# Car Accident Severity

Applied Data Science Capstone Project Report

**Coursera**

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# Introduction

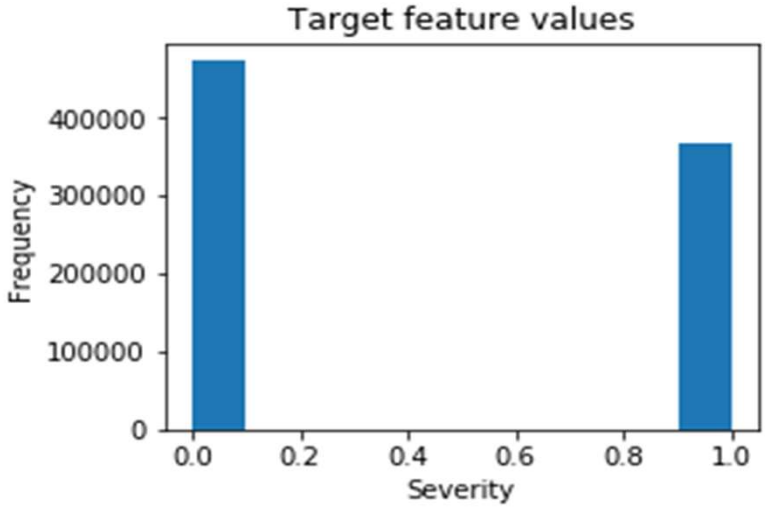
- Traffic accidents are
  - cause of 1.35 million deaths globally in 2016.
  - Main cause of death among those aged 15–29 years.
  - Predicted to become the 7th leading cause of death by 2030.
- Predicting the accident severity in advance could be used to send the exact required staff and equipment to the place of the accident, thus saving a significant amount of lives each year.
- Road safety should be a prior interest for governments, local authorities and private companies investing in technologies that can help reduce accidents and improve overall driver safety.

# Data acquisition and cleaning

- All the recorded accidents in France from 2005 to 2016, both years included.
- Initial dataset from the Kaggle, here.
- Pre-selcted features on my GitHub, here
- In total 49 features, 839,985 rows in the Kaggle dataset.
- Redundant and not relevant features were dropped 29 features pre-selected  On the data cleaning missing values and outliers were replaced.

