Predicting collisions severity and probability

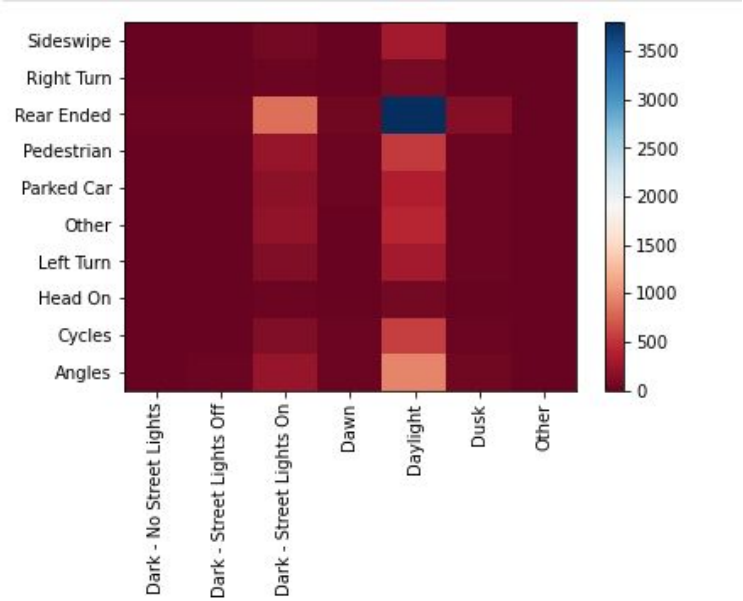
Predicting collision severity and probability is valuable for:

- Transportation and logistics companies
- Travellers
- Taxi drivers
- This prediction could be used in driver support systems to help prevent accidents and reduce number of people's deaths

Data acquisition and cleaning

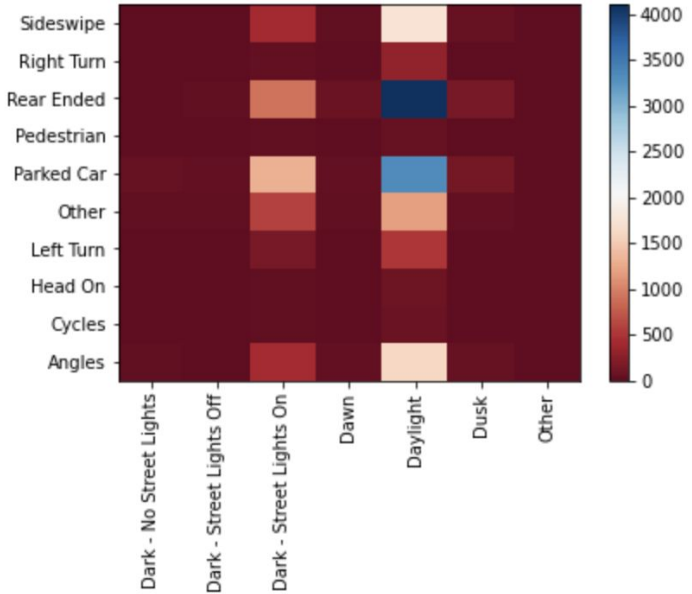
- The dataset in this project has been taken from coursera cloud storage (Data-Collisions.csv)
- Dataset has contains data in term 2004/01/01 to 2020/05/20
- The instant dataset included 192031 rows and 53 features
- Duplicate, highly similar, features with null values were dropped
- Cleaned data contains 16 features

