ESP2LIFE HACKATHON

PROBLEM STATEMENTS

S. NO	THEME	PROBLEM STATEMENT
1	**Energy Automation**	**Smart Water Usage Monitor** In households and industrial settings, water wastage is a common issue. Develop a Smart Water Usage Monitor to track water consumption in real-time. The system should detect leaks, check usage patterns, and send alerts when abnormal consumption is detected. This will help in conserving water and reducing water bills.
2	**Vehicle Automation**	**Intelligent Parking Assistant** Finding parking spaces in crowded urban areas can be frustrating. Develop an Intelligent Parking Assistant that uses sensors to detect available parking spots and guides drivers to the nearest available spot via a mobile app. The system can also monitor parking duration and notify users when their time is about to expire.
3	**Home Automation**	**Smart Medication Dispenser** Many people, especially the elderly, struggle to manage their medication schedules. Develop a Smart Medication Dispenser that organizes and dispenses medication at scheduled times. The system can send reminders and alerts to users and caregivers, ensuring timely medication intake.
4	**Security Automation**	**Child Safety Lock System** Develop a system to prevent children from exiting unsupervised. The system should detect proximity to exits, triggering locking of doors if a child attempts to leave. Additionally, it sends SMS notifications to guardians, alerting them of any exit attempts. This system ensures children's safety by providing real-time alerts and automatic door locking, offering peace of mind to parents and caregivers.
5	**Security Automation**	**Pet Monitoring system** Develop a pet collar system to detect location, movements and notify users about the pet.

6	**Industrial Automation**	**Automated Vending Machine System** The primary issues with current vending machine operations include stock management, where manual restocking and inventory management are time-consuming and error-prone, leading to situations where machines either run out of popular items or are overstocked with less popular ones; and dispensing errors, where failures in the dispensing mechanism can result in products not being delivered to the customer even after payment, causing customer dissatisfaction and potential revenue. The suggested solution is to create an improved vending machine monitoring and management system that incorporates sensors and Wi-Fi networking using ESP32 to automate stock level monitoring and ensure effective product distribution. This system would include real-time inventory tracking to ensure prompt refilling and appropriate inventory levels, as well as a dispensing verification mechanism to certify successful transactions and notify operators of any dispensing mistakes.
7	**Energy Automation**	**Solar Panel Tracking System** Develop a system to maximize energy capture efficiency by tracking the sun's position.
8	**Health and sports Automation**	**Smart Cycling System** Existing cycling activities lack an integrated system that combines fitness monitoring and security features, forcing cyclists to rely on numerous devices and applications to monitor their activities and safeguard their bikes. This fragmentation might be cumbersome and ineffective in offering a smooth and secure cycling experience. Furthermore, while fitness trackers and bike security systems exist, they often do not interact with one another, resulting in gaps in functionality and user experiences. The proposed approach is to create a Smart Cycling System to check cycling activity and improve security.

9	**Security Automation**	**Robust Pass lock System** The fundamental concerns with current pass lock systems are them reliance on traditional keypads or biometric inputs, which are vulnerable to wear and tear, hacking, and climatic conditions, reducing their dependability and security. Traditional keypads can set up clear patterns over time, making it simpler for unauthorized users to guess passcodes, while biometric systems can be jeopardized by dirt, dampness, or technological failure. Thus, the need to create a Robust Pass lock System using a joystick and passcode system, combining joysticks, servos, and GSM modules with an ESP32 microprocessor. This system uses a joystick's unique input technique to improve security since it allows for a more complicated and unpredictable means of inputting passcodes than regular keypads do. GSM modules provide remote notifications and alarms, which improve usability by notifying users of unauthorized access attempts or lock status in real time. This joystick-based pass lock system is very original owing to its unusual input method, paired with improved security and ease of use, making it a high-utility, stand-alone project.
10	**Security Automation**	**Fall Detection and Alert System** Develop a system to detect falls and notify emergency contacts.
11	**Health and Sports Automation**	**Hand Rehabilitation Device** Develop a wearable device for hand rehabilitation using gyro and load sensors. Develop a wearable device that should accurately track hand movements and exertion levels, providing real-time data to healthcare providers for personalized therapy monitoring.
12	**Security Automation**	**Traffic/Crowd Management** Develop a smart traffic management system with a real-time console for hotel room availability, other facilities, and total people present at Complex. Implement RFID/QR code scanners for real-time checks. Extend the system to include parking space tracking, traffic jam monitoring, and AI alerts for crowding, integrating with Google Maps. Implement RFID-tagged barriers for monitoring traffic, cars, and people. Integrate all data into a centralized district-level database. Create a smart signal. controller for congestion reduction and emergency vehicle route assessment.

13	**Security Automation**	**Narcotic Detectors** Develop handheld contraband tracing devices using microcontrollers to detect and quantify contraband articles. Ensure the device can connect its scanning data to a computer, network, or server link determined quantities to a centralized server (PHQ level) to prevent pilferage. Ensure the device can connect data with a centralized police network, with high sensitivity for narcotics detection.
14	**Vehicle Automation**	**Road Safety** Develop smart pillars or sensors using radio waves to measure vehicle speed and generate data for automatic traffic violation challans. Develop at least four such pillars for extension. Create a vehicle honk system where sensors/pillars alert drivers about approaching vehicles at blind curves or U-turns, reducing accident risks.
15	**Health and sports automation**	**Senior Care IoT Solution** Develop an IoT solution using sensors, wearables, and smart devices to improve the lives of seniors living alone. Focus areas include safety and fall detection, medication management, remote monitoring, and social engagement.
16	**Health and sports automation**	**IoT-Based Navigation System for Visually Impaired** Develop an IoT-driven system offering real-time navigation guidance for visually impaired individuals. Incorporate IoT sensors for environment mapping, adaptive route optimization algorithms, and haptic/auditory feedback for intuitive usability.