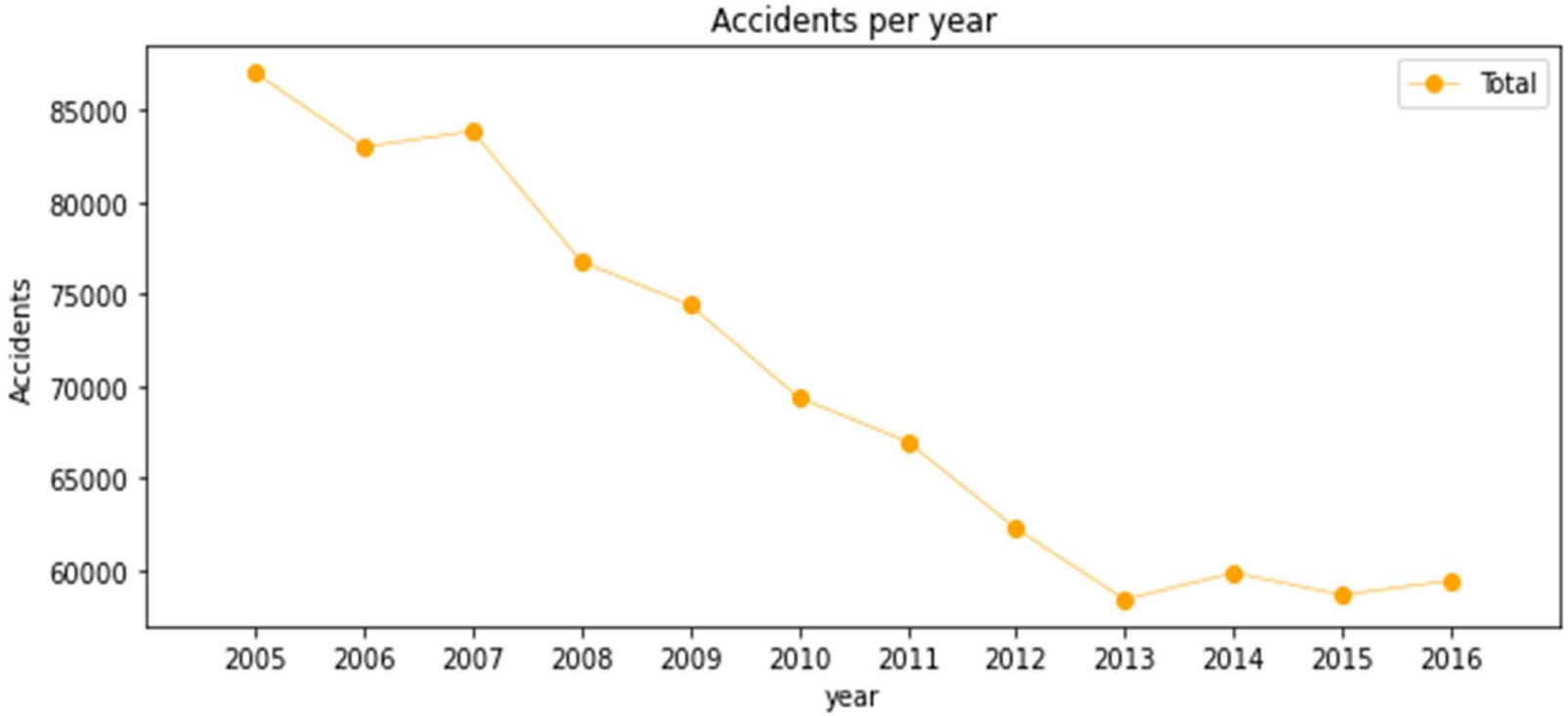
# EDA-Target

- The target feature a binary classifier, describing the accident severity.
  - 0: low severity.
  - 1: high severity , from hospitalized wounded injuries to death.




- It is a balanced labeled dataset with more cases of lower severity.

