
Predicting Shipping On-time Performance

— Winston Zhong —

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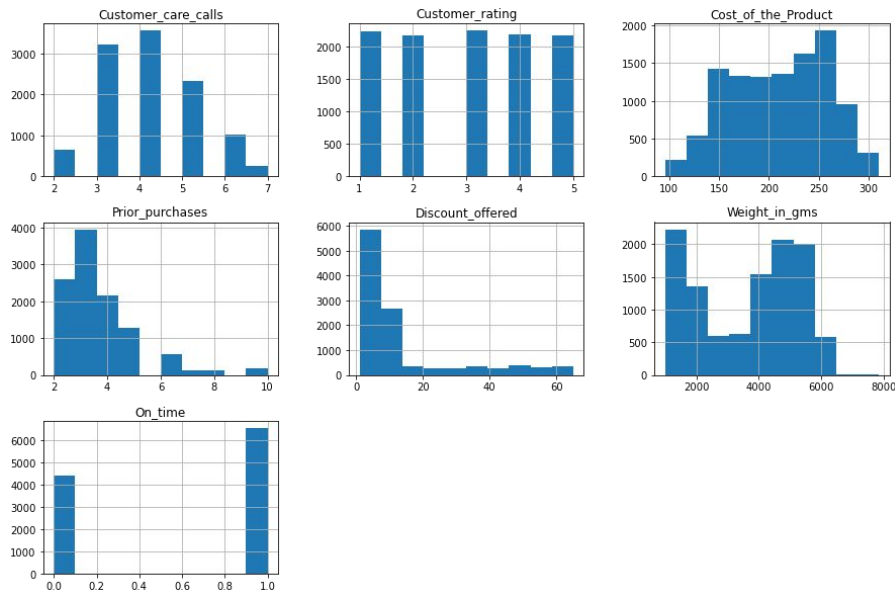
Introduction

- E-commerce company wants to improve shipping on-time performance
- Developed classification model to predict whether a shipment will arrive on time or not
- Use model to see which factors had the most effect on shipping performance



