# Toxic Comment Classification Challenge

Solutions by Divyank Singh

# Toxic Text Classification

A method of classifying a comment into toxic or not-toxic depending upon its inherent features

