

## Problem Statement:

Design and implement a Smart Parking System using IoT technology to address the growing urban congestion and parking challenges in cities. The system should provide a solution for efficient parking management by monitoring and optimizing parking space usage, reducing traffic congestion, and enhancing the overall convenience of parking for both drivers and parking facility operators. Key objectives and challenges to be addressed include:

1. **Real-time Parking Space Monitoring:** Develop a system that can accurately detect and monitor the availability of parking spaces in real-time, providing information to drivers about vacant spots.
2. **Parking Reservation and Payment:** Implement a reservation system that allows users to pre-book parking spaces and make payments electronically, reducing the need for physical tickets or cash payments.
3. **Parking Guidance System:** Design a user-friendly interface or mobile app that guides drivers to available parking spaces within the parking facility efficiently.
4. **Occupancy Management:** Optimize parking space allocation and usage by dynamically adjusting pricing, encouraging turnover, and preventing overcrowding in certain areas.
5. **Security and Surveillance:** Integrate surveillance cameras and security features to ensure the safety of parked vehicles and deter theft or vandalism.
6. **Sustainability and Environmental Impact:** Explore ways to reduce vehicle emissions and promote eco-friendly transportation options, such as electric vehicle charging stations.
7. **Data Analytics and Reporting:** Develop a system that collects and analyzes data on parking patterns, user behavior, and revenue generation to improve decision-making for parking facility management.
8. **Scalability and Integration:** Ensure that the system is scalable to accommodate varying sizes of parking facilities and can be integrated with existing urban infrastructure and transportation systems.
9. **User Education and Awareness:** Create educational materials and awareness campaigns to inform the public about the benefits of the Smart Parking System and encourage its adoption.

The successful implementation of this Smart Parking System should lead to reduced traffic congestion, improved urban mobility, increased revenue for parking facility operators, and a more convenient parking experience for city residents and visitors.