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Machine Learning for Food Demand Prediction: A CatBoost Regression Model

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Abstract

Accurately forecasting food demand is crucial for optimizing supply chain effciency and reducing waste. This study presents a machine learning approach utilizing the CatBoost algorithm to predict food demand based on historical data. By leveraging features such as promotion activity, meal types, and customer center information, the model was trained using a dataset aggregated from multiple sources. Data preprocessing involved handling missing values and categorizing features. The model's performance was evaluated using key metrics such as R^2, Mean Absolute Error (MAE), and Root Mean Squared Error (RMSE). Results demonstrate that the CatBoost Regressor achieves a high prediction accuracy ($R^2 = 80.08$) compared with other algorithms such as linear regression (R2 =7.73), Gradient Boosting Regressor (R2=45.52), Extreme Gradient Boosting(R2=64.91), Random Forest Regressor algorithm (R2=46.49), making it a reliable tool for improving food supply chain decisions.

Keywords: CatBoost Regression, Food Demand Prediction, Supply Chain Optimization

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