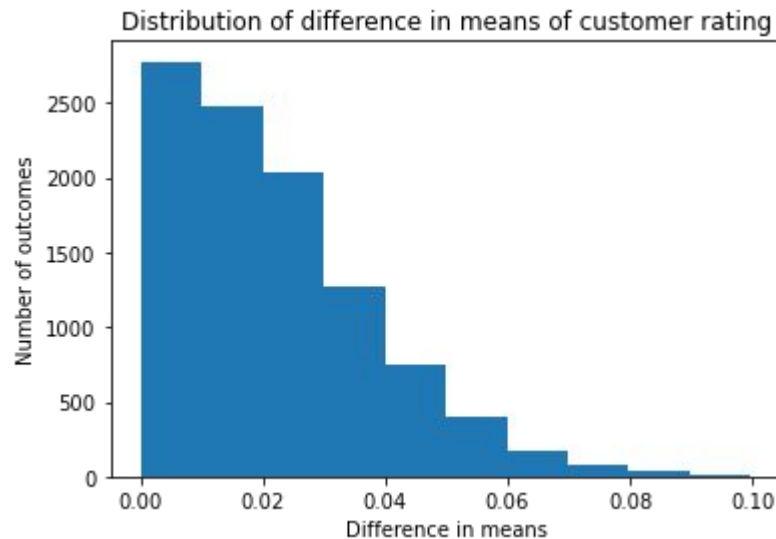
Data Acquisition and Wrangling

- Data from Kaggle
- Remove ID column, strip spaces, rename column name

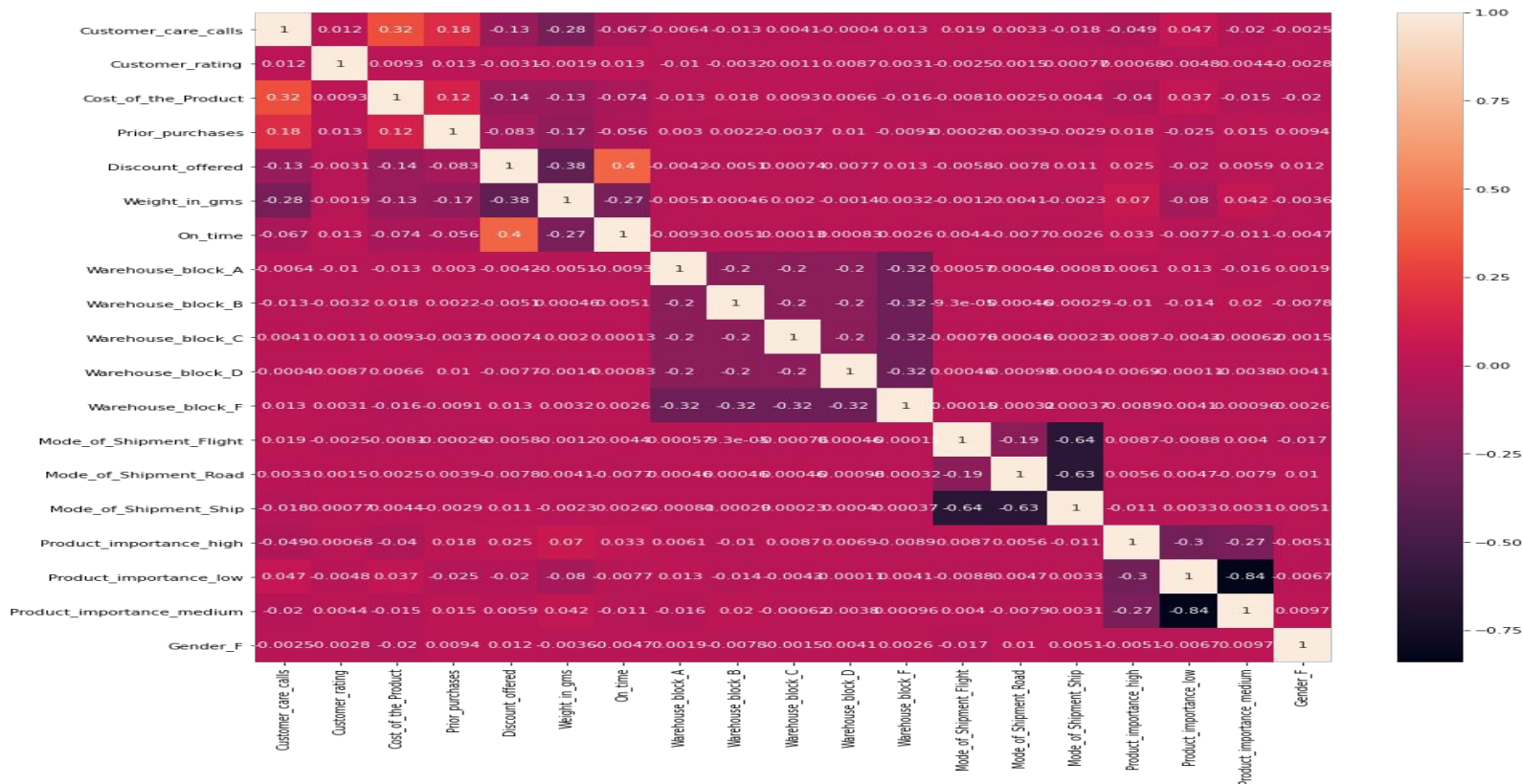


Exploratory Data Analysis

- Overall on time rate: 40.33%
- On time rate by ship mode:
 - Flight: 39.84%
 - Ship: 40.24%
 - Road: 41.19%
- Average customer rating by result:
 - On time: 2.97
 - Late: 3.01
 - Permutation test showed that averages are not significantly different, p-value = 0.1657