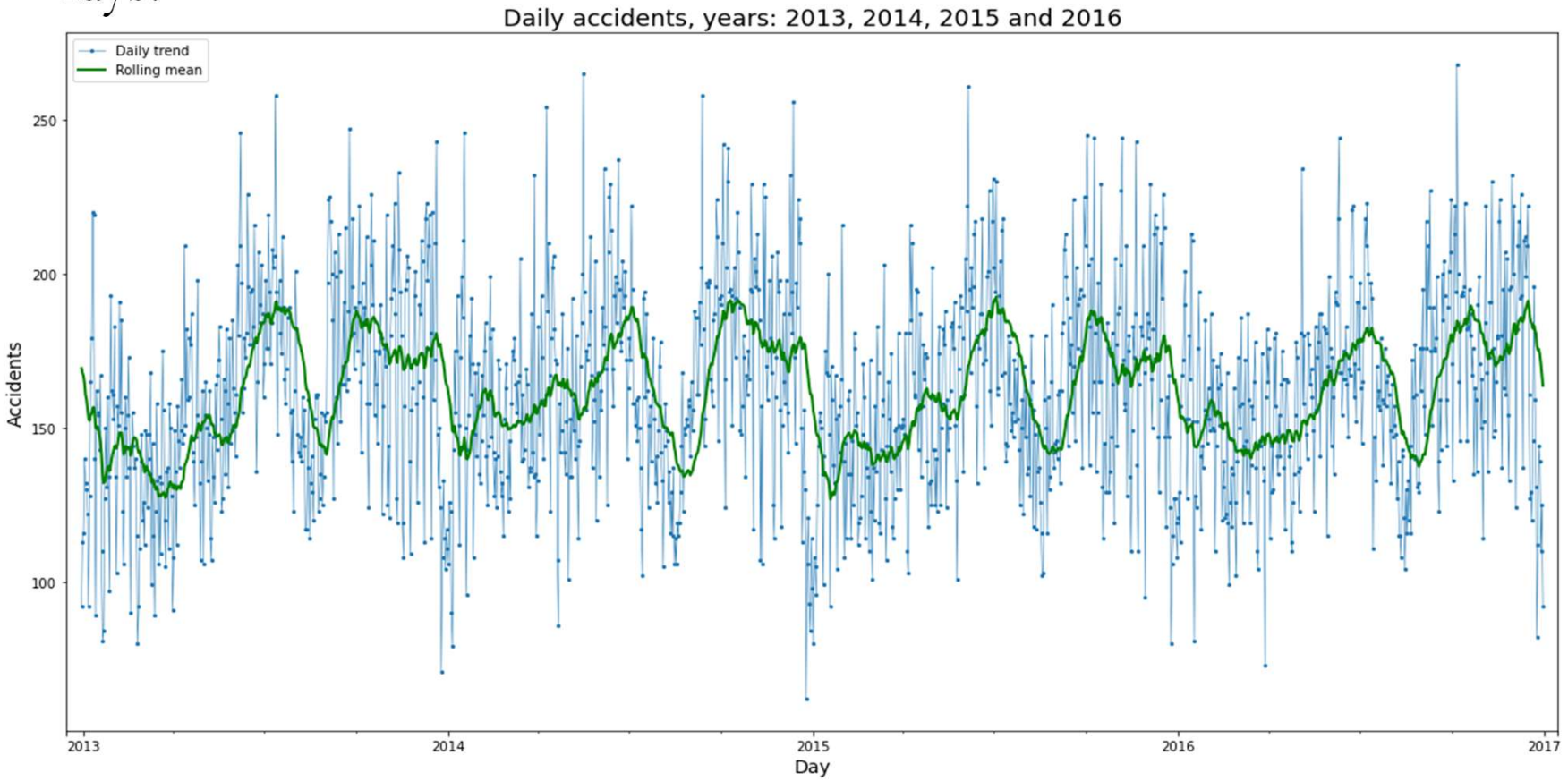
# EDA-Seasonality




- The number of traffic accidents decreased over the years from 2005 to 2013, after which the trend became stable.

