REPORT

Project Title:

Dynamic Pricing for Urban Parking Lots
Summer Analytics 2025 – Consulting & Analytics Club × Pathway
Team Member: Avisweta De

Mail id: deavisweta7@gmail.com

Objective:

To build a real-time dynamic pricing system for 14 urban parking lots based on occupancy, demand, traffic, vehicle type, and competitor prices.

Dataset Overview:

- **73 days × 18 time points/day**
- Features include: Occupancy, Capacity, QueueLength, TrafficConditionNearby, VehicleType, IsSpecialDay, etc.

Tech Stack:

- **Python**, **Pandas**, **NumPy** for logic
- **Pathway** for real-time data simulation
- **Bokeh** for visualization
- **Google Colab** + **GitHub**

Models Implemented:

1. **BaselineLinearPricingModel**
2. **DemandPricingModel**
   Uses a multi-feature demand function to update prices smoothly and responsively.
3. **CompetitivePricingModel** (Optional)
   Considers nearby parking prices based on geolocation and suggests rerouting when needed.

Visualizations:

- Real-time pricing line plots using **Bokeh**
- Comparison with competitor prices

Outcome:

Successfully implemented a real-time, explainable pricing engine using real-world simulation and visualizations — encouraging optimal parking lot utilization and smarter urban space management.

Conclusion:

Through this project, I gained hands-on experience in creating real-time data-driven solutions by developing a dynamic pricing engine for urban parking lots. I learned how to simulate streaming data using Pathway and build custom pricing models from scratch based on occupancy, traffic conditions,

queue length, and competitor behavior. This experience deepened my understanding of feature engineering and demand modeling in a real-world context. I also looked into how economic theory can translate into data science logic to create fair and understandable pricing systems. Additionally, I used Bokeh to create interactive visualizations that clearly communicate model behavior, which improved my ability to present data in an insightful and accessible way. Overall, this project sharpened my problem-solving skills, strengthened my knowledge of end-to-end pipeline development, and taught me how to balance business goals with technical execution.