

LightGBM based Machine Learning Approach for Sales Prediction

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Abstract: *The importance of the sales forecasting is known in the industry of different businesses, which could handle the inventory properly, allocate the resources in order to maintain a balance and do strategic decisions. This work predicts sales with the help of machine learning driven framework by predicting sales using LightGBM, which is a gradient boosting algorithm best suited for structured data. And it was shown using Walmart's historical sales data but should be applicable to any retail organization, e-commerce platform, or enterprise with future sales projections; handles missing values, time based feature extractions and interaction engineered variables during pre-processing of the data. Finally, the fact that model performance optimization is optimized based on Hyperparameters with Optuna, and these predicted reductions in sales rates are measured using metrics such as Root Mean Squared Error (RMSE), Mean Absolute Error (MAE), R^2 score indicate that by massive improvement in LightGBM and with advanced feature engineering and hyperparameter tuning, sales forecasting accuracy can be greatly improved. Future work is then to embed the marketing campaign, economic trends and seasonal fluctuations into the model to generate more accurate predictions for other business applications.*

Keywords: Sales Forecasting, LightGBM, Predictive Analytics, Retail Sales Prediction, Feature Engineering