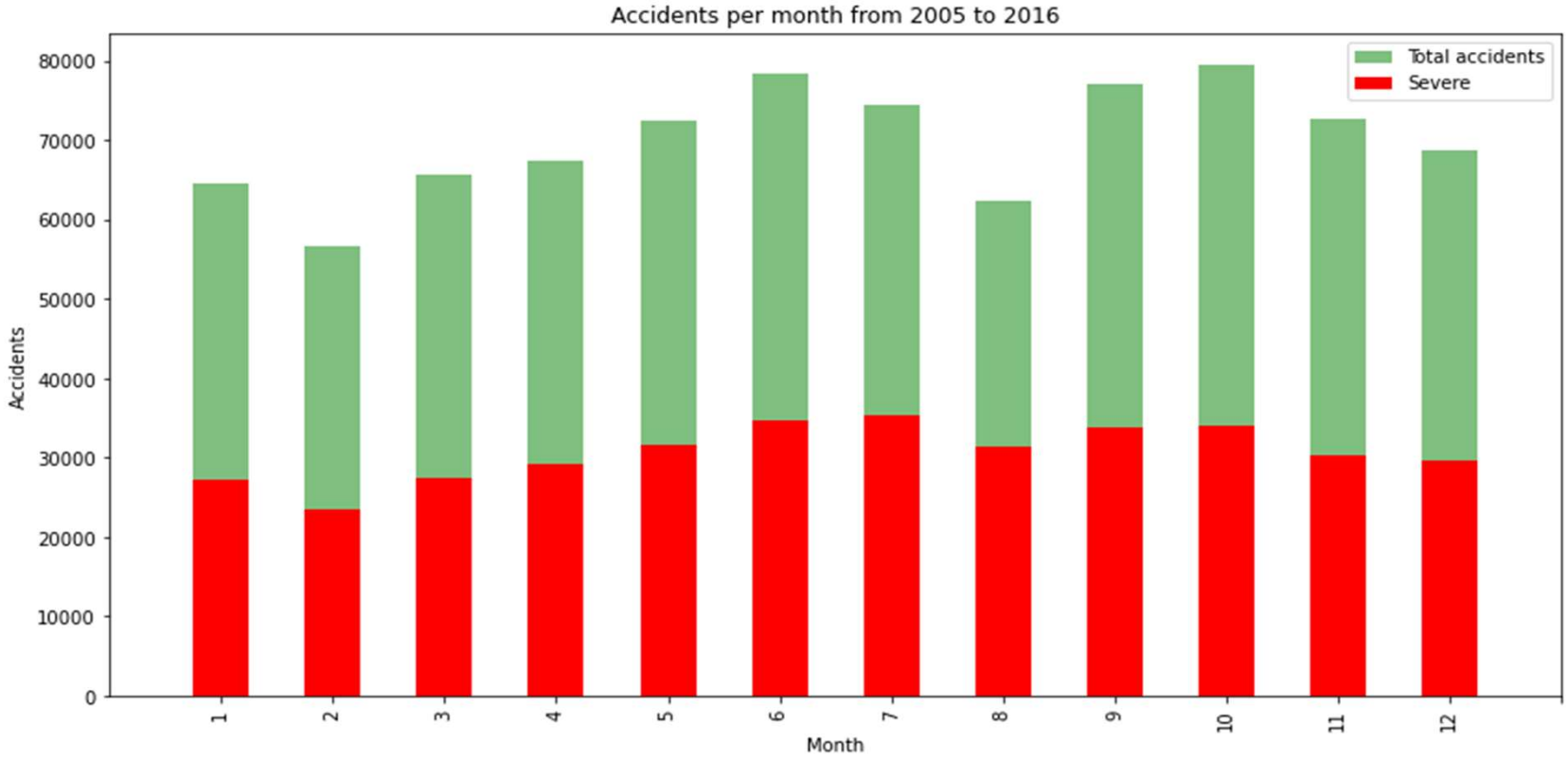
# EDA-Seasonality

- Total no. of accident per day during the 2013, 2014, 2015 and 2016. The plot includes the rolling mean, with a window size of 30 days.



