Project Proposals

Project - 1

Problem Statement: Traffic Monitoring and Congestion Control

As cities continue to grow, so does the number of vehicles on the road. This has led to an increase in traffic congestion, which not only leads to longer commutes for individuals but also has negative environmental and economic impacts. The problem statement for the Traffic monitoring and congestion control project is to develop a system that can monitor traffic flow and congestion in real-time, provide alerts and suggestions for alternate routes to drivers, and assist in the management of traffic to reduce congestion and improve overall traffic flow.

Expected Bare Minimum:

- Develop a system that can collect real-time traffic data from various sources, including sensors and GPS devices.
- Analyze the collected data to identify patterns, congestion, and areas that require attention.
- Develop a system that can provide drivers with real-time information about traffic conditions, suggest alternate routes, and estimate travel times.
- Develop an intelligent traffic control system that can manage traffic flow at intersections and on highways to reduce congestion and improve overall traffic flow.
- The system should contain four intersections, and the end-to-end functionality should be designed for all four intersections.
- Various scenarios should be created while collecting data for various traffic flow conditions.
- A traffic network can be considered as a grid (not completly) and create various permutations
- Mechanism to control gates for pedestrian crossing.
- More than 10 sensors of at least two variants should be used
- Failure analysis of sensors needs to be considered.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 2 weeks at a 15-minute average

Project - 2

Problem statement: IoT-based Fire Detection System

Traditional fire detection systems rely on sensors that are often expensive, complex to install and require extensive maintenance. The problem statement for the IoT-based Fire Detection System project is to develop a cost-effective and reliable system for the early detection of fires using IoT technologies. The system should be able to detect fires in real-time and alert relevant stakeholders, including building occupants, fire departments, and building managers**.**

Expected bare minimum:

- Develop a system that can monitor for signs of a fire, such as smoke, heat, and flames, using sensors connected to an IoT network.
- Analyze the data collected by the sensors to identify potential fires and classify them based on severity (Develop an alarm system that can notify relevant stakeholders in real-time, including building occupants, fire departments, and building managers.
- Actuate a fire safety system based on data to put off the fire
- Develop a user interface that allows building managers to monitor the status of the system, review past alarms, and perform maintenance tasks.
- Various scenarios need to be created with and without fire high temperature, smoke, smoke + fire etc.).
- Develop an application for alerting the firefighters and show a sample building plan to help firefighters with navigation.
- Test and validate the system in a real-world environment to ensure its reliability and effectiveness in detecting fires and alerting relevant stakeholders.
- More than 10 sensors of at least two variants should be used
- Failure analysis needs to be done.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 3

Problem statement: Intelligent Parking System

Finding a parking spot in busy urban areas (such as malls) can be a frustrating experience for drivers, leading to increased traffic congestion, wasted time, and higher fuel consumption. Traditional parking systems are often outdated, and inefficient, and do not provide real-time information on available parking spots. The problem statement for the IoT-based Intelligent Parking System project is to develop a system that uses IoT technologies to provide drivers with real-time information on available parking spots, optimize parking utilization, and reduce traffic congestion.

Expected bare minimum:

- Develop a system that can monitor parking spots in real-time using sensors connected to an IoT network.
- Analyze the data collected by the sensors to identify available parking spots, parking patterns, and trends.
- Develop a user interface that can provide drivers with real-time information on available parking spots, including location, availability, and pricing (pricing can).
- Develop an intelligent parking allocation system that can optimize parking utilization, reduce traffic congestion, and also analyze any possible hazards like fire/smoke, etc.
- Test and validate the system in a real-world environment to ensure its reliability and effectiveness in providing drivers with real-time parking information and reducing traffic congestion.
- Demonstrate the increased parking management efficiency with this system for different parking load scenarios.
- A minimum of three-storied parking area needs to design and a system that can optimize on all the floors of the building.
- Also, demonstrate the choice of parking slot with a suitable actuation
- More than 10 sensors of at least two variants should be used
- Failure analysis needs to be done
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 4

Problem statement: Soil Monitoring System - Irrigation

Traditional methods of soil monitoring and irrigation are often inefficient and rely on manual intervention, which can lead to inconsistent results and lower crop yields. The problem statement for the IoT based soil monitoring and drip irrigation project is to develop a system that uses IoT technologies to monitor soil parameters, and automate irrigation using a drip irrigation system.

