

Prediction model for Collision severity

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Introduction

- Road accidents occur when a vehicle collides with another vehicle, pedestrian, animal, tree, or any stationary object like a building.
- Road accidents cause property damage or sometimes injury leading to either disability or even extreme case a threat to life.
- Road accidents may occur due to various factors like visibility, traffic congestion on certain days, or weather.
- There are several statistics available in both open and closed domains for people to analyze and also create models to avoid road accidents in the future.

Introduction

- Once the models are created, it can either help reduce road accidents by warning the human beings or feeding these models into Autonomous vehicle systems to make clever decisions to avoid accidents.
- The model can serve society in a very beneficial way of reducing property loss as well as the loss of life.
- This model will particularly be helpful to the traffic department in warning the drivers by placing appropriate sign boards where accidents can be avoided. It can also serve the autonomous vehicle manufacturer to incorporate it into their vehicle system to make clever decisions based on the situations to avoid accidents.

Data

- The dataset used in this study consists of 37 attributes and one target.
- The road accidents may be of any kind like a car collision, bicycle, other vehicle collisions.
- The data is collected from 2004 to present and provided by SPD and recorded by traffic records.
- The dataset is updated weekly based on the data collected every week.

Data cleaning

- The dataset was imbalanced with a lot of unknowns and null values.
- The dataset was cleaned by assigning the modal value of each attribute to the unknowns and null values.
- Then the attributes were encoded using a label encoder to assign integer values.

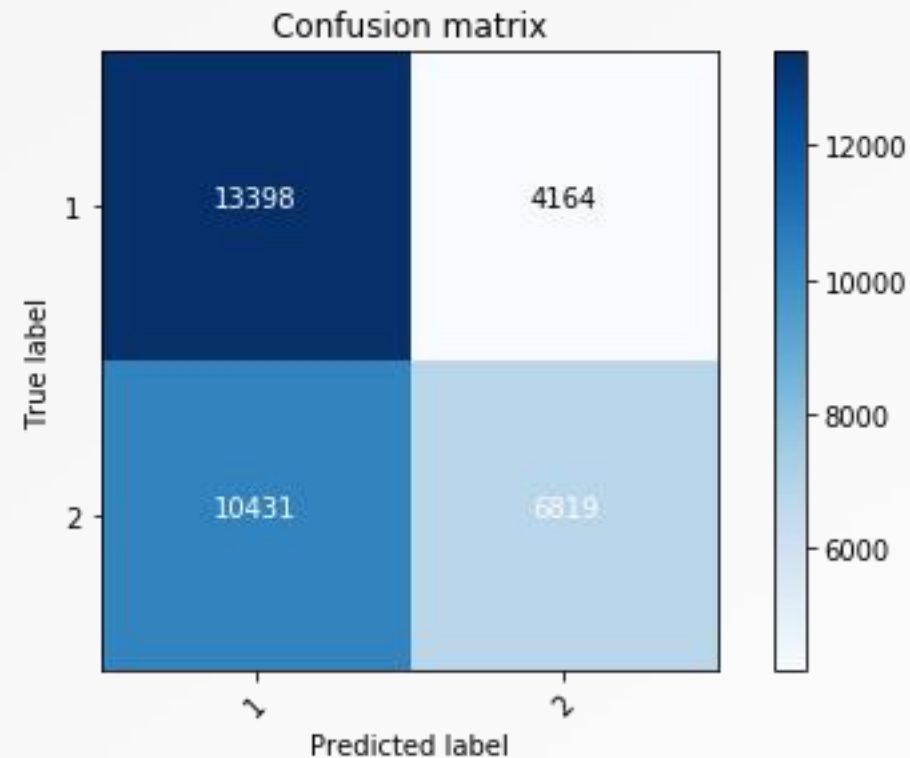
Methodology

- The dataset after cleaning was split into training and test dataset as 70:30.
- The training dataset was used to train five different machine learning classifier algorithms.
- Then the testing dataset was used to evaluate the models by using the accuracy and F1 score.
- The five machine learning classifier algorithms used are
 - K Nearest neighbor
 - Logistic Regression
 - Support Vector machine
 - Decision tree
 - XGBoost

