Springboard Capstone Project 1: Analysis of Online Shopping Dataset

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Kaggle Dataset Repository

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Introduction

Business Problem

- Rapid increase in online shopping leads to need of finding ways to know customer's intention
- Use data from web sessions to answer this question
- Supervised classification data science problem which can be solved using ML classification algorithms

Approach

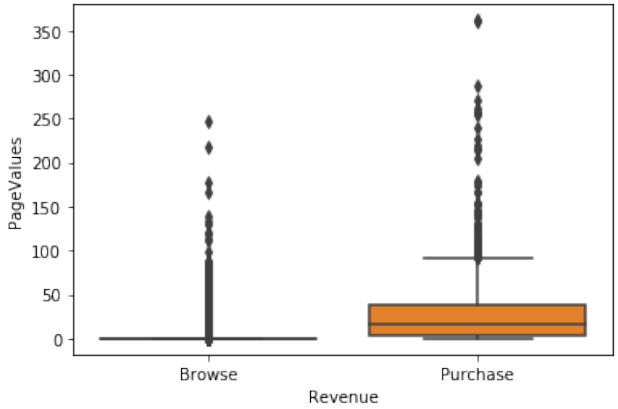
Data Acquisition and Wrangling

- Data was taken from the Kaggle Dataset Repository
- Values of some features are derived from the URL information of the pages visited by the user
- Some features represent the metrics measured by "Google Analytics" for each page in the e-commerce site
- No wrangling was needed and the data was then split into two data sets based on Revenue

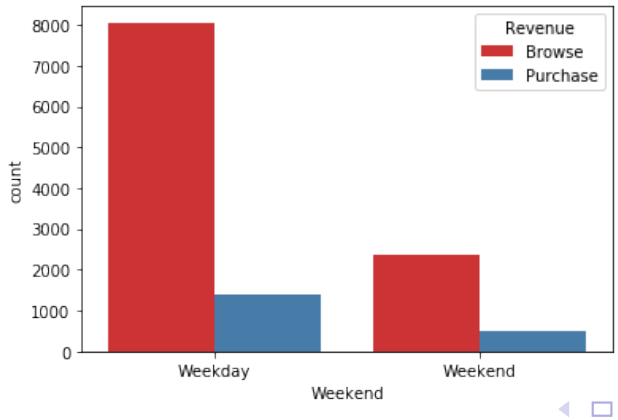
Approach

Descriptive Analysis

- Browsing Customers visit less pages on average than Purchasing Customers illustrated in the boxplot below