Expected bare minimum:

- Develop a system that can monitor soil moisture levels, soil temperature, and other parameters that affect the irrigation using sensors connected to an IoT network.
- Analyze the data collected by the sensors to determine the water requirements of the crops and optimize irrigation.
- Develop an automated drip irrigation system that can deliver water directly to the roots of the crops, reducing water usage and minimizing evaporation.
- Develop a user interface that allows farmers to monitor the status of the system, review historical data, and adjust irrigation schedules.
- Demonstrate using different soils and soil conditions (saline, dry, etc.) and their effects on plant growth.
- Highlight the change in yield of a crop by comparing the yield results of a crop without this system (grow actual plants).
- More than 10 sensors of two variants should be used
- Failure analysis needs to be conducted.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 5

Problem statement: Soil Monitoring System - Quality

In the agriculture industry, farmers need to have accurate and real-time information about the quality of their crops to ensure optimal yields and profitability. Traditional methods of crop quality monitoring and soil analysis are often time-consuming, expensive, and rely on manual intervention, which can lead to inconsistencies and lower crop yields. The problem statement for the IoT based soil monitoring system and quality checking project is to develop a system that uses IoT technologies to monitor soil quality, crop growth, and other parameters that affect crop yields, and provide real-time feedback to farmers about the quality of their crops.

Expected bare minimum:

- Develop a system that can monitor soil quality, crop growth, and other parameters using sensors connected to an IoT network.
- Analyze the data collected by the sensors to determine the quality of the crops, identify any deficiencies or issues, and suggest corrective measures to the farmers.
- Develop a user interface that allows farmers to monitor the status of their crops, review historical data, and receive real-time feedback on the quality of their crops.
- Develop a predictive analytics module that can forecast the quality of the crops based on historical data and external factors like weather patterns, soil conditions, and other environmental factors.
- Demonstrate a mechanism that can automate crop maintenance based on the data and farmer's feedback (e.g., sprinkling fertilizers/pesticides etc.)
- Highlight the change in yield of a crop by comparing the yield results of a crop without this system (grow actual plants).
- Various environmental scenarios related to plant growth should be created during data collection
- More than 10 sensors of two variants should be used
- Failure analysis needs to be conducted.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 6

Problem statement: Waste Management System

Managing waste is a critical challenge for municipalities and cities, and traditional waste management methods often rely on manual processes that can be inefficient and result in high costs. There is a need for a smart waste management system that can automate the process of garbage monitoring and enable effective waste management. The problem statement for the IoT-based Garbage Monitoring System and Dry Waste Crushing project is to develop a system that uses IoT technologies to monitor the level of garbage in waste bins, automate the process of waste collection, and enable effective management of dry waste.

Expected bare minimum:

- Develop a central waste management system that can monitor the level of garbage in waste bins and a central waste yard using sensors connected to an IoT network.
- With IoT-enabled sensors, garbage collection trucks can be equipped with automated mechanical arms that can detect and pick up garbage bins that are full.
- Analyze the data collected by the sensors to determine the optimal time for waste collection, reducing the number of unnecessary trips and saving time and money.
- Develop a user interface that allows waste management personnel to monitor the status of the system, review historical data, and manage waste collection schedules.
- Develop a dry waste crushing system that can reduce the volume of dry waste and make it easier to transport and manage.
- IoT sensors can monitor the air quality and temperature around landfills and waste management facilities. This data can be used to improve the health and safety of workers and nearby communities.
- More than 10 sensors of two variants should be used
- Failure analysis needs to be conducted.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min (by varying the status of garbage bins)

Project - 7

Problem statement: IoT-based landslide detection system

Landslides can cause significant damage to property, infrastructure, and human life. Traditional methods of landslide detection rely on manual observation and can be time-consuming and costly. The problem statement for the IoT-based Landslide Detection System project is to develop a system that uses IoT technologies to monitor soil stability, slope stability, and other parameters that affect the likelihood of a landslide, and alert people in the affected area of potential danger.