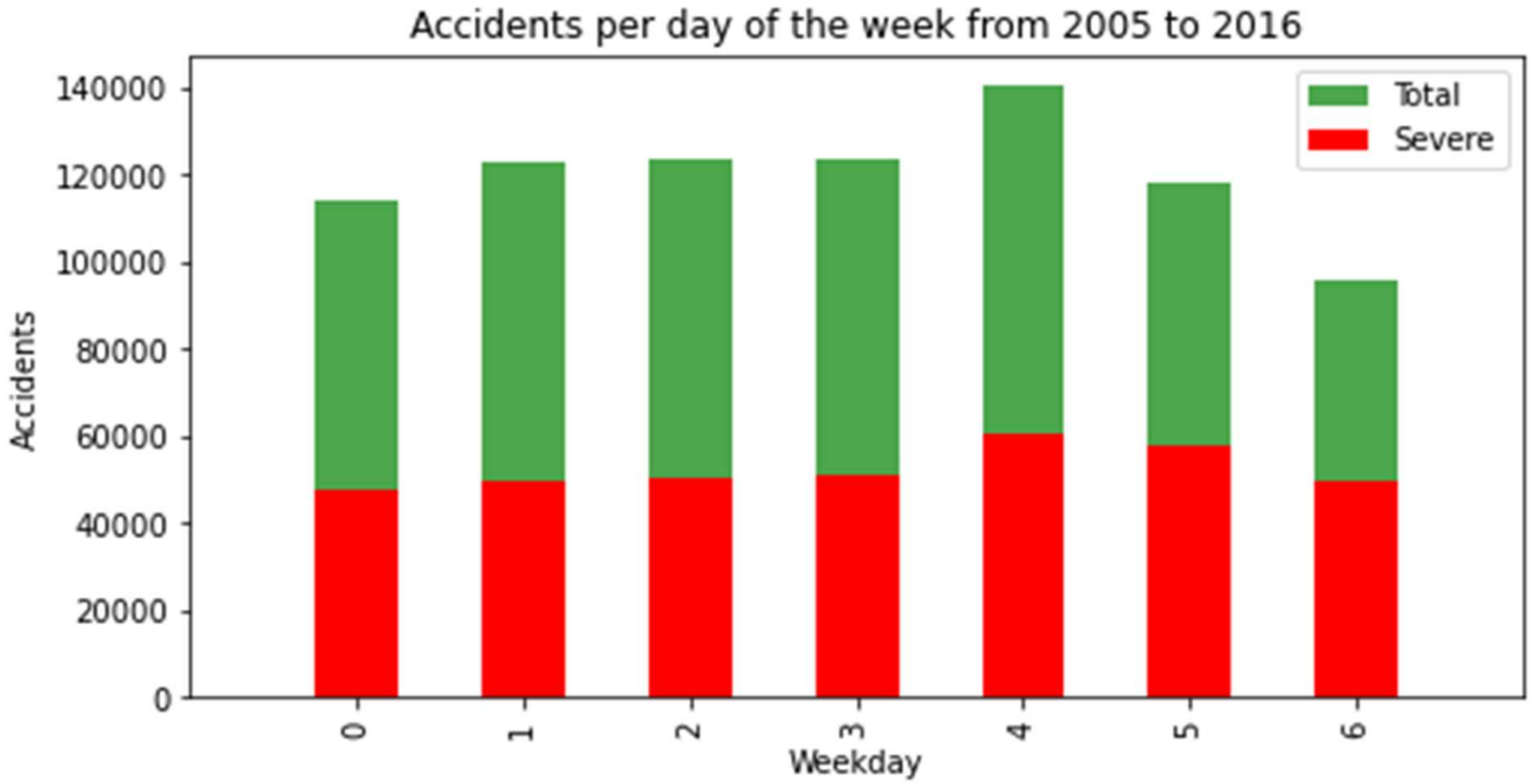
# EDA-Seasonality

- Accidents increase from March to June and then again in September, decreasing at the end of the year.



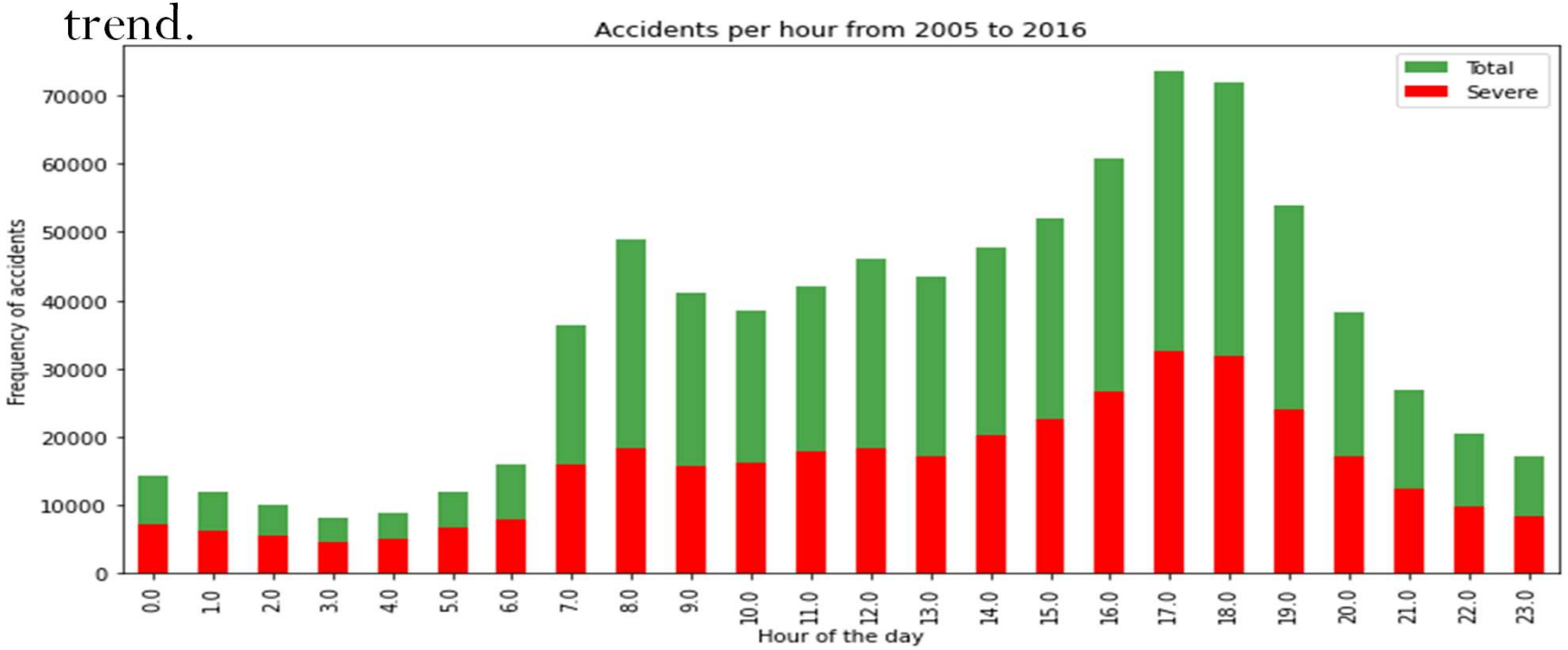
# EDA-Seasonality

- Steady trend during the week. More accidents on Friday and less on Sunday



# EDA-Seasonality

- The trend of highly severe accidents is proportional to the global trend.