17	**Security Automation**	**Smart door lock using facial recognition** To create a door lock that can unlock using facial recognition and send notification on detection of intruders.
18	**Health and Sports Automation**	**Real-Time Orthotic Device Efficiency Measurement** Construct an IoT-enabled solution to record movements of orthotic and normal legs based on metrics like pressure, velocity, and orientation. Store or send data to orthotists in real-time and display it as graphs for analysis.
19	**Agriculture Automation**	**Automated LAN for Plants** Design a network of edge devices at each plant which sends data to fog devices and that network should be controlled from cloud platform.
20	**Energy Automation**	**Smart energy conservation system** To create a full-fledged energy conservation system model based on a residential area. The model can include technologies like automatic lights that only turn on in the presence of people, turning off all electrical appliances (with exceptions) when the person leaves home
21	**Agriculture Automation**	**Advanced self-watering plant system** Develop an advanced self-watering plant system that involves integrating solar and battery power sources to ensure sustainable operation without relying on traditional plumbing infrastructure. This system addresses familiar challenges faced by individuals struggling to maintain plant health by incorporating a concealed water reservoir that eliminates the need for frequent refills and reduces maintenance effort. Essential features include sensors for monitoring soil moisture levels and ambient light conditions, perfecting solar panel efficiency. Real-time monitoring of water level and battery status ensures continuous functionality, while a connected mobile application provides users with alerts and detailed insights into plant health and system performance. By automating essential maintenance tasks and perfecting environmental conditions for plant growth, this system aims to empower users of varying gardening ability levels to successfully nurture plants in indoor/outdoor settings.

22	**Home automation**	**Automatic TV timer system for children** Design a TV timer system for three children that manages individual TV usage through dedicated buttons, allowing each child to start his/her timer upon pressing his/her respective button. Holding any button pauses all timers and turns off the TV, enforcing fairness and preventing conflicts. When a timer expires, unless another child opts to switch to another timer, the TV automatically turns off, promoting fair time distribution. Nightly resets ensure a fresh start each day, while any attempts to override timers result in manual disabling of TV access as a deterrent. After a timer runs out or is paused, the system smoothly transitions back to its default mode after a particular duration, ensuring seamless operation and ease of use for children and parents alike.
23	**Gadget automation**	**Music player controller using hand gestures** Develop a music player that responds to hand gestures for controlling playback, adjusting volume, and selecting songs. Users can skip tracks, raise or lower volume and choose playlists by making simple gestures like waving or tapping. This hands-free interface makes it easy and intuitive to run without needing to touch the device, offering a modern and convenient way to enjoy music. This project explores gesture-based interaction in consumer electronics, providing a user-friendly experience for music enthusiasts.

24	**Industrial automation**	**Portable sensor system for detecting structural vibrations** Develop a portable sensor system capable of detecting and checking structural vibrations in buildings. The system should be able to record and analyze vibration, patterns in real-time, offering actionable insights to prevent potential structural issues. Ensure the device runs autonomously for extended periods and can wirelessly send data to a central database for further analysis and monitoring. Implement robust algorithms for detecting anomalies in vibration patterns and provide alerts when necessary to ease prompt maintenance or intervention.
25	**Home Automation**	**Wireless intercom system** Design and implement a wireless intercom system to ease communication between different rooms in a house. This system will use Wi-Fi or Bluetooth to send audio signals, providing a modern and flexible alternative to traditional wired intercoms. Each intercom unit will feature a user-friendly interface, such as a touch screen or button panel, to start and receive calls, and will support both. one-to-one and broadcast communication modes. The system will be compatible with existing smart home ecosystems and include mobile app integration for remote control. Ensuring high-quality audio transmission, security features, and easy installation, this intercom system will enhance convenience and connectivity within the house.
26	**Security automation**	**Smart locker system** Design and develop a smart locker system for security and convenience, storage solutions in gyms, schools, or workplaces. These lockers will be equipped with electronic locks that can be controlled via a mobile app. Users can reserve and access lockers remotely, and the system will provide real-time usage data and notifications for enhanced security and management.

27	**Energy automation**	**Environment monitoring and analyzation device** Develop a compact IoT-enabled environmental monitoring solution that integrates sensors for temperature, humidity, and air quality. The device should employ efficient power management for prolonged operation and use wireless communication protocols to relay data to a central server or cloud platform. This system aims to provide real-time environmental data for monitoring and analysis purposes in various applications such as smart buildings, agriculture, or industrial environments.
28	**Energy automation**	**IoT-based energy management system** Design and realize an IoT-based energy management system for houses or businesses that checks and perfects energy usage. The system should incorporate renewable energy sources, analyze consumption patterns and adjust energy distribution in real-time to lower expenses and support sustainable practices.
29	**Vehicle automation**	**Bicycle-mounted sensor system** Develop a bicycle-mounted sensor system that enhances rider safety by detecting approaching vehicles and providing alerts to cyclists. Integrate with smartphone apps for navigation and real-time traffic updates.
30	**Health and Sports automation**	**Personal assistant device for visually impaired** Build a personal assistant device designed to aid visually impaired individuals with navigation, object recognition, and reading text. This project involves developing a portable device equipped with cameras and sensors that can detect obstacles, recognize objects, and read text aloud the device can provide audio feedback to help users navigate their environment and interact with the world around them.