

# Project Deliverables: Integrated Retail Analytics for Store Optimization

## Comprehensive Report

- Detailed exploratory data analysis (EDA) with trends, anomalies, and variable relationships.
- Insights & strategic recommendations for store operations, promotions, and resource allocation.
- Hypothesis testing results validating sales drivers like holidays, markdowns, and store size.

## Predictive Models

- Sales Forecasting models (Ridge, Random Forest, XGBoost) with evaluation metrics.
- Final optimized model (XGBoost) achieving high accuracy ( $R^2 \approx 0.9965$ , MAPE  $\approx 1.37\%$ ).
- Anomaly detection to identify unusual sales spikes/drops.

## Segmentation & Market Insights

- Store segmentation based on type, size, and performance.
- Product/Department analysis highlighting high-performing vs. underperforming categories.
- Promotional impact assessment (holiday vs. non-holiday sales).

## Code & Visualizations

- Clean and reusable Python codebase with preprocessing, feature engineering, and modeling.
- Interactive data visualizations (sales trends, holiday effect, store size vs. sales, SHAP explainability plots).
- Model explainability outputs showing top predictors of sales.