

Sales Forecasting Using Machine Learning

Internship Project

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Machine Learning Domain

Implemented using Python (Google Colab)

Introduction

- Sales forecasting predicts future revenue using historical data.
 - Helps businesses plan inventory, pricing, and marketing.
 - Machine Learning improves forecasting accuracy.
 - Data-driven decisions reduce business risks.

Problem Statement

- Businesses face uncertainty in predicting sales.
 - Manual estimation methods lack precision.
 - Need for automated predictive modeling.
 - Goal: Build ML model for sales prediction.

Project Objectives

- Develop a sales forecasting model.
 - Analyze impact of advertising and pricing.
 - Evaluate model using error metrics.
 - Generate business recommendations.

Dataset Overview

- 24 months of sales data.
 - Features:
 - • Month
 - • Advertising Spend
 - • Price
 - • Sales (Target Variable)

Exploratory Data Analysis

- Visualized monthly sales trend.
 - Observed fluctuations across months.
 - Advertising shows positive influence on sales.
 - Pricing impacts demand levels.

Model Selection

- Linear Regression selected as baseline model.
 - Simple and interpretable algorithm.
 - Suitable for continuous value prediction.
 - Helps understand feature relationships.

Model Training Process

- Dataset split into 80% training and 20% testing.
 - Model trained using Advertising Spend and Price.
 - Predictions generated on unseen test data.
 - Model performance evaluated.

Model Evaluation Metrics

- Mean Absolute Error (MAE): 224.19
 - Mean Squared Error (MSE): 69843.81
 - MAE represents average prediction error.
 - MSE penalizes larger prediction errors.

Interpretation of Results

- Average prediction error \approx 224 sales units.
 - Model shows moderate prediction capability.
 - Performance can improve with more data.
 - Advanced models may enhance accuracy.

Business Insights

- Higher advertising spend increases sales.
 - Pricing significantly impacts revenue.
 - Forecasting helps optimize inventory.
 - Supports data-driven strategic planning.

Strategic Recommendations

- Increase marketing during low-demand months.
 - Optimize pricing strategies.
 - Continuously retrain model with new data.
 - Use forecasting for demand planning.

Challenges & Limitations

- Small dataset (24 months).
 - Limited seasonal features included.
 - Random sample data used for demonstration.
 - Model simplicity limits complex pattern detection.

Future Enhancements

- Implement Random Forest or XGBoost.
 - Incorporate holiday and seasonal data.
 - Apply time-series models (ARIMA/LSTM).
 - Deploy model as web application.

Conclusion

- Machine Learning effectively predicts sales trends.
 - Model achieved MAE: 224.19 and MSE: 69843.81.
 - Provides actionable business insights.
 - Supports informed and strategic decisions.