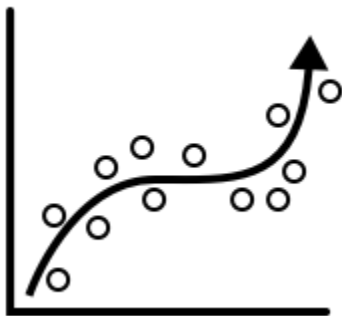


Heat Map After One-hot Encode



Baseline Modeling

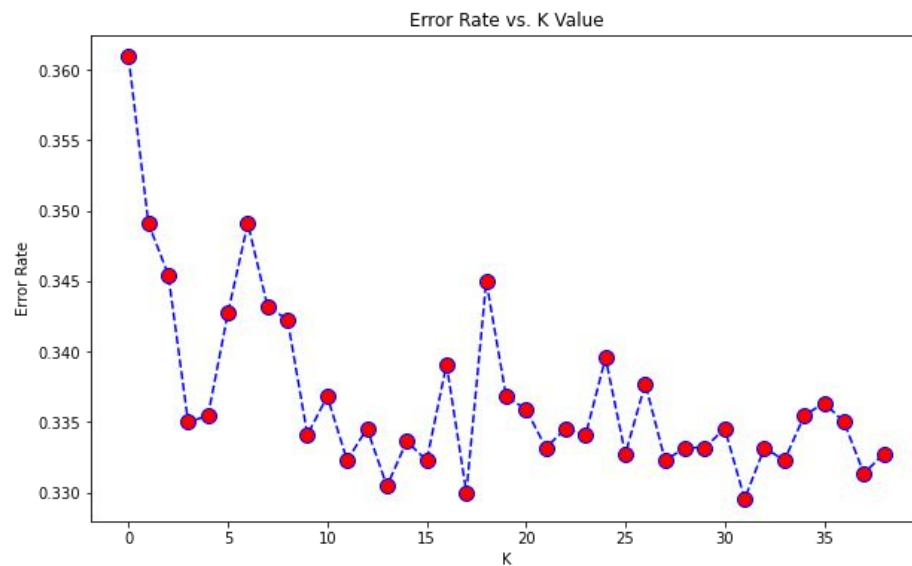
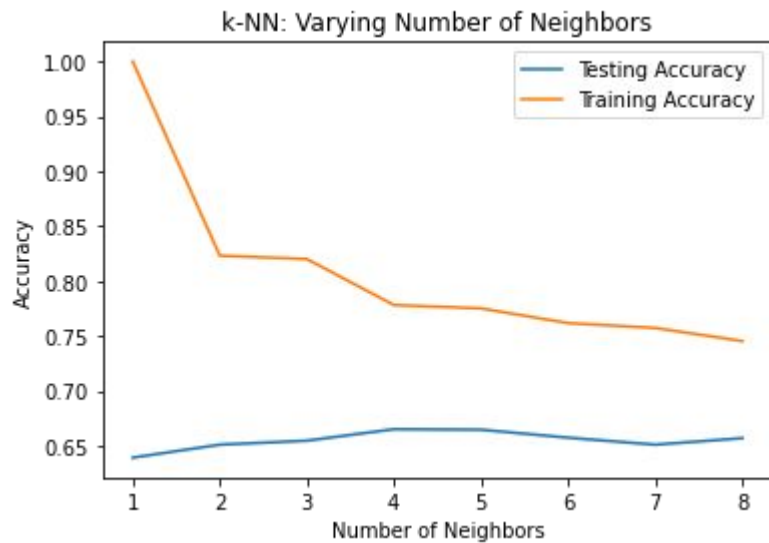
- Logistic regression, K-nearest neighbors, gradient boosting, and decision tree
- Minimize false positives and maximize accuracy score and precision
- Improve models by scaling data and hyperparameter tuning



Logistic Regression

	Accuracy	Precision	False Positives
Default	0.63	0.53	456
Default Scaled	0.63	0.53	443
Tuned	0.63	0.53	444
Tuned Scaled	0.64	0.54	443