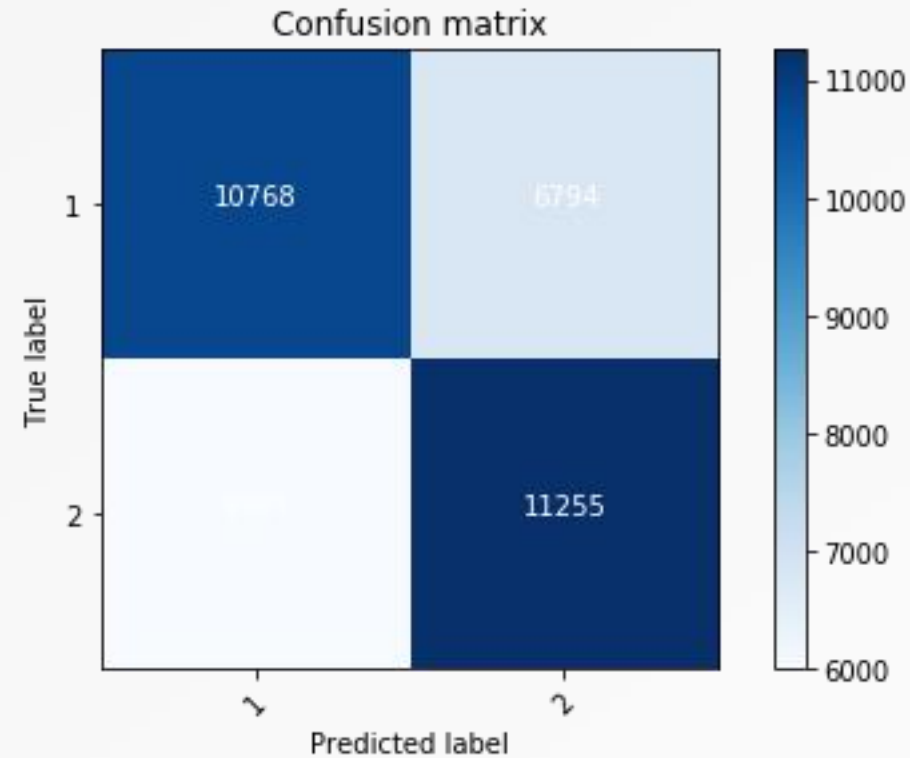
Results and discussion

- The following subsections shows the confusion matrix for various models trained with 70% of the data from the dataset.
- The confusion matrix is plotted from the predicted and true data from the test dataset which remaining 30% of the collision dataset.

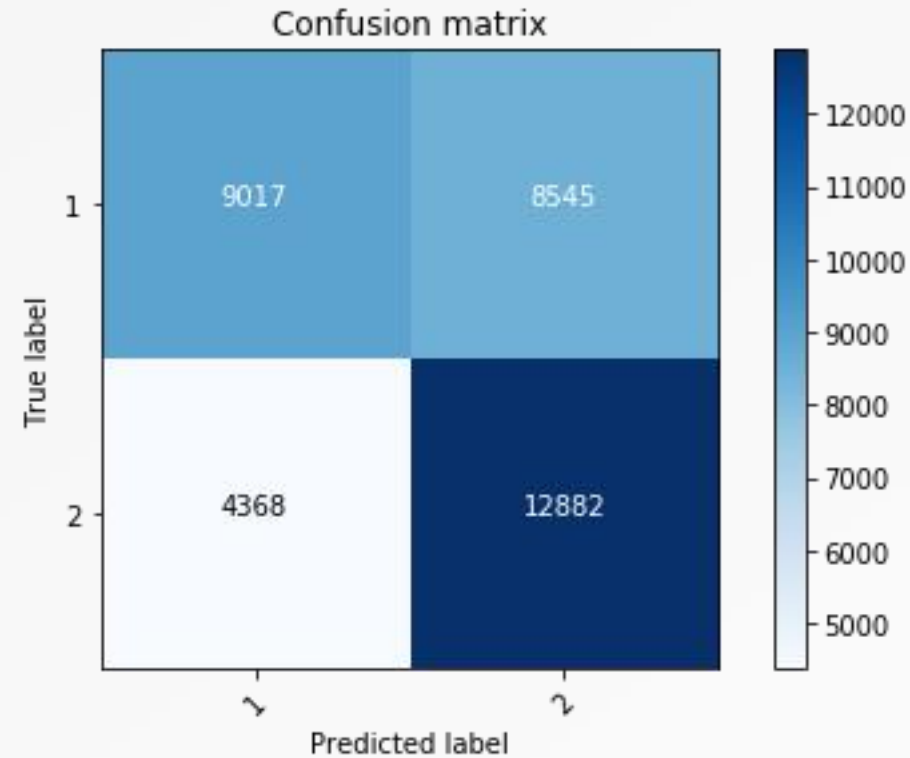
Results and discussion - K-nearest neighbor model



