection: Identify breaches in their nascent stages, preventing damage and safeguarding critical operations from the silent hand of cybercrime.
- Holistic Visibility: Gain a unified view of your infrastructure security posture, breaking down silos and empowering proactive defence strategies across all connected devices.
- Reduced Response Time: Eliminate the wait-and-see game! By anticipating threats through continuous hunting, security teams can respond with lightning speed and precision, minimizing potential fallout.
- Adaptive Resilience: AI models continuously learn and evolve, staying ahead of the curve and neutralizing even the most innovative and ever-changing attack patterns.

Expectations:

Develop algorithms that can adapt and evolve in real time based on new threat intelligence and changing attack patterns. Demonstrate expertise in machine learning to develop models capable of detecting novel attack patterns and zero-day threats. Implement mechanisms for continuous monitoring of system behaviour, network traffic, and resource utilization. Develop mechanisms to fine-tune the AI models to minimize false positives and improve the accuracy of threat detection.

MCSIT 12. Blockchain Technology for KYC : The solution to inefficient KYC process.

The current Know Your Customer (KYC) landscape is a tedious labyrinth of paperwork, redundant checks, and siloed data. For individuals, it means enduring slow onboarding, frustrating duplication of efforts, and limited financial inclusion. For financial institutions, it translates to high costs, operational inefficiencies, and increased vulnerability to fraud and money laundering.

Current Limitations:

- Repetitive Paperwork: Individuals repeat the KYC process for every financial institution, drowning in paperwork and facing lengthy delays.
- Data Silos and Fragmented Trust: Disconnected data silos limit information sharing and collaboration, hindering regulatory compliance and hindering effective fraud detection.
- High Costs and Operational Inefficiencies: Manual verification processes and redundant document checks drain resources and impede operational efficiency for financial institutions.
- Limited Accessibility and Exclusion: Ineffective KYC processes contribute to financial exclusion, leaving individuals and businesses without access to essential financial services.

Proposed Solution:

- We challenge you to develop innovative solutions leveraging blockchain technology to revolutionize the KYC process, enhancing trust, efficiency, and accessibility for individuals and financial institutions alike.
- Imagine a world where your identity is securely stored on a secure, tamper-proof distributed ledger, granting you instant access to financial services with simplified, one-time KYC verification. Think seamless onboarding, seamless data sharing, and real-time fraud detection, all powered by the invisible hand of blockchain.

Real-World Impact:

- Empowering Individuals: Reduce friction and paperwork for individuals, promoting financial inclusion and access to essential services.

- Streamlining KYC for Institutions: Achieve operational efficiency with automated verification, data sharing, and regulatory compliance.
- Enhanced Security and Trust: Build a more secure and transparent financial ecosystem with tamper-proof data storage and real-time fraud detection.
- Unlocking Innovation: Foster the development of new financial products and services by removing KYC barriers to entry.

Expectations:

Implement a secure and decentralized identity management system on the blockchain to protect user data from unauthorized access. Demonstrate expertise in blockchain technology, selecting an appropriate consensus mechanism and ensuring the security and immutability of the distributed ledger. Develop smart contracts for managing KYC processes, ensuring automation and transparency. Ensure seamless integration with existing financial institution systems, allowing for interoperability and a smooth transition to blockchain-based KYC.

MCSIT 13: Smart Parking with Real-Time Detection and Reservation

Finding a parking spot in a crowded city can be a frustrating and time-consuming experience. Traditional parking management systems often lack real-time data on available spots, leading to wasted time and increased traffic congestion.

Current Limitations:

- Limited Information: Drivers rely on outdated signage or circling parking lots to find available spaces, leading to wasted fuel and frustration.
- Inefficient Management: Manual parking lot monitoring is labour-intensive and prone to errors.
- Lack of Reservation: Drivers cannot reserve parking spots in advance, leading to unnecessary competition for limited space.

Proposed Solution:

Design an innovative IoT (Internet of Things) system for real-time parking availability detection and reservation. Here are some potential approaches:

- Leveraging Existing Infrastructure: Utilize sensors embedded in existing streetlights or dedicated parking sensors to detect vehicle presence in each parking space.
- Real-time Data Collection: Develop a network of low-power, long-range communication protocols (e.g., LoRaWAN) to transmit parking availability data to a central server in real-time.
- Smart Reservation System: Design a mobile app or web interface that allows drivers to locate available parking spaces, reserve spots in advance, and potentially pay for parking fees.