- Spikes: 8am: people go to work

  5-6pm: people return home.

# Classification Models

- Random Forest: 10 decision trees
  maximum depth of 12 features
- Logistic Regression c=0.001
- K-Nearest Neighbor K=16
- Supervised Vector Machine Due to computation inefficiency, training size was reduced to 75,000 samples.

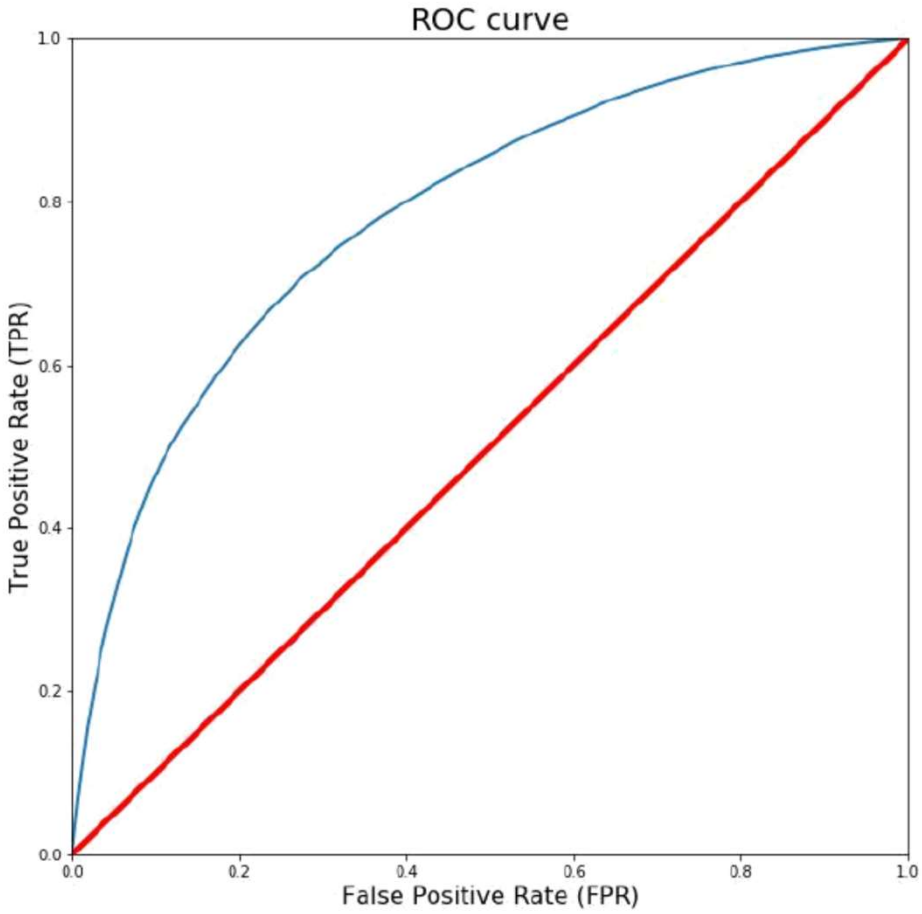
# Results

- This table reports the results of the evaluation of each model.

| Algorithm | Jaccard | F1-score | Precision | Recall | Time(s) |
|---|---|---|---|---|---|
| Random Forest | 0.722 | 0.72 | 0.724 | 0.591 | 6.588 |
| Logistic Regression | 0.661 | 0.65 | 0.667 | 0.456 | 6.530 |
| KNN | 0.664 | 0.66 | 0.652 | 0.506 | 200.58 |
| SVM | 0.659 | 0.65 | 0.630 | 0.528 | 403.92 |

- With no doubt the Random Forest is the best model, in the same time as the logistic regression it improves the accuracy from 0.66 to 0.72 and the recall from 0.45 to 0.59.