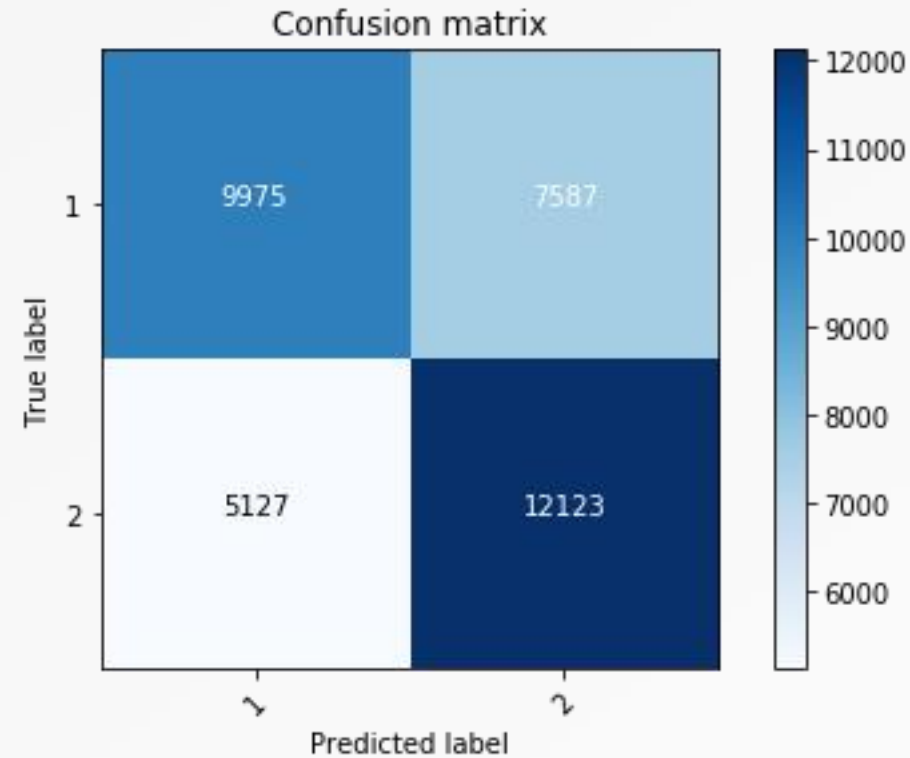
Results and discussion - Linear regression model



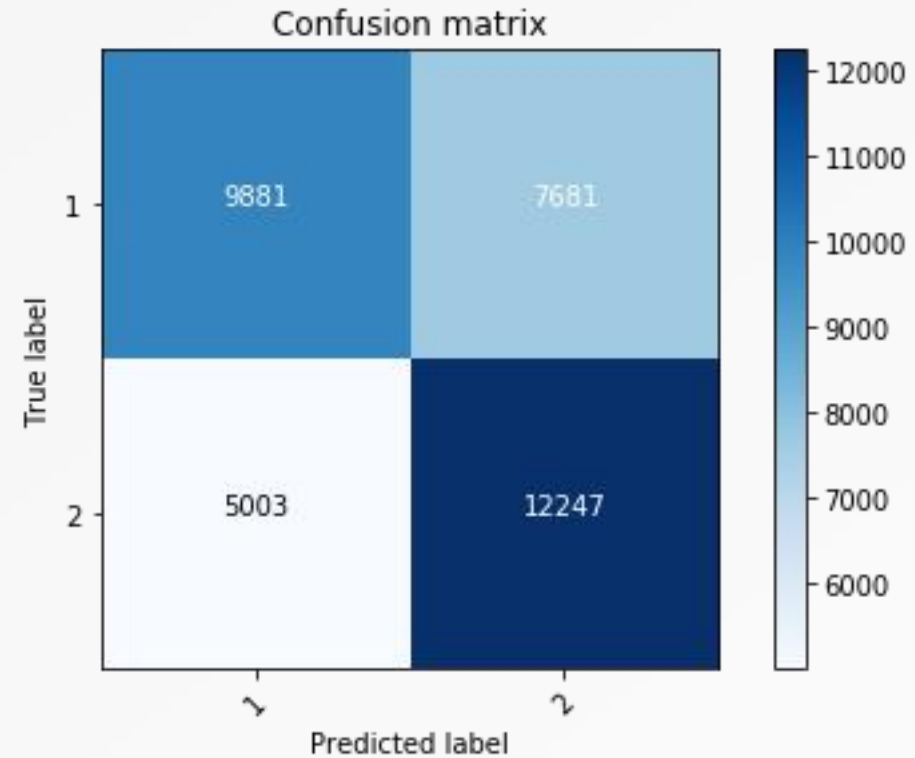
Results and discussion - Support vector machine model