KNN



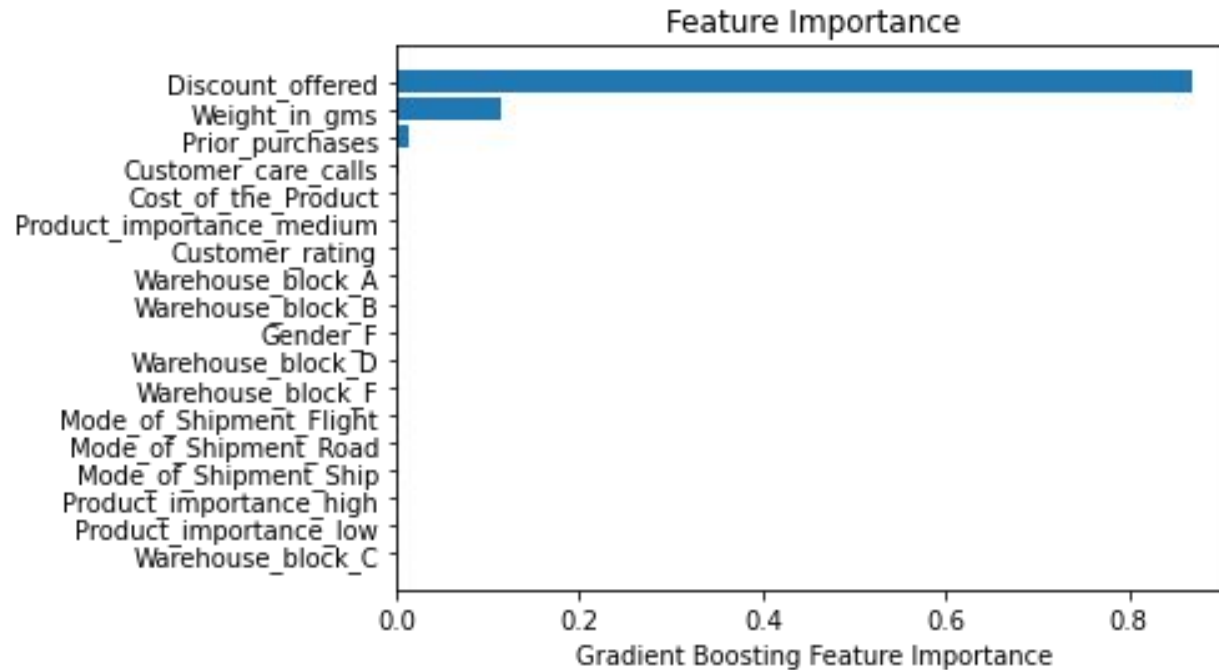
KNN

	Accuracy	Precision	False Positives
Default	0.66	0.57	434
Default Scaled	0.63	0.53	445
K=31	0.63	0.53	456

Gradient Boosting

	Accuracy	Precision	False Positives
Default	0.67	0.55	614
Default Scaled	0.67	0.55	614
Tuned	0.67	0.56	487
Tuned Scaled	0.67	0.55	661

Gradient Boosting Feature Importance

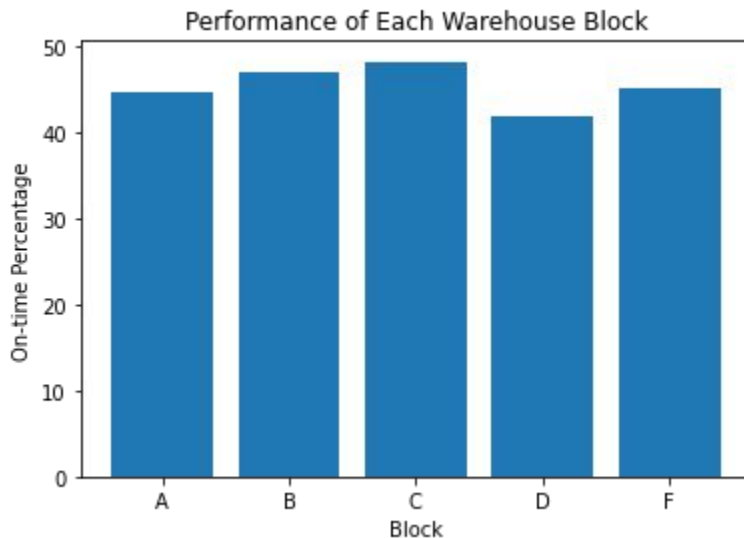


Decision Tree

	Accuracy	Precision	False Positives
Default	0.63	0.53	402
Default Scaled	0.63	0.53	402
Tuned	0.66	0.54	709
Tuned Scaled	0.66	0.54	709

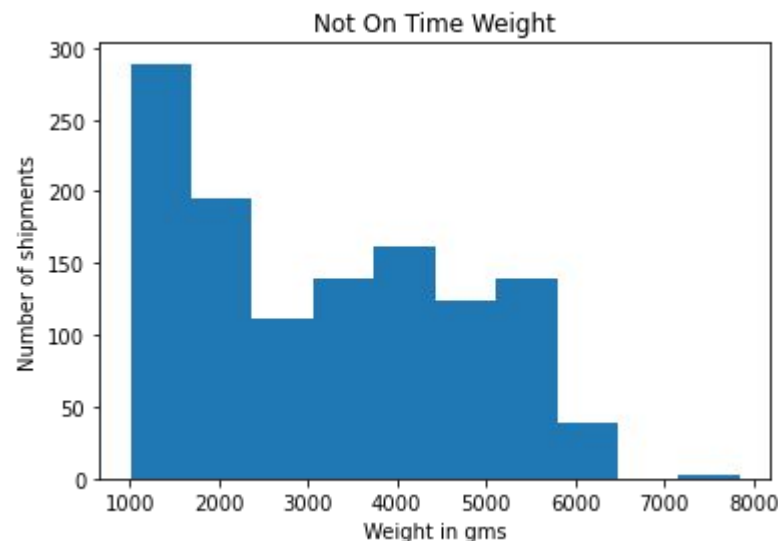
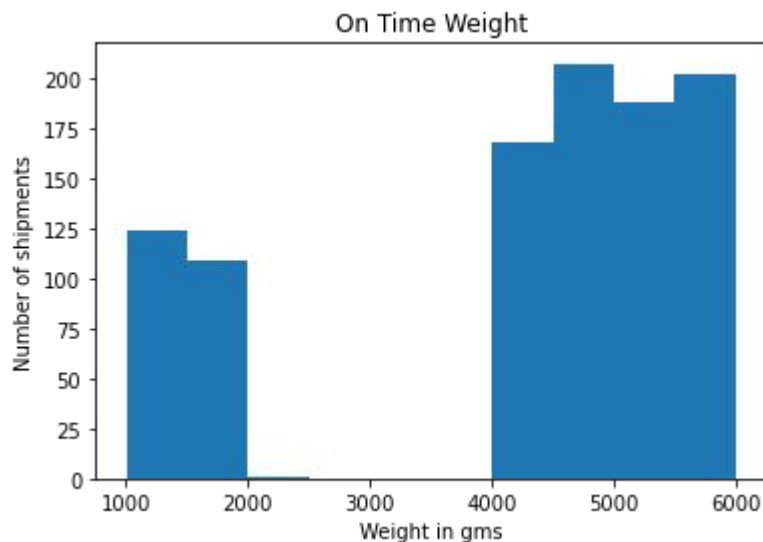
Recommendations

