

ESP2LIFE HACKATHON

PROBLEM STATEMENTS

S.NO.	THEME	PROBLEM STATEMENT
1	Home Automation	Automatic Screen Closer System: Develop an Automatic Screen Closer system using Blynk & NTP Client technology.
2	Home Automation	Automated Bathroom Exhaust System: Develop an automated exhaust system sensing occupancy and environmental conditions.
3	Home Automation	Child Safety Lock System: Develop a system to prevent children from exiting without supervision using a distance sensor.
4	Home Automation / Waste Management	Smart Trash Can Tracker System: Develop a system to monitor fill levels and weight of trash cans.
5	Home Automation / Safety & Security	Smart Door Lock System: Develop a system to detect door movements and notify users if the door remains open.

6	Industrial IoT / Smart System / Miscellaneous	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 timely 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 / Power Management	Solar Panel Tracking System: Develop a system to maximise energy capture efficiency by tracking the sun's position.
8	Health & Sports / Smart vehicles	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 frequently do not interact with one another, resulting in gaps in functionality and user experiences. The proposed approach is to create a Smart Cycling System that combines an accelerometer, gyroscope, GPS modules, and Wi-Fi connectivity with an ESP32 microcontroller to monitor cycling activity and improve security.

9	Safety & Security / Home Automation	<p>Robust Passlock System: The fundamental concerns with current passlock systems are their 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 establish apparent patterns over time, making it simpler for unauthorised users to guess passcodes, whereas biometric systems can be jeopardised by dirt, dampness, or technological failure. Thus the need to create a Robust Passlock 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 unauthorised access attempts or lock status in real time. This joystick-based passlock 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.</p>
10	Smart Automation / Safety & Security	<p>Fall Detection and Alert System: Develop a system to detect falls and notify emergency contacts.</p>
11	Health and Sports	<p>Hand Rehabilitation Device: Develop a wearable device for hand rehabilitation using gyro and load sensors.</p>
12	Smart system / Smart automation	<p>Traffic/Crowd Management: Develop a smart traffic management system with a real-time console for hotel room availability, helicopter services, other facilities, and total people present at Shri Kedarnath 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,</p>

		integrating with Google Maps. Implement RFID-tagged barriers for monitoring traffic, cars, and people. Integrate all data into a centralised district-level database. Create a smart signal controller for congestion reduction and emergency vehicle route assessment.
13	Health and Sports / Safety and security	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 centralised server (PHQ level) to prevent pilferage. Ensure the device can connect data with a centralised police network, with high sensitivity for narcotics detection.
14	Safety and security / Smart 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 / Smart automation	Senior Care IoT Solution: Develop an IoT solution leveraging 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	Smart automation	IoT-Based Navigation System for Visually Impaired: Develop an IoT-driven system providing 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	Health and Sports	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.
18	Home automation / Safety and security	Smart door lock using facial recognition: To create a door lock that can unlock using facial recognition and send notification on detection of intruders.
19	Smart automation / Clean and green technology	Automated hydroponics: To create an automated field-level hydroponics system that can nurture plant growth.
20	Energy / Power management	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 etc.
21	Agriculture/ Clean and green technology	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 common 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,optimising 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 optimizing environmental

		conditions for plant growth, this system aims to empower users of varying gardening expertise levels to successfully nurture plants in indoor/outdoor settings.
22	Home automation	<p>Automatic TV timer system for children:</p> <p>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.</p>
23	Home automation/ Smart system/Entertainment/ Miscellaneous	<p>Music player controller using hand gestures:</p> <p>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 operate 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.</p>

24	Smart automation/ Industrial IOT/ Safety and security management/ Disaster management	Portable sensor system for detecting structural vibrations: Develop a portable sensor system capable of detecting and monitoring structural vibrations in buildings. The system should be able to record and analyse vibration patterns in real-time, providing actionable insights to prevent potential structural issues. Ensure the device operates autonomously for extended periods and can wirelessly transmit 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 facilitate timely maintenance or intervention.
25	Home automation / Smart home	Wireless intercom system: Design and implement a wireless intercom system to facilitate communication between different rooms in a house. This system will utilise Wi-Fi or Bluetooth to transmit 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 initiate 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	Safety and security management	Smart locker system: Design and develop a smart locker system for secure and convenient 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	Power management/ Clean and green technology	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 utilise 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	Power management/ Clean and green technology	IoT-based energy management system: Design and realise an IoT-based energy management system for houses or businesses that monitors and optimises energy usage. The system should incorporate renewable energy sources, analyse consumption patterns, and adjust energy distribution in real-time to lower expenses and support sustainable practices.
29	Smart automation/ Smart vehicles	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	Smart education	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.