Real-World Impact:

- Reduced Traffic Congestion: Drivers can locate available parking quickly, minimizing time spent circling and improving traffic flow.
- Enhanced User Experience: Drivers can plan their trips more efficiently and avoid the stress of searching for parking.
- Improved Parking Management: Real-time data can help parking authorities optimize lot utilization and enforce regulations effectively.
- Potential Revenue Stream: Parking reservations can be integrated with payment systems for a potential revenue source.

Expectations:

Build a smart parking system with sensors for real-time availability, a user app for finding and reserving spots, and a central server to manage data. Showcase it in a simulated environment or real-world test.

MCSIT 14: Automated Electrolyte Bottle Level Monitoring with IoT

In hospitals, timely monitoring of fluid and electrolyte levels is crucial for patient recovery. However, busy schedules can lead to missed or delayed checks of electrolyte bottles, potentially leading to complications.

Current Limitations:

- Manual Monitoring: Nurses rely on visual inspection to determine electrolyte bottle levels, which can be time-consuming and prone to human error.
- Delayed Alerts: By the time a low level is noticed, the bottle may be nearly empty, potentially causing a delay in replacing it.
- Lack of Automation: Existing systems often lack automated alerts, requiring constant vigilance from nurses.

Proposed Solution:

Design an IoT-based system for automatic monitoring and alerting of electrolyte bottle levels. Here are some key aspects:

- Smart Sensor Integration: Utilize sensors like ultrasonic sensors or weight sensors to detect the remaining electrolyte solution in the bottle.
- Real-time Monitoring: Develop a system that continuously monitors the sensor data and transmits it to a central hub in real time.

- Automated Alerts: Trigger alerts (e.g., visual display, mobile app notification) when the electrolyte level falls below a predefined threshold, indicating the specific patient's room number.
- Data Visualization: Design a user interface (web dashboard or mobile app) that displays real-time data on electrolyte bottle levels for each patient.

Real-World Impact:

- Improved Patient Care: Automated monitoring ensures timely replacement of electrolyte bottles, minimizing the risk of complications.
- Enhanced Nurse Efficiency: Automating alerts frees up nurses' time for other critical patient care tasks.
- Reduced Costs: Early detection of low levels prevents potential complications, leading to reduced healthcare costs.
- Data-driven Decision Making: Real-time data on electrolyte usage can inform patient care protocols and resource allocation.

Expectations:

The expectation is to design, build, and explain an IoT system that monitors electrolyte bottle levels in real time. The system should send data wirelessly, trigger alerts, and display information. Data visualization for monitoring and analysis is also required.

MCSIT 15: "See the World" - Wearable Assistant for the Blind with Real-Time Object Recognition

Navigating the world can be a challenge for blind individuals. While assistive technologies exist, many lack real-time environmental understanding.

Current Limitations:

- Limited Situational Awareness: Current solutions often rely on pre-recorded information or require physical contact, hindering real-time understanding of surroundings.
- Inaccessibility of Visual Information: People with blindness are unable to access visual cues about their environment, limiting their independence.
- Lack of Multifunctionality: Existing solutions may focus on specific tasks, not offering a comprehensive suite of assistive features.

Proposed Solution:

We challenge you to design a wearable assistant for blind people that leverages computer vision for real-time object detection and tracking. Here's the vision:

- Smart Glasses with Computer Vision: Develop a comfortable and stylish pair of smart glasses equipped with a camera and computer vision processing unit.
- Real-time Object Recognition: Utilize AI algorithms to identify objects in the user's environment in real-time, providing audio descriptions through voice assistance.
- Object Tracking: Track the movement and location of identified objects, allowing for continuous spatial awareness.
- Person Identification: Integrate facial recognition features to identify familiar people on command, fostering social interaction.
- Additional Features: Explore integrating other functionalities based on user needs, like currency recognition, obstacle detection, and colour description.

Real-World Impact:

- Enhanced Independence: Real-time object recognition empowers blind people to navigate more confidently and explore their surroundings independently.
- Increased Social Interaction: Object and person identification facilitates social engagement and builds confidence in unfamiliar environments.
- Improved Quality of Life: The wearable assistant fosters a greater sense of connection to the world, promoting inclusion and overall well-being.

Expectations:

Develop a wearable assistant prototype with smart glasses and computer vision. Implement real-time object detection, tracking, and optional person identification. Integrate voice assistant for audio descriptions and interaction. Include additional user-focused features. Present a working prototype showcasing core functionalities and potential impact.