

Final Assignment Report: Food Delivery Time Prediction

Title

Food Delivery Time Prediction Using Machine Learning

Objective

To predict the estimated delivery time of food orders using historical order and delivery data, improving customer experience and operational efficiency.

Problem Statement

Food delivery platforms must accurately estimate delivery time considering multiple dynamic factors. Manual estimation is unreliable, hence a data-driven predictive approach is required.

Dataset Description

- Order details (order time, preparation time)
- Restaurant location (latitude, longitude)
- Customer location (latitude, longitude)
- Distance between restaurant and customer
- Delivery time (target variable)

Data Preprocessing

- Removed missing and inconsistent values
- Renamed and matched column names correctly
- Calculated distance using latitude and longitude
- Converted time-related features into numerical format
- Removed irrelevant or redundant columns

Feature Engineering

- Distance between restaurant and customer
- Order preparation duration
- Time of order (hour-based patterns)
- Encoded categorical data where required

Exploratory Data Analysis (EDA)

- Analyzed distribution of delivery time
- Observed strong dependency on distance
- Identified outliers affecting delivery duration
- Checked correlation between features

Model Selection

- Linear Regression

- Decision Tree Regression
- Random Forest Regression (best performing)

Model Training

- Split data into training and testing sets
- Trained models on historical data
- Tuned parameters to reduce prediction error

Evaluation Metrics

- Mean Absolute Error (MAE)
- Mean Squared Error (MSE)
- Random Forest achieved the lowest error

Results

- Distance is the most influential feature
- Random Forest provided accurate and stable predictions
- Prediction error reduced significantly compared to baseline

- **Conclusion**

The machine learning model successfully predicts food delivery time with good accuracy. Such models can help food delivery platforms provide reliable ETAs and improve customer satisfaction.

- **Future Scope**

- Include real-time traffic and weather data
- Use GPS-based live tracking
- Deploy model as an API for real-time prediction
- Experiment with deep learning models

- **Tools & Technologies Used**

- Python
- Pandas, NumPy
- Scikit-learn
- Jupyter Notebook