Predicting Time of Arrival for Food Delivery Service

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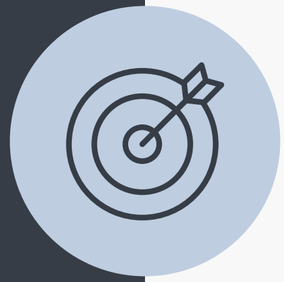
Overview

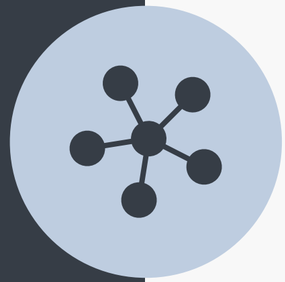


Problem

Understand problem background

Data

Data preparation and cleansing to perform modeling



Modeling

Overview and results of predictive models

Problem Background

MOTIVATION FOR CREATING PREDICTIVE MODEL

The Problem

MOTIVATION FOR CREATING PREDICTIVE MODEL

01. This analysis aims to predict estimated delivery times for a food delivery service.

02. With the increasing use of delivery systems, companies like Amazon, would want to know obstacles that may affect estimated delivery time.

03. Providing accurate estimates to the customer will help manage expectations, which may lead to retained customers.

Data Preparation

DATA CLEANSING REQUIRED FOR MODELING

Data Prep.

Data Cleansing required for modeling

01. Combines and cleans 65,000 text files resembling each row of the data. Includes 19 total features.

02. Uses K-Nearest Neighbors (kNN) to impute missing factor data.

03. Uses predictive-mean matching (PMM) to impute missing numeric data.

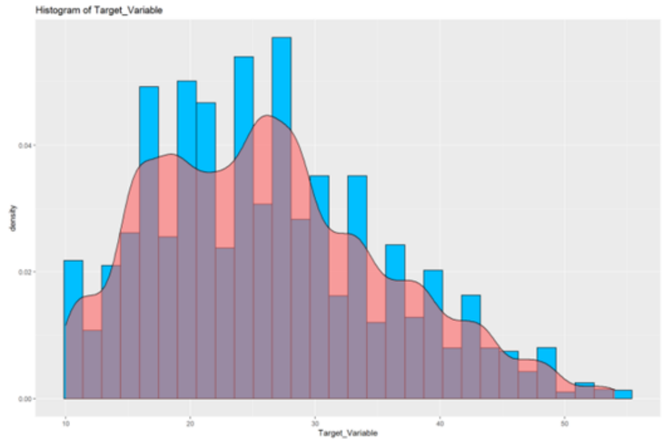
04. Normalizes highly skewed distributions, including the target variable.

05. No factor-lumping is required due to limited unique values.

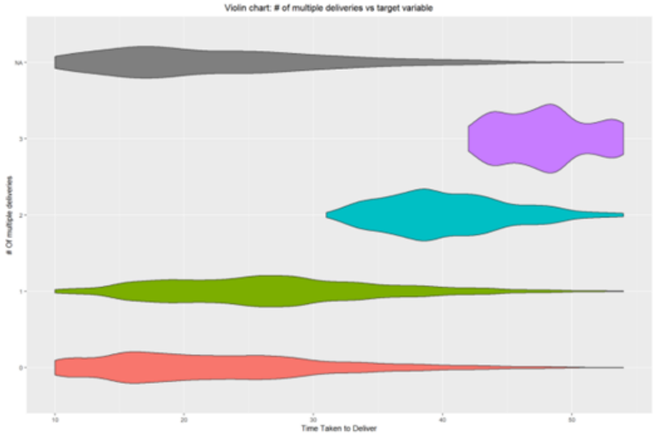
Data Exploration

UNDERSTANDING RELATIONSHIPS WITHIN THE DATA

Data Exploration



Target Variable:
Delivery Time



Multiple Deliveries
vs. Delivery Time

Rating vs. Delivery Time

Modeling

CONCEPTS AND RESULTS OF CREATING PREDICTIVE MODELS

Modeling Overview

01. Used various machine learning algorithms to predict the time to deliver orders.

02. Goal: reduce the root-mean-squared error (RMSE) by comparing modeling performance.

OLS Results

A stepwise variable selection process is carried out to simplify the model without impacting much of the performance.

RMSE	01	0.786
Adj. R-Squared	02	0.551

MARS Results

RMSE	01	0.761
Adj. R-Squared	02	0.580
Degree	03	1
Prune	04	23

Elastic Net Results

RMSE	01	0.787
Adj. R-Squared	02	0.551
Alpha	03	0.4
Lambda	04	0.0011129

PCR Results

RMSE	01	0.787
Adj. R-Squared	02	0.551
ncomp	03	15

Decision Tree Results

RMSE	01	0.840
Adj. R-Squared	02	0.487
cp	03	0.00655

Random Forest Results

RMSE	01	0.649
Adj. R-Squared	02	0.464
mtry	03	6

Gradient Boosted Results

RMSE	01	0.669
Adj. R-Squared	02	0.675
Max Depth	03	3
eta	04	0.3
nrounds	05	150

Model Conclusion

Model	Function or Package	Hyperparameters	RMSE	Adj. R-Squared
Random Forest	rf	mtry = 6	0.649	0.464
Gradient Boost	xgbTree	max_depth = 3 eta = 0.3 nrounds = 150	0.669	0.6751
MARS	caret and earth	Degree = 1 nprune = 23	0.761	0.580
OLS	lm	N/A	0.786	0.551
Elastic Net	caret and elasticnet	Alpha = 0.4 Lambda = 0.0011129	0.787	0.551
PCR	pcr	ncomp = 15	0.787	0.551
Decision Tree	rpart	cp = 0.0065568	0.840	0.487

Summary

Delivery Problem

Data Cleansing

Predictive Models