Collisions with injures



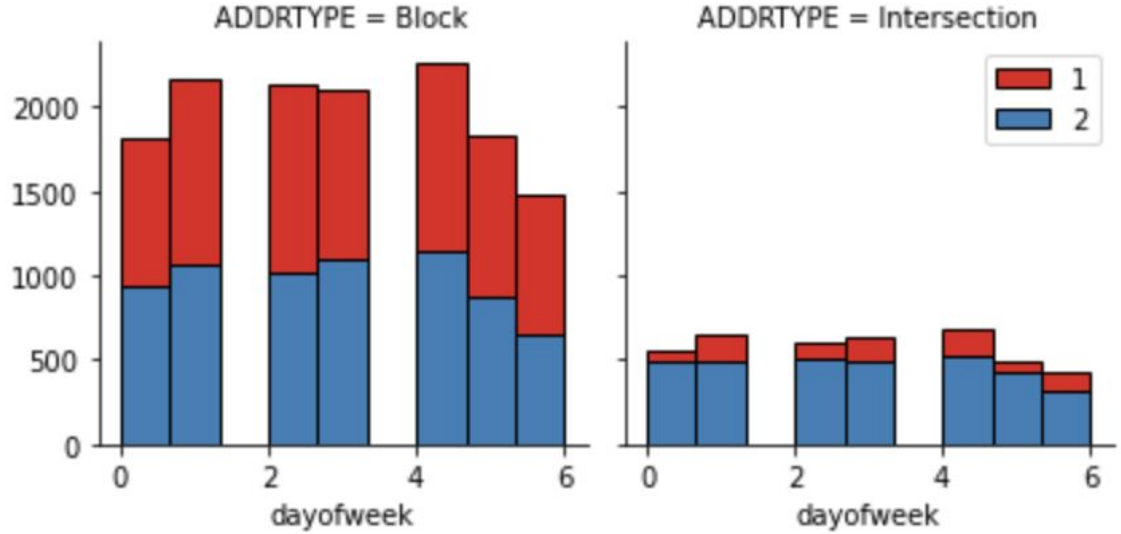
Most of collisions with injuries (severity code - 2) occure at daylight, clear weather, dry road on mid-block road with rear ended type of collision and without influence of drugs or alcohol ($p<0.001$).

Collisions with property damage



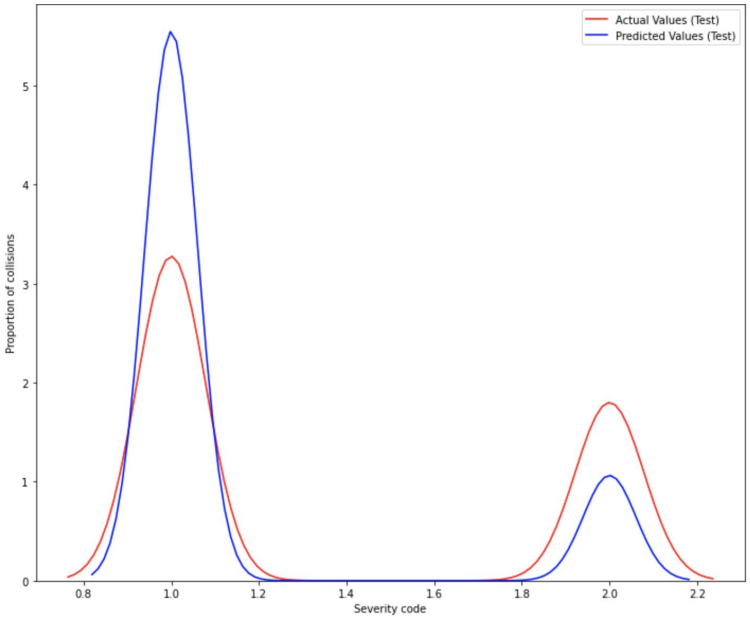
Most of collisions with property damage (severity code - 1) occure at daylight, clear weather, dry road on mid-block road with rear ended and parked car types of collision, without influence of drugs or alcohol ($p<0.001$).

