Dynamic Pricing for Urban Parking Lots

This report outlines the development of a dynamic pricing engine for urban parking lots as part of the Summer Analytics 2025 Capstone Project.

Problem:

Urban parking spaces are often under or over-utilized due to static pricing. The aim of this project is to optimize pricing in real-time using historical and live data.

Objectives:

- Implement real-time pricing for 14 parking lots.

- Use occupancy, queue length, vehicle type, traffic, and special day information.

- Ensure smooth and explainable price changes.

- Include competitive pricing logic (optional).

- Suggest rerouting when appropriate.

Models Implemented:

1. Baseline Linear Pricing Model

   - Price increases linearly with occupancy.

2. Demand-Based Pricing Model

   - Composite demand score using multiple features.

   - Prices adjusted based on normalized demand.

3. Competitive Pricing Model (optional)

   - Adjusts prices using spatial competition (latitude, longitude).

Technologies Used:

- Python (NumPy, Pandas)

- Bokeh for real-time visualization

- Pathway for streaming simulation

- Google Colab and GitHub for development and version control

Deliverables:

- Jupyter Notebook with models and visualization

- Bokeh plots for pricing

- GitHub repository with full documentation

- This report summarizing the solution