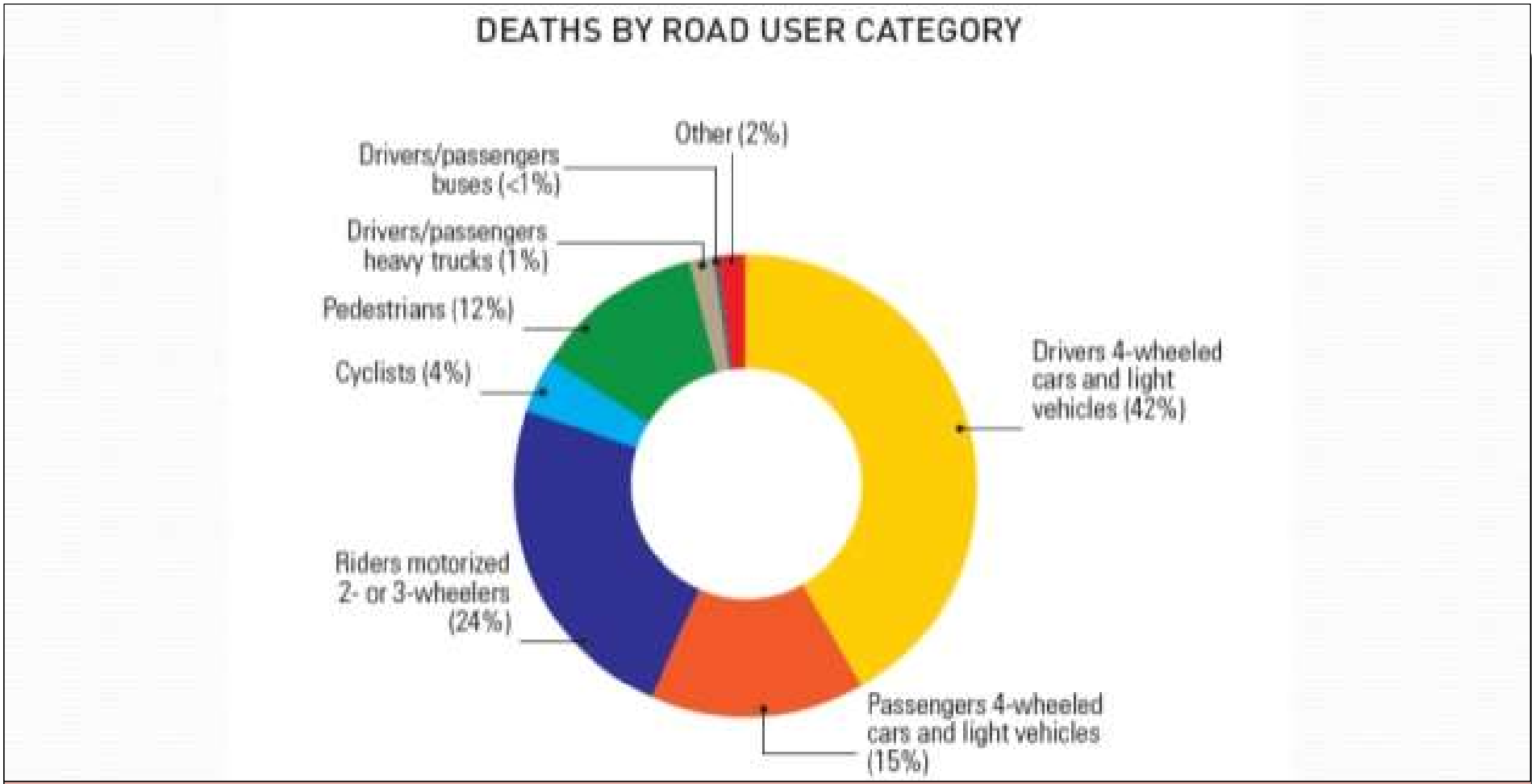
# ROC curve from the results of the Random Forest model.



# Conclusion and future projects

- Built useful models to predict the severity of a traffic accident.
  - Accuracy of the models has room for improvement.

- Future projects:
  - Add features such as vehicle speed and time of uninterrupted travelling.
  - Prediction of potential accident, critical spots and time.


DEATHS BY ROAD USER CATEGORY
Other (2%)
Drivers/passengers buses (<1%)
Drivers/passengers heavy trucks (1%)
Pedestrians (12%)
Cyclists (4%)
Riders motorized 2- or 3-wheelers (24%)
Drivers 4-wheeled cars and light vehicles (42%)
Passengers 4-wheeled cars and light vehicles (15%)

# THANKS