Collisions distribution by days of week and address type of collision

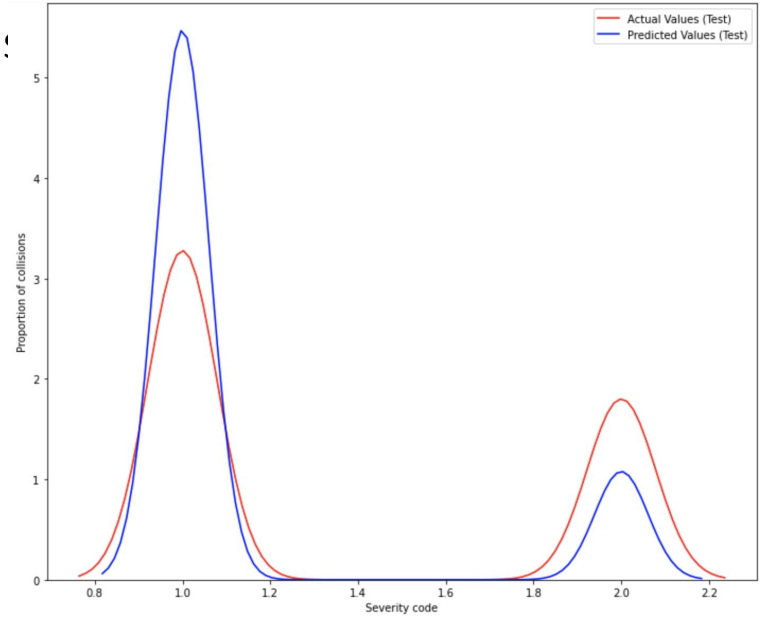


1 - property damage
2 - injuries
Also examined other features and hypotheses, including:
○ The number of people involved in a collision (significant correlation with severity code)
○ The number of vehicles (significant correlation)
○ The number of bicycles (significant correlation)
○ pedestrians count (strong correlation)

