**Purpose of the project:**

The purpose of the project is to provide the solution for the track 5 i.e. To build an Iot based security system for the university.

In the problem statement, we were given some real life challenges to provide the solution for, and we in our project have solved most of them. We have attached a video of a generic model of the security system which is scalable and economical. Please watch the video before going any further in this documentation.

**CHALLENGES FACED:**

1. To track movements of objects:

Solution : we have used RFID SENSOR to tackle this problem. We just need to assign a unique tag(RFID TAG) to each object, as soon as an object crosses the RFID sensor, the sensor detects the unique RFID tag and it will update the details in the database and thus we know that this particular object crossed this specific location at this particular point of time. As the object is under surveillance 24/7, the chances of it getting stolen get highly reduced.

1. Emergency detection:

Solution: IoT Sensors: IoT sensors can be used to detect any emergency situations like fire, earthquake, etc. These sensors can be linked with the cloud software to send alerts to the security office in real-time. We have used piezo vibration sensor to detect emergencies like earthquake. Many other sensors like FLAME SENSOR can also be integrated with this security system to detect emergencies like fire breakout.

1. Scalability:

Solution: We can use multiple nodes which can communicate with each other and as the number of devices and the amount of data generated by them increases, it is important to have a scalable database that can handle the increased data volume. You can use databases that are designed to handle huge amount of data, such as influxdb, Cassandra, or Mongo db.

1. Integration with the existing infrastructure :

Solution: We can connect the security system with various sensors and cctv cameras. We can improve the pre-existing security system using this iot based project.

1. To avoid blind spots :

Solution: We can use multiple cameras and various sensors to deal with this problem. This will decrease the chances of theft and increase the security in the premises.

1. Safety along riverside slope/restricted zones:

Solution: we have used esp32 cams to capture the restricted areas to ensure 24/7 surveillance. Whenever a person get missed in the frame of the esp32 cam, it will send an alert to the system.

**SCOPE:**

The scope of the IoT system would be to provide real-time monitoring and management of the campus environment and security, including tracking of objects and people on campus, detecting emergencies such as fire and earthquakes, ensuring student safety around the river side slope, and integrating with the campus CCTV surveillance system. This system would be designed to improve the overall safety and security of the campus, and provide a more efficient and effective means of managing campus resources. Additionally, the system could be expanded to include other types of sensors and data sources to further enhance campus operations and management.

**Web Application:**

The web application is responsible for providing a user interface to the end-users to view the data collected from the sensors. The web application is built using HTML, CSS, and JavaScript. The web application fetches data from the InfluxDB server using the InfluxDB API and displays the data in the form of graphs, tables and charts.

**APIs:**

The following APIs are used in this project:

Post gresql API: Used to fetch data from the Post gresql server.

FastAPI: Used to create APIs to connect sensors with Post gresql server.

**SENSORS:**

The following sensors are used in the project:

**RFID Sensor:**

RFID stands for Radio Frequency Identification. An RFID sensor uses radio waves to communicate with a RFID reader, and is used to track and identify objects that have an RFID tag attached to them. The sensor contains a microchip that stores the object's identification information, and an antenna that receives the radio waves sent by the reader. RFID sensors are commonly used in inventory management, supply chain tracking, and access control systems.

**NodeMCU:**

NodeMCU is a low-cost Wi-Fi module that uses the ESP8266 microcontroller. It is designed to be programmed with the Lua scripting language, and can be used to build Internet of Things (IoT) devices that can communicate with other devices over Wi-Fi. NodeMCU has a built-in USB-to-serial converter, which makes it easy to program and debug using a computer.

**Arduino Uno:**

The Arduino Uno is a popular microcontroller board that is widely used in electronics prototyping and DIY projects. It is based on the Atmel AVR microcontroller, and has a variety of input/output pins that can be used to control and monitor external devices. The Uno can be programmed using the Arduino Integrated Development Environment (IDE), which is a simple and user-friendly programming environment.

**Vibration Sensor:**

A vibration sensor is a sensor that detects and measures vibrations or oscillations in mechanical systems. The sensor typically consists of a piezoelectric crystal or accelerometer that converts the mechanical vibrations into electrical signals that can be measured and analyzed. Vibration sensors are commonly used in industrial machinery monitoring, automotive diagnostics, and structural health monitoring.

**ESP CAM:**

ESP CAM is a small camera module that uses the ESP32 microcontroller. It is designed to be used with microcontrollers or single-board computers, and can be programmed to capture images or videos and transmit them over Wi-Fi. The module has a built-in camera sensor, and can be controlled using a simple serial interface. ESP CAM is commonly used in IoT projects, surveillance systems, and robotics.