

## Dynamic Pricing for Urban Parking – Capstone Project

### Project Overview

This capstone project presents a smart pricing simulation model for urban parking lots. It dynamically adjusts parking prices in real time or batch mode based on several influencing factors. Built using Python, it demonstrates demand-driven pricing algorithms integrated with real-time data processing tools.

### Objective

To simulate and implement a demand-based pricing strategy for parking spaces by accounting for:

- Parking occupancy
- Queue length
- Traffic conditions
- Special day status
- Type of vehicle (Cycle, Bike, Car, or Truck)

The model ensures that parking prices adapt intelligently to dynamic environmental and usage variables, helping optimize space utilization in urban areas.

### Technologies Used

- Pathway – For real-time and static data stream processing
- Pandas – For data manipulation
- Bokeh – For data visualization and trend analysis
- Google Colab – As the development and execution environment

### Project Files

| File Name | Description |

| Dynamic\_Pricing\_Final.ipynb | Main notebook with complete logic, implementation, and outputs |

| dataset.csv | Input dataset containing raw parking data (no headers) |

| final\_output.csv | Output file with computed parking prices after processing |

| README.md | Documentation of the project workflow and key components |

### Core Logic

The pricing is determined by a weighted demand formula implemented in the pricing\_logic() function:

Demand =  $1.5 \times (\text{occupancy} / \text{capacity})$

+  $0.5 \times \text{queue length}$

- traffic weight

+  $2.0 \times \text{special day}$

+ vehicle weight

- Vehicle Weights: Truck > Car > Bike > Cycle

- Traffic Weights: Low < Average < High

- Base Price: ₹10

- Final Price Range: Smoothly adjusted between ₹5 and ₹20, based on normalized demand

#### Data Flow Architecture

dataset.csv



Pathway ingestion (has\_header=False, mode="static")



pricing\_logic() calculation



Result table creation



Write to CSV → final\_output.csv



File download via files.download("final\_output.csv")

#### Pricing Models

- Model 1: Linear Pricing – Basic static pricing logic (baseline)

- Model 2: Demand-Based Pricing – Active model used in simulation
- Model 3: Competitive Pricing – (Optional & not implemented) Pricing based on GPS data from nearby parking lots

#### How to Run

- Open Google Colab and load `Dynamic_Pricing_Final.ipynb`
- When prompted, upload your `dataset.csv` file (must be headerless)
- Execute all cells in sequence
- The model will generate and download `final_output.csv` automatically with computed pricing

#### Developer Info

Project developed by Anantha Rohan Krovvidi

GitHub: [KRohanGit](#)