Results and discussion - Decision tree model



Results and discussion - XGBoost model

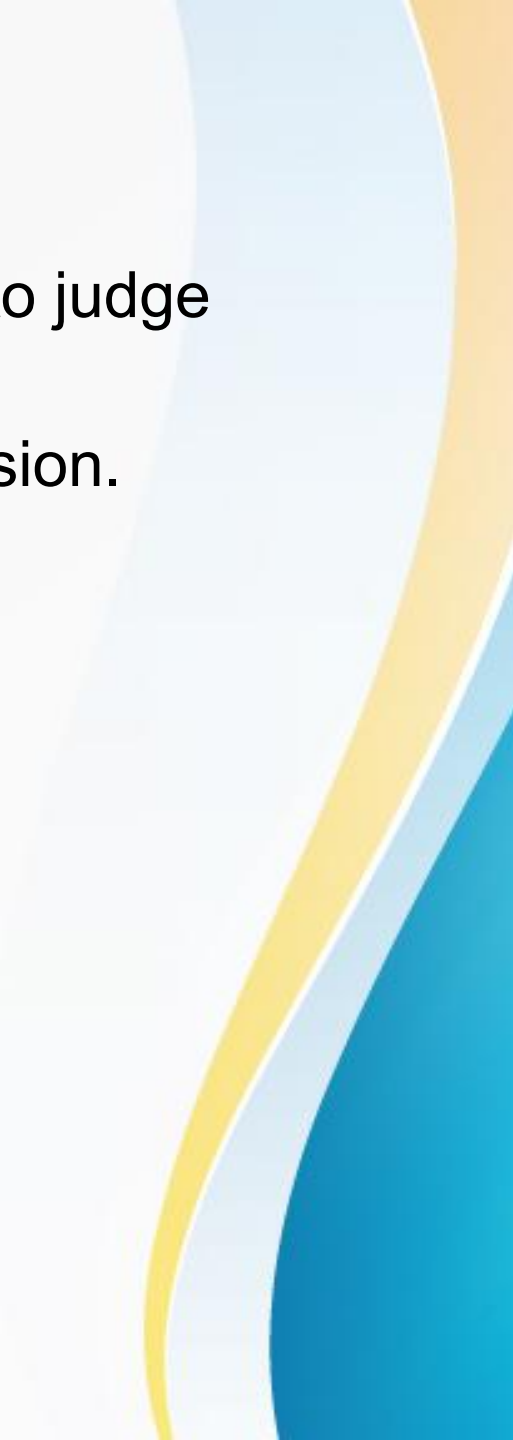


Results and discussion

- After training five different models, the k-nearest neighbor had an accuracy of 0.581 and an F1 score of 0.566, the Logistic regression model had an accuracy of 0.633 and an F1 score of 0.633, the SVM had an accuracy of 0.629 and an F1 score of 0.624, the decision tree also had an accuracy of 0.629 and F1 score of 0.624 and XGBoost had an accuracy of 0.629 and F1 score of 0.624.

	Score	F1 Score
KNN	0.581	0.566
Logistic Regression	0.633	0.633
SVM	0.629	0.624
Decision Tree	0.629	0.624
XGBoost	0.629	0.624

Conclusion

- The models trained on the collision dataset provide a prediction to judge whether the collision would occur or not.
 - The model also predicts the severity of collision in case of a collision.
 - This model would help in reducing the collision and its severity.
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- A decorative graphic on the right side of the slide, consisting of several overlapping, curved, wavy shapes in light blue, yellow, and dark blue, creating a modern, abstract design.