Classification models: distribution of predicted and real data looks not bad

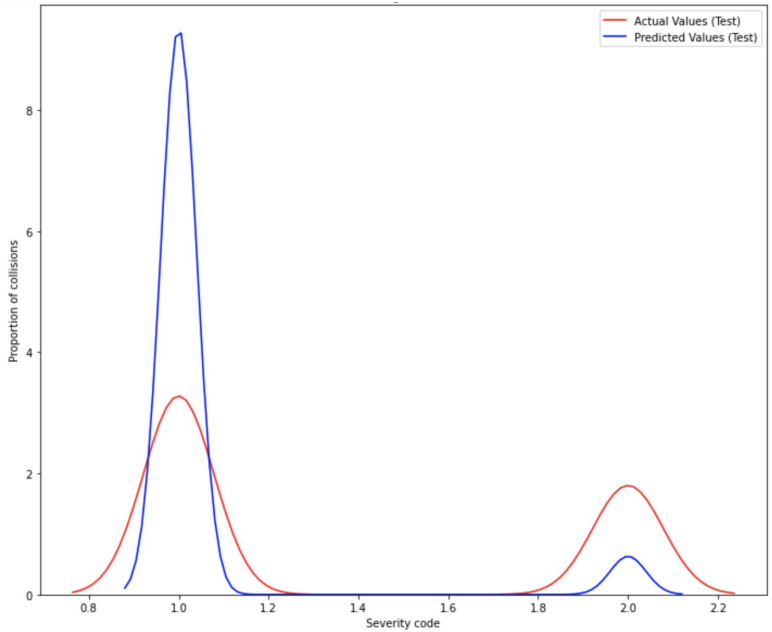


SVM

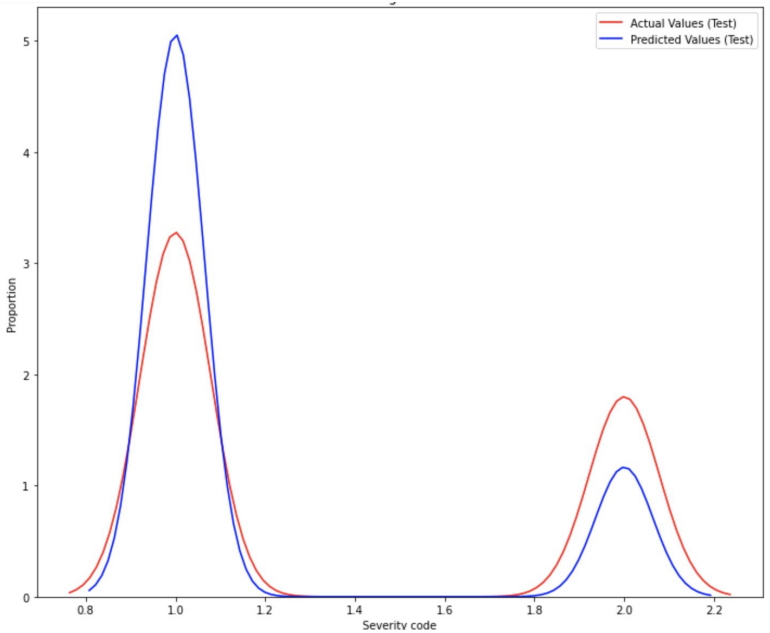


Logistic Regression

Classification models: distribution of predicted and real data looks not bad

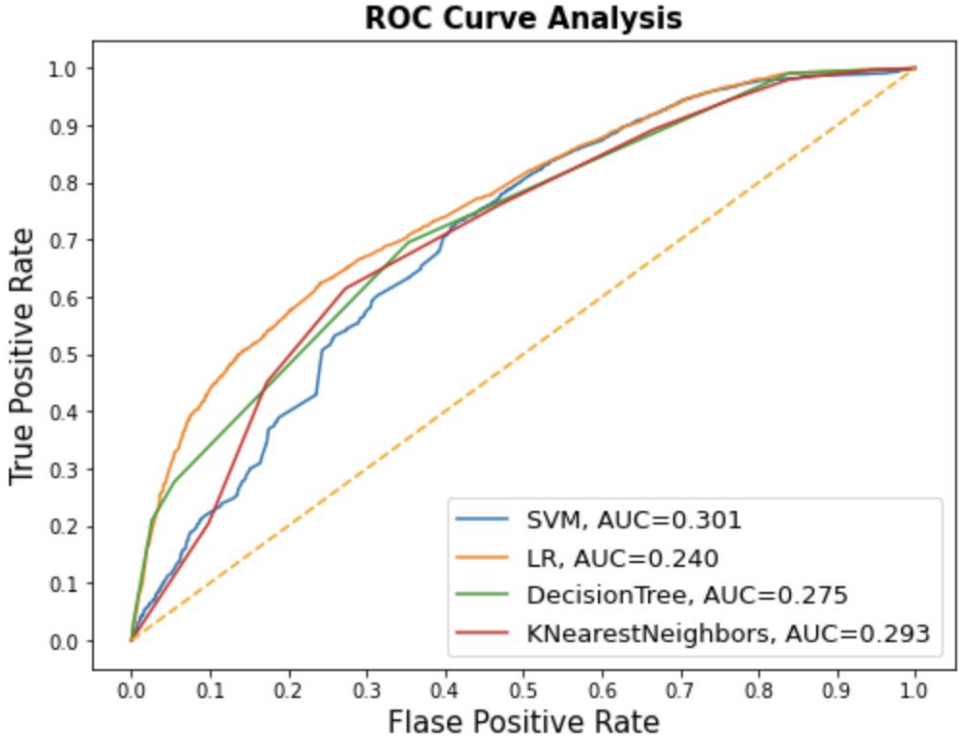


Decision Tree



K-Nearest neighbors

Classification models performance



SVM and Logistic regression have very similar performance. (F1 score=0.68, Jaccard index =0.71)

Logistic Regression has the best ROC curve characteristics (AUC=0.24)

Logistic Regression is the best model for collision probability and severity prediction

Conclusion and future directions

- Built useful models to predict collisions severity and probability
- Accuracy of the models is quite high
- Capture more features
- Ideas include: car makes, car conditions, manufacturing date of a car