- Move high importance shipments from warehouse block D to warehouse block C
- 20.51% of high importance late shipments not in block C were in block D



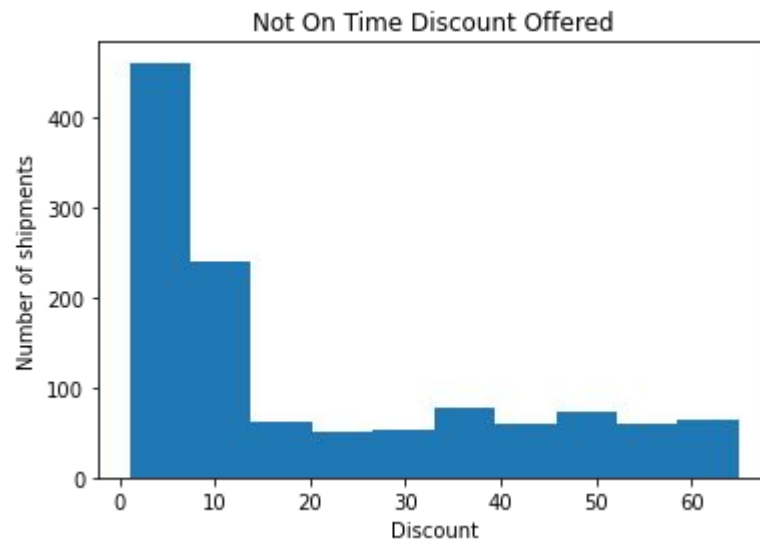
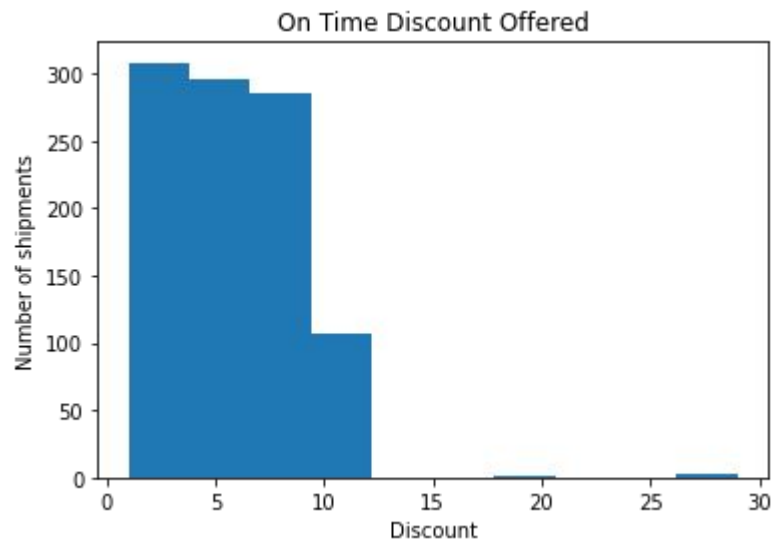
Recommendations

- Shipping performance for products weighing between 2,000 grams and 4,000 grams need to be improved significantly



Recommendations

- Improve shipping for discounts $> 12\%$, especially for discounts $> 30\%$



Future Work

- More features like distance from origin to destination and types of products
- Collect more data to see how changes affect on-time performance