Expected bare minimum:

- Develop a system that can monitor soil stability, slope stability, and other parameters using sensors connected to an IoT network.
- Analyze the data collected by the sensors to determine the likelihood of a landslide and alert people in the affected area in real-time.
- Develop a user interface that allows people to monitor the status of the system, review historical data, and receive real-time alerts about potential landslides.
- Develop a predictive analytics module that can forecast potential landslides based on historical data and external factors like weather patterns, soil conditions, and other environmental factors.
- Test and validate the system in a nearly real-world environment to ensure its reliability and effectiveness in detecting potential landslides and alerting people in the affected area.
- Various soils and soil conditions need to be considered to analyze the landslide possibilities.
- Demonstrate a mechanism to deploy guardrails (could be trees or barriers at various points) to minimize the effect of landslides.
- More than 10 sensors of two variants should be used
- Different scenarios of land slide occurrences need to be created while collecting the data.
- Failure analysis needs to be conducted.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 2 weeks with various landslide scenarios

Project - 8

Problem statement: IoT-based Flood Monitoring System

Floods can cause significant damage to property, infrastructure, and human life. Traditional methods of flood monitoring rely on manual observation and can be time-consuming and costly. There is a need for a smart flood monitoring system that can accurately and quickly detect potential floods and alert people in the affected area. The problem statement for the IoT-based flood monitoring system project is to develop a system that uses IoT technologies to monitor water levels, weather patterns, and other parameters that affect the likelihood of a flood, and alert people in the affected area of potential danger.

Expected bare minimum:

- Develop a system that can monitor water levels, weather patterns, and other parameters using sensors connected to an IoT network.
- Analyze the data collected by the sensors to determine the likelihood of a flood and alert people in the affected area in real time.
- Develop a user interface that allows people to monitor the status of the system, review historical data, and receive real-time alerts about potential floods.
- Develop a predictive analytics module that can forecast potential floods based on historical data and external factors like weather patterns, soil conditions, and other environmental factors.
- Demonstrate a mechanism to deploy a suitable damage control mechanism (e.g., flood gates) to minimize the effect of flooding (e.g., dams).
- More than 10 sensors of two variants should be used
- Various flood scenarios need to be created while collecting the data.
- Failure analysis needs to be conducted.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 2 weeks covering various flooding scenarios

Project - 9

Problem statement: IoT-based Load Management System

The problem statement is to design an efficient power load-switching system that can seamlessly switch between solar generation and conventional energy based on solar energy production and load requirements. The objective is to maximize the utilization of solar energy and minimize the use of conventional energy while ensuring a stable power supply to meet the load demand. The system should ensure that the load demand is met at all times. Additionally, the system should be designed to be scalable and adaptable to different load requirements and solar energy production levels.

Expected bare minimum:

- Real-time monitoring and control of energy consumption of various devices and appliances
- Predictive analysis of energy usage patterns based on user behavior
- Automatic optimization of energy usage based on the user's schedule and energy usage patterns
- Integration with renewable energy sources to reduce the dependency on non-renewable sources
- User interaface-based notification system for abnormal energy consumption, power outages, and energy-saving suggestions
- More than 10 sensors of two variants should be used
- Various load scenarios need to be considered and maximize the usage of solar energy over conventional energy.
- Failure analysis needs to be conducted.
- A tabletop model to demonstrate the proof of concept using LEDs/Bulbs etc.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 10

Problem statement: Smart Energy Grid Failure Management:

The problem statement is to design a smart energy grid management system that can efficiently handle energy grid failures. Energy grids are critical infrastructure that supplies power to homes, businesses, and industries. However, energy grids are susceptible to various failures such as equipment malfunction, extreme weather conditions, cyber-attacks, and natural disasters, leading to power outages.

Expected bare minimum:

- Real-time monitoring and control of energy consumption of various devices and appliances
- Predictive analysis of energy usage patterns to efficiently spread the load in the grid
- Manual switching based on user input and automated switching of grid wires to prevent any outages
- User Interface to indicate the health of different components in the energy grid.
- Priority-based load switching to prevent power outages to emergency services
- More than 10 sensors of two variants should be used
- Various grid failure scenarios need to be considered and minimize the current outage.
- Failure analysis needs to be conducted.
- A tabletop model to demonstrate the proof of concept using LEDs/Bulbs etc.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 11

Problem statement: Intelligent Bathroom Flushing System

The traditional method of flushing a toilet after use is manual, which means that the user must press a button or lever to flush the toilet. This process is not only unhygienic but also wasteful, as users may forget to flush or may use more water than necessary. Additionally, in public restrooms, there is a risk of spreading germs and disease by touching the flush handle, which may not be sanitized regularly. To address these issues, we propose to develop an IoT-based automatic bathroom flushing system that can detect when the user has left the toilet and flush the water automatically. The system will be designed to conserve water, ensure hygiene, and reduce the spread of germs and diseases.

