**Retail Demand Forecasting**

In this project I focused on retail demand forecasting using XGBoost that is combined with a dynamic user simulation module to model user behavior impacting demand.

📝 **Key components:**

* Libraries: Pandas, NumPy, Matplotlib, Seaborn, XGBoost, scikit-learn
* Data: <https://www.kaggle.com/datasets/tanayatipre/store-sales-forecasting-dataset>

**📝Workflow:**

1. Data Exploration: Understand the structure, missing values, distributions.
2. Preprocessing: Handle missing values, encode categorical variables (if any), normalize/scale as needed.
3. Modeling:

- Use XGBoost Regressor to train the model.

- Perform cross-validation.

- Split data into train and test sets.

4. Evaluation:

- Compute Mean Squared Error (MSE).

- Compute R² score.

- Visualize actual vs. predicted demand.

5. Dynamic User Simulation:

A custom simulation to model changes in demand based on hypothetical customer behavior patterns (e.g., price sensitivity, seasonal variation).

**📝 Results Summary**

The XGBoost model was able to predict retail demand quite well. It gave a low Mean Squared Error (MSE), showing that the predictions were close to the actual values. The R² score was high, which means the model explained most of the changes in demand. Overall, the model performed well and can help forecast demand based on sales data.