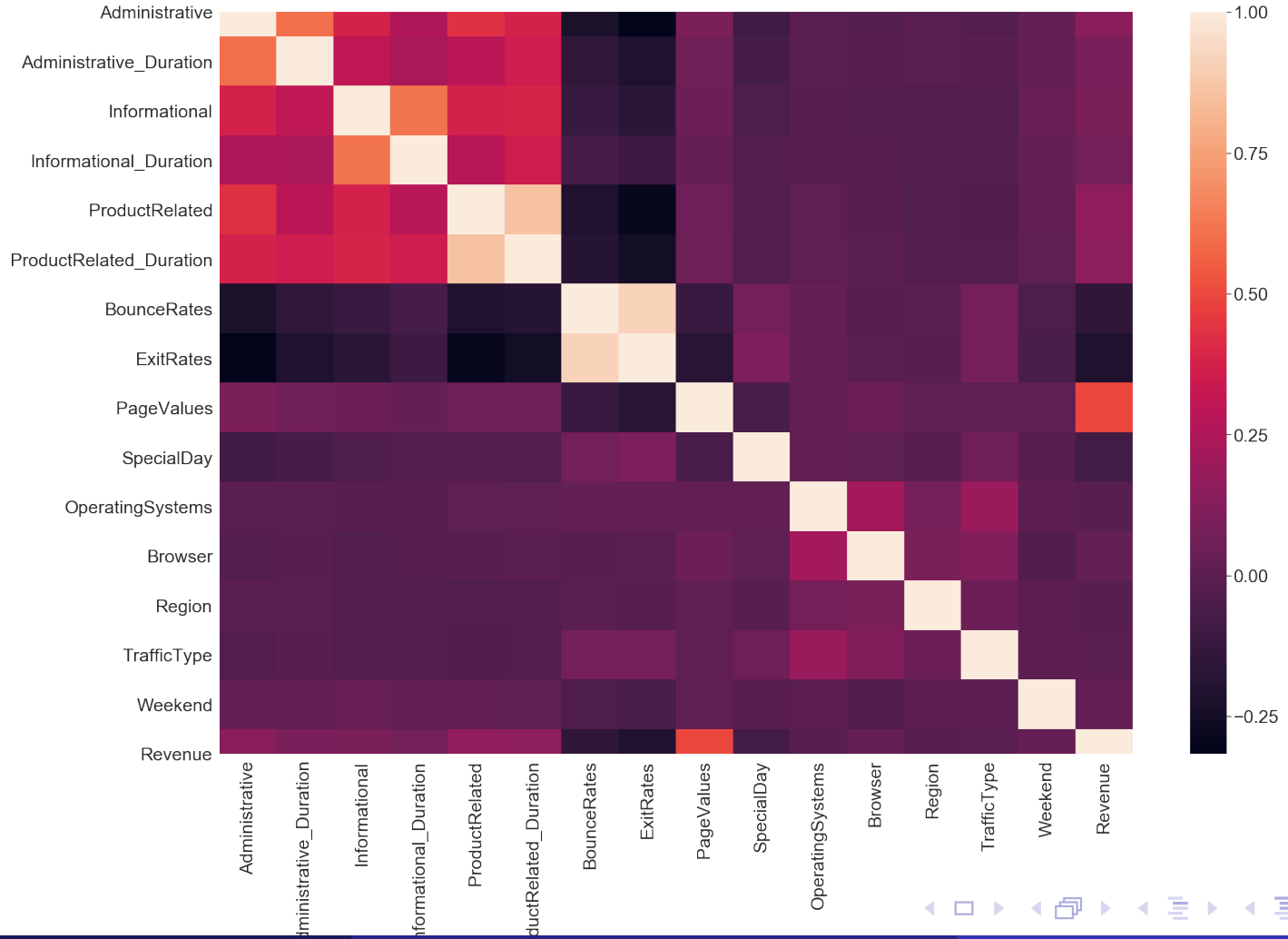
- Ratio between browsing and and purchasing customers is lower on the weekend vs. week days shown in the histogram below



Approach

Correlation

- Based on the plot below the page value rate is the most strongly correlated variable to the session being a purchase



Approach

Hypothesis Testing

- Test four hypotheses described below:
  1. A Special Day is independent of a user making a Purchase
  2. A Returning User is independent of the user making a purchase
  3. Weekends are independent of a user making a Purchase
  4. The Informational Duration means for the two groups of data (Purchase, Browse) are equal.
- There was significant evidence to reject all four hypotheses

Approach

Baseline Modeling

- Baseline models used were:
  1. K-nearest Neighbours Classifier
  2. Logistic Regression Classifier
- The training and test split was 80-20
- Using a 5-fold cross-validation the accuracy of models are as follows:
  1. KNeighbors Accuracy = 0.86 (+/- 0.03)
  2. Logistic Regression Accuracy = 0.88 (+/- 0.01)

Model	User Decision	Precision	Recall	F1 Score	Comments
K-Nearest Neighbors	Browse	0.86	0.98	0.91	Optimized parameters: n = 6
	Purchase	0.62	0.18	0.29	
Logistic Regression	Browse	0.88	0.98	0.92	Optimized parameters: Penalty = l1
	Purchase	0.73	0.3	0.43	C = 0.00021544346900318823