Expected bare minimum:

- Design and develop an IoT-based automatic bathroom flushing system that can detect when a person has used the toilet and flush the water automatically.
- Incorporate sensors and microcontrollers to detect user presence, flush the toilet, release of air freshener after each usage and also control water consumption.
- Develop a user-friendly interface for configuring and controlling the system.
- Test and validate the system to ensure its functionality and reliability.
- Demonstrate the effectiveness of the system in conserving water, ensuring hygiene, and reducing the spread of germs and disease.
- Develop a suitable mechanism/predictive analysis to understand various operational aspects such as water consumption and cleaning requirements.
- More than 10 sensors of two variants should be used
- Water consumption analysis needs to be done.
- Various scenarios need to be created while collecting and analysing the data.
- Failure analysis needs to be conducted.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month

Project - 12

Problem statement: Warehouse Management in Hospitals

Hospitals typically have a large inventory of medical supplies, equipment, and medications that need to be efficiently managed and tracked. This can be a challenging task, as the inventory needs to be constantly monitored and replenished to ensure that patients receive the best possible care. IoT (Internet of Things) technology can be effectively used in warehouse management in hospitals to ensure smooth and efficient operations.

Expected bare minimum:

- Automated inventory management: IoT sensors can be placed on every item in the warehouse, which can monitor the inventory in real time. This can help hospital staff keep track of the number of items in the warehouse, their expiration dates, and reorder levels. Automated inventory management can also help prevent overstocking or understocking of critical supplies.
- Asset tracking: Hospitals often have expensive medical equipment that needs to be tracked and monitored. IoT sensors can be placed on these assets to monitor their location, usage, and maintenance. This can help hospitals reduce the risk of theft or loss, and also ensure that equipment is being used effectively and efficiently.
- Temperature monitoring: Some medical supplies, such as vaccines, medications, and blood products, require strict temperature control. IoT sensors can be placed in storage units to monitor the temperature and alert staff if the temperature falls outside the acceptable range.
- In case of extreme temperature conditions actuate the air conditioner
- More than 10 sensors of two variants should be used
- Failure analysis needs to be conducted with a easy user interface.
- Various serious needs to be created with respect to availability of items and usage.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month

Project - 13

Problem statement: IoT-based Patient Monitoring System

The healthcare industry has been increasingly relying on technology to provide efficient and effective care to patients. One area where technology can play a significant role is patient monitoring. The traditional approach to patient monitoring involves frequent check-ins by healthcare professionals, which can be time-consuming and expensive. IoT-enabled patient monitoring systems can help healthcare providers remotely monitor patients' health status, collect real-time data, and provide timely interventions when necessary.

Expected bare minimum:

- Hardware selection: Choose the appropriate sensors and IoT devices for monitoring patient health parameters. The sensors could include heart rate sensors, blood pressure monitors, temperature sensors, pulse oximeters, etc.
- Saline bottle monitoring is an important aspect of hospital operations. It involves monitoring the levels of saline in intravenous (IV) fluid bags or bottles to ensure that patients receive the right amount of fluids during treatment.
- An IoT-enabled gesture-based intimation system can automate the process of identifying patient gestures and alerting healthcare providers.
- Data processing and analysis: Process the patient data collected by the sensors and analyze it in real-time to identify any abnormal patterns or deviations from normal parameters.
- User interface development: Develop an easy-to-use user interface for healthcare providers to access patient data, receive alerts, and respond to emergency situations.
- Security and privacy implementation: Implement robust security measures to protect patient data from unauthorized access or breaches.
- More than 10 sensors of two variants should be used
- Failure analysis needs to be conducted.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month

Project - 14

Problem statement: Traffic management and congestion control for free passage of emergency vehicles

Traffic congestion and delays can cause significant challenges for emergency services, resulting in delayed response times and reduced patient outcomes. Freeway traffic management systems can be used to monitor traffic and reduce congestion, but there is a need for a more efficient and effective approach to ensure priority access for emergency vehicles such as ambulances. The goal of this project is to develop a traffic monitoring and congestion control system specifically designed for ambulances on freeways. The system should be able to detect the presence of an ambulance and provide priority access to emergency vehicles by controlling the flow of traffic.

