Smart Stock Inventory Optimisation

Predicting Product Sales Using Machine Learning

Presented by: Data Science Team

Our objective is to revolutionise inventory management by accurately forecasting daily sales, ensuring optimal stock levels and enhanced operational efficiency for retail stores.

The Inventory Dilemma: Overstocking vs. Understocking

Overstocking Challenges

Understocking Pitfalls

Our Dataset: A Comprehensive View of Retail Dynamics

We leveraged a rich retail store inventory dataset, comprising approximately 70,000 records, to train and validate our forecasting models.

- Approximately 70,000 records covering diverse retail operations.
- Rich mix of numerical, categorical, and time-series features.
- Daily sales data capturing critical identifiers, context, and operational metrics.

Model Development: Building Predictive Power

We explored two robust machine learning models to forecast unit sales, focusing on their ability to handle complex retail data.

Random Forest Regressor

Served as our baseline model, known for its ensemble learning capabilities and robustness against overfitting.

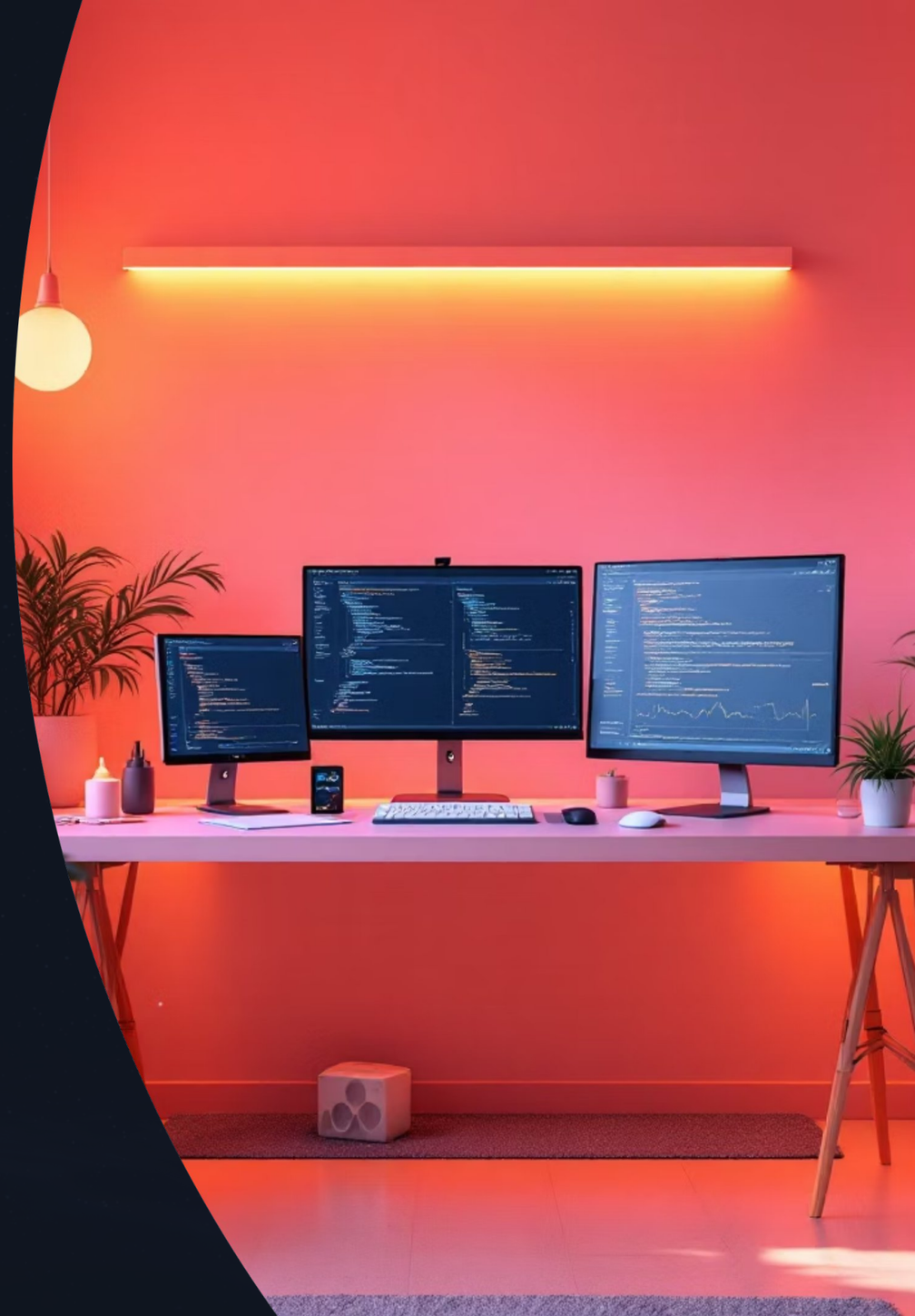
XGBoost (Gradient Boosting)

Implemented to potentially achieve higher accuracy, renowned for its performance in structured data prediction tasks.

Target Variable: Units Sold

Data Split: 70% for training, 30% for testing

Output: Predictions rounded to integers for practical inventory application



Random Forest Regressor: A Strong Baseline

The Random Forest Regressor demonstrated strong predictive capabilities, accurately forecasting sales within a narrow margin of error.

7.26

Mean Absolute Error (MAE)

Average magnitude of the errors in a set of predictions, without considering their direction.

8.51

Root Mean Squared Error (RMSE)

Measures the square root of the average of the squared errors, giving higher weight to larger errors.

5.30%

MAE % of Mean Sales

Indicates the percentage error relative to average sales, showcasing practical accuracy.

Optimal Parameters: n_estimators=300, max_depth=20, min_samples_split=5

This model provided accurate predictions, generally within 7 units of actual sales, establishing a solid foundation for inventory forecasting.

Key Findings: Random Forest Leads the Way

Best Model Identified

The **Random Forest Regressor** emerged as the superior model, demonstrating lower error rates and more stable predictions for our dataset.

Critical Predictors

Insights revealed that **lag features** (historical sales) and **rolling averages** are highly influential in accurate sales forecasting.

This analysis provides a clear direction for implementing an effective inventory forecasting system, leveraging the identified strengths of the Random Forest model.

Thank You!

We are confident that this Machine Learning-driven approach to inventory forecasting will significantly enhance operational efficiency and profitability for retail businesses.

Questions?

Feel free to reach out to our team for further discussion.