

# **Problem Definition**

Pricing Optimization for Armenian Cafes and Restaurants

**Course:** DS223 – Marketing Analytics

**Instructor:** Karen Hovhannisyan

## **Team Members:**

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Frontend Developer	Areg Khachatryan
Data Scientist	Shushan Gevorgyan

## 1. Context

In Armenia's competitive café and restaurant sector, pricing decisions are frequently based on intuition or competitor imitation rather than on data-driven insights. Business owners often adjust prices according to market trends or nearby competitors without evaluating how these changes influence demand, customer satisfaction, or overall profitability. This lack of analytical pricing frameworks results in fluctuating revenue, limited forecasting capability, and inefficient promotional strategies.



## 2. Problem Statement

Cafés and restaurants in Armenia lack the analytical infrastructure and tools required to test and optimize pricing strategies. Without quantitative models, price changes are made reactively, leading to uncertain profit margins and an incomplete understanding of price sensitivity among customers. The challenge lies in creating a solution that balances affordability for consumers and profitability for businesses through evidence-based pricing decisions.

## 3. Analytical Objective

The objective of this project is to design a data-driven pricing optimization framework that identifies optimal price points for café and restaurant products based on simulated and empirical data. The system should allow managers to predict how changes in price affect demand and revenue, and to make informed decisions supported by quantitative metrics.

## 4. Methodology

To address this problem, the team will apply a combination of marketing analytics and econometric techniques, including:

- **A/B Testing** – Compare multiple price levels for the same product to identify which generates higher revenue or conversion.
- **Regression Analysis / Price Elasticity Modeling** – Quantify how sales volume changes as a function of price.
- **Customer Segmentation (optional)** – Cluster customers by purchasing behavior or sensitivity to price changes.
- **Uplift Modeling (optional)** – Estimate the causal effect of promotions or discounts on customer responses.
- **Bass Diffusion Model (optional)** – Forecast adoption and popularity of newly introduced menu items.

Data will be generated through research of current café and restaurant menu prices in Yerevan, reflecting real-world market conditions. These data points will then be interpolated and simulated to construct a representative dataset that captures price variations, seasonal demand, and purchasing patterns typical of Armenia’s food service industry.

## 5. Implementation Plan

The proposed system will be implemented using a modular architecture:

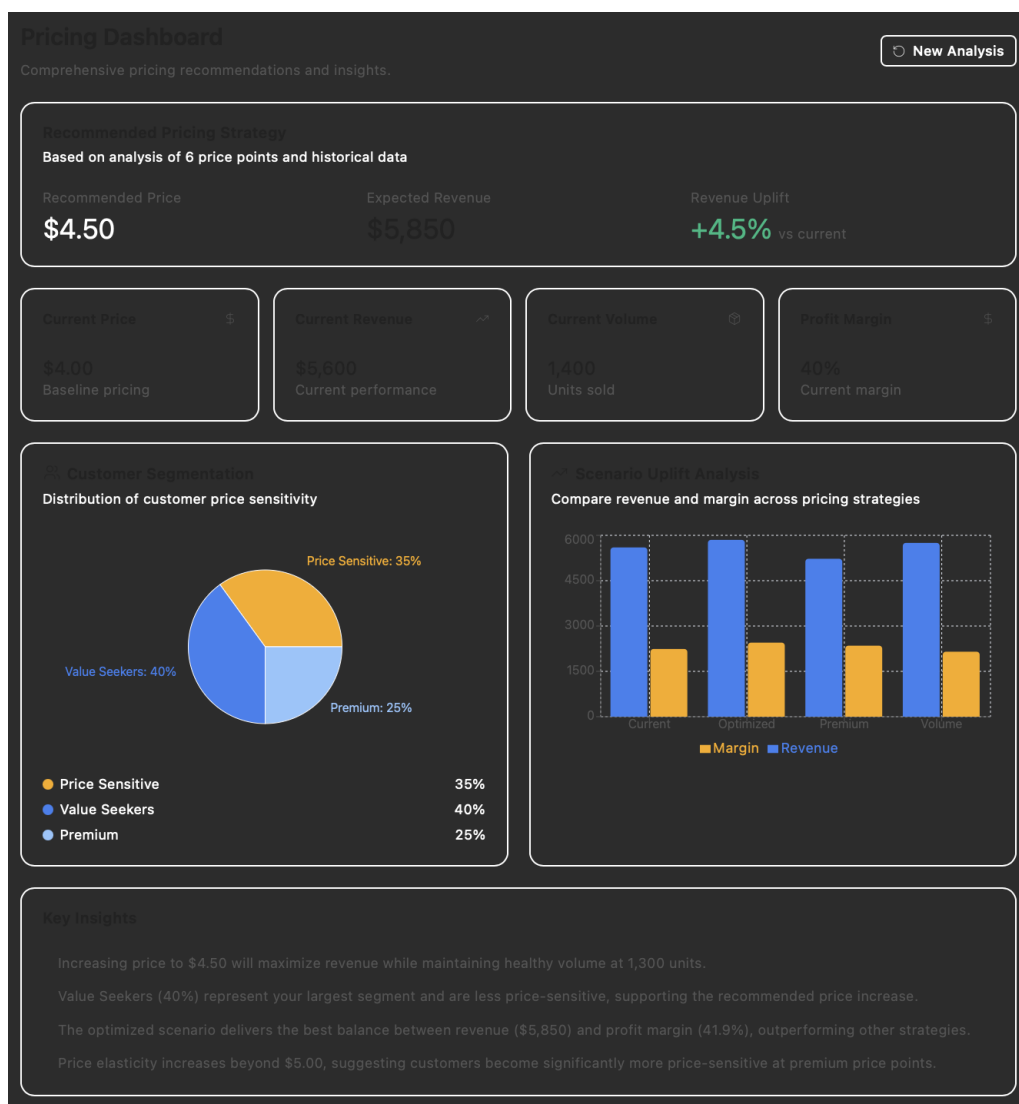
- **Python** for data preprocessing, analysis, and model development.
- **FastAPI** for backend services and model deployment.
- **Streamlit** for frontend visualization and user interaction.
- **SQLite/PostgreSQL** for data storage and management.

The application will allow users to input or upload pricing data, run simulations, visualize elasticity and demand curves, and receive recommendations for optimal prices.

## 6. Expected Outcomes

The project is expected to deliver:

- A working prototype of a pricing optimization dashboard tailored for Armenian cafés and restaurants.
- Quantitative evidence showing the relationship between price, demand, and revenue.
- Visual analytics tools that communicate results clearly to decision-makers.
- Improved accuracy and consistency in pricing strategies through data-driven analysis.



## 7. Evaluation Metrics

The performance and impact of the solution will be evaluated based on:

- Statistical accuracy of models ( $R^2$ , RMSE, uplift accuracy).
- Improvement in predicted revenue under optimized pricing.
- User interface clarity and interpretability.
- Practical applicability of recommendations for real businesses.

## 8. Conclusion

This project aims to bridge the gap between intuition-based and evidence-based pricing in Armenia's hospitality sector. By integrating analytical modeling, simulation, and visualization, the solution will provide a scalable and interpretable tool that supports sustainable business decisions in the food and beverage industry.