Expected bare minimum:

- Real-time monitoring: The system should be able to monitor traffic in real-time, detecting the presence of an ambulance and alerting the system (A beacon signal can be sent when a vehicle is about to arrive).
- Congestion control: The system should be able to manage traffic congestion by controlling the flow of vehicles and providing priority access for emergency vehicles.
- Integration with emergency services: The system should be able to communicate with emergency services to provide information on the location and status of an ambulance, and to receive information on the best route to take.
- User-friendly interface: The system should be easy to use, with a simple and intuitive interface that can be used by the emergency services personnel.
- The system should contain four intersections, and the end-to-end functionality should be designed for all four intersections.
- Various scenarios should be created while collecting data for various traffic flow conditions.
- A traffic network can be considered as a grid (not completely) and create various permutations.
- Demonstrate the improved efficiency for an emergency service using this technique.
- More than 10 sensors of at least two variants should be used
- Failure analysis of sensors needs to be considered.
- A table top model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 2 weeks with various traffic and junction scenarios

Project - 15

Problem statement: Smart Home for the Aged

The aim of this project is to design and develop an IoT-based smart home system for the elderly to help them live independently and safely. The system should be able to monitor and control various devices and appliances in the home, such as lights, thermostats, doors, and security systems, using voice commands or a mobile application. The smart home system should be designed to address the needs of the elderly, who may have physical limitations or memory issues. The system should be easy to use and intuitive, with features that cater to their specific needs, such as automatic medication reminders and emergency alerts.

Expected bare minimum:

- Voice-activated control of devices and appliances in the home
- Automatic medication reminders and alerts
- Motion sensors to detect falls or other accidents. The sensors could include heart rate sensors, blood pressure monitors, temperature sensors, pulse oximeters, etc.
- Emergency alert system to notify caregivers or emergency services in case of an emergency with a suitable user interface
- Identifying user patterns, and routines and identifying any anomalies.
- Alarm system in case of gas leakages.
- Integration with wearable health monitoring devices to track vital signs and activity levels
- Remote monitoring and management of the home for caregivers or family members
- More than 10 sensors of two variants should be used
- Various scenarios w.r.t. control of different applications need to be created, and data should be collected accordingly.
- Failure analysis needs to be conducted.
- A tabletop model to demonstrate the proof of concept.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min

Project - 16

Problem statement: Optimizing Energy Utilization

The objective of this project is to design and develop an IoT-based solar power generating and monitoring system that can optimize solar energy output based on sunlight levels. The system should be able to track and analyze the amount of sunlight received by the solar panels and adjust the output of the solar energy system accordingly to maximize energy efficiency. The solar power generating and monitoring system should consist of a network of sensors, controllers, and IoT devices that can collect and process data on sunlight levels, energy production, and energy consumption. The system should also include a user interface that displays real-time information about energy production and consumption, as well as recommendations for optimizing energy efficiency.

Expected bare minimum:

- Solar panels are equipped with sensors that can detect sunlight levels and rotate panels to the best orientation to maximize the solar energy generated.
- The system should be self-sufficient in terms of energy
- Controllers should adjust the output of the solar energy system based on sunlight levels
- IoT devices that can collect and transmit data on energy production and consumption
- User interface that displays real-time information on energy production and consumption, as well as recommendations for optimizing energy efficiency
- Integration with smart home devices to control energy consumption in the home
- Remote monitoring and management of the solar power system with a suitable user interface.
- More than 10 sensors of two variants with a suitable number of sensors should be used.
- Various scenarios wrt to the availability of sunlight and panel orientations need to be considered.
- A tabletop model to demonstrate the proof of concept using LED’s and bulbs.
- Failure analysis needs to be conducted.
- The system should be a net-zero energy system.

Data Collection Requirement:

- Minimum Data collection requirement: > 1 month at 1 min