Role: Data Analyst: Insights Specialist

Project Topic: "Automated Parking Spot Detection System Using Computer Vision"

Problem Formulation:

"The project aims to develop an automated system leveraging computer vision technology to detect available parking spots in real-time. By training pre-existing models with labeled images scraped and annotated by our team, the system will accurately identify open parking spots within a parking lot. This solution addresses the challenge of optimizing parking space utilization and streamlining the parking experience for drivers by providing real-time information on available spots, thereby reducing congestion, minimizing search time, and enhancing overall parking efficiency."

With consideration to some factors such as:

* Purpose of the parking lot (i.e residential or commercial) -for commercial purposes do we take account to opening and closing time of the lot and what is the consideration for overnight stay.
* Capacity of the parking lot (Size of occupancy in sq. meters)
* Size of cars (The heights and weights of cars allowed, this will be a guide to design the frames or segmentation)
* Design of the parking lot (entrance, driveway and exit)
* Manpower (to manage the arrival of drivers traffic)
* Ticketing

Key Performance Indicators (KPIs) for Parking Lot Management: By analyzing these KPIs and metrics, you can provide actionable insights to the parking lots manager, enabling data-driven decision-making and effective management of the parking facility.

1. **Occupancy Rate**: Calculate the percentage of occupied parking spots versus total available spots over time. This metric helps the manager understand the utilization of the parking lot and identify peak hours of activity.
2. **Turnover Rate**: Measure the rate at which parking spots become vacant and occupied again. High turnover indicates efficient use of parking spaces, while low turnover may suggest issues such as overstay or lack of availability.
3. **Average Stay Duration**: Determine the average duration vehicles stay parked in the lot. This metric helps in managing pricing strategies and understanding customer behavior.
4. **Peak Hour Analysis**: Identify the busiest hours of the day or week when the parking lot experiences the highest demand. This information can be used to optimize staffing, manage traffic flow, and allocate resources effectively.
5. **Revenue Generation**: Track the revenue generated from parking fees over time. This includes total revenue, average revenue per vehicle, and revenue distribution across different payment methods (e.g., cash, credit card).
6. **Violation Rate**: Monitor the frequency of parking violations such as overstaying time limits, unauthorized parking, or improper use of designated spaces. High violation rates may indicate the need for stricter enforcement measures.
7. **Customer Satisfaction**: Gather feedback from parking lot users through surveys or ratings to measure satisfaction levels. This qualitative data complements quantitative metrics and helps in identifying areas for improvement.
8. **Maintenance Needs**: Keep track of maintenance issues such as malfunctioning equipment, damaged infrastructure, or cleanliness concerns reported by users. Timely maintenance reduces downtime and enhances user experience.
9. **Environmental Impact**: Assess the environmental footprint of the parking lot by tracking metrics like energy consumption, emissions, and waste generation. Implementing sustainable practices can lead to cost savings and positive community perception.
10. **Revenue Leakage**: Identify potential revenue leakage due to unpaid fees, ticket errors, or fraudulent activities. Implementing robust accounting and auditing processes helps minimize losses and ensures financial integrity.