Approach

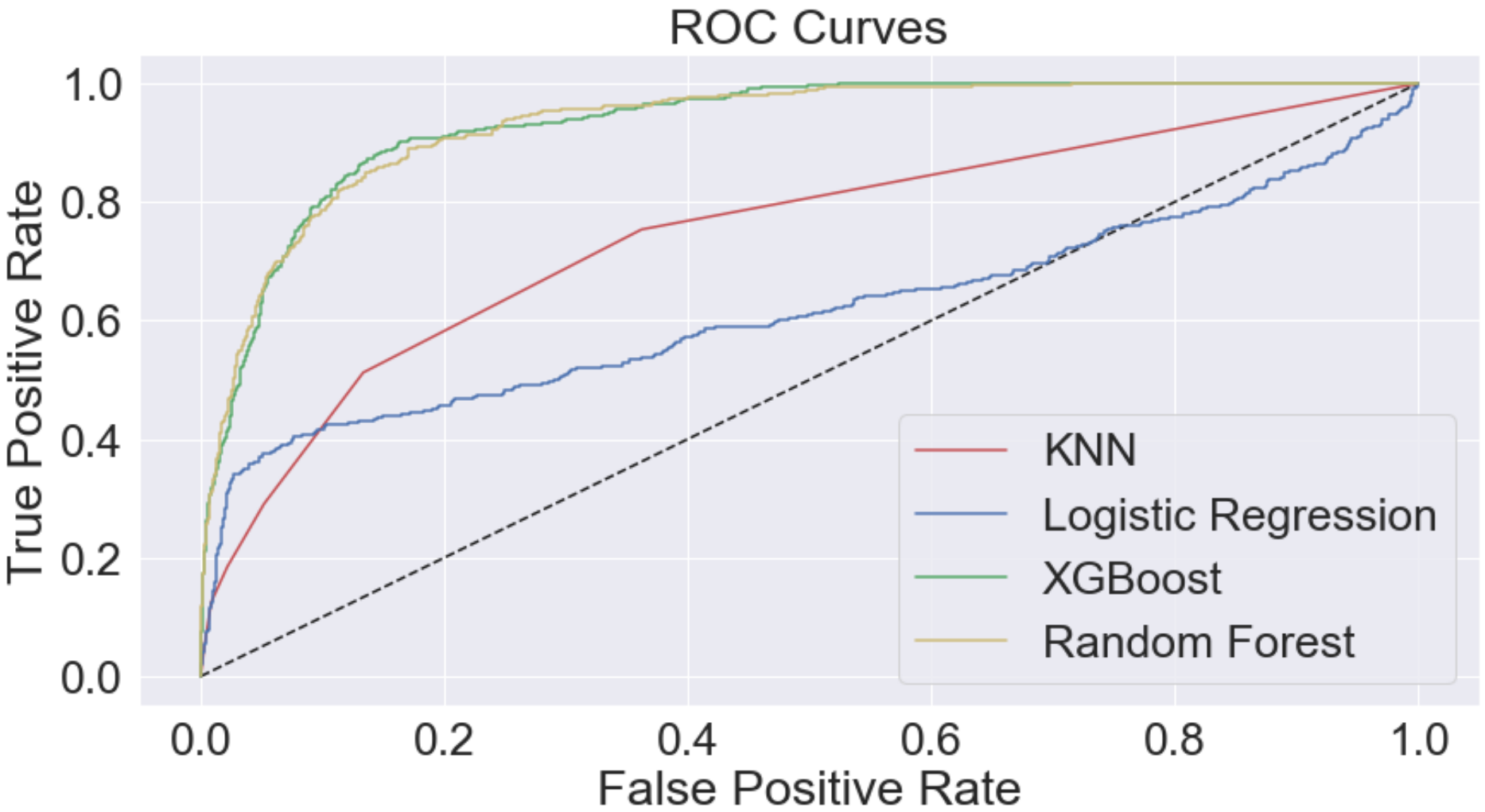
Extended Modeling

- Baseline models used were:
  1. XGBoost Classifier
  2. Random Forest Classifier
- Using a 5-fold cross-validation the accuracy of models are as follows:
  1. XGBoost Accuracy = 0.90 (+/- 0.03)
  2. Forrest Accuracy = 0.89 (+/- 0.03).

Model	User Decision	Precision	Recall	F1 Score	Comments
XGBoost	Browse	0.92	0.96	0.94	Optimized parameters: Learning rate = 0.05, Max Depth = 3, Min Child
	Purchase	0.73	0.56	0.63	Weight = 1, gamma = 0.1 , Colsample by tree = 0.6, n-estimators = 300
Random Forest	Browse	0.92	0.96	0.94	Optimized parameters: n-estimators = 100, Max Depth = 20
	Purchase	0.75	0.56	0.64	Min Sample Split = 12, Min Sample Leaf = 3

Approach

Model Comparisons



Conclusions and Future Work

- Hypothesis tests conclude that weekends and special days impact users decision to make a purchase
- A returning user is not mutually exclusive on the decision to make a purchase
- Model prediction analysis concludes that XGBoost and Random Forest models are the best predictors of classifying a purchase session
- A new or improved product recommendation system can be implemented to encourage more site engagement

Recommendation for the Client

- Recommend using XGBoost Model to predict purchases for sessions
- Look to maximize sales on Special Days and weekend when there is increased site activity
- Recommend implementing a product recommendation system to encourage users to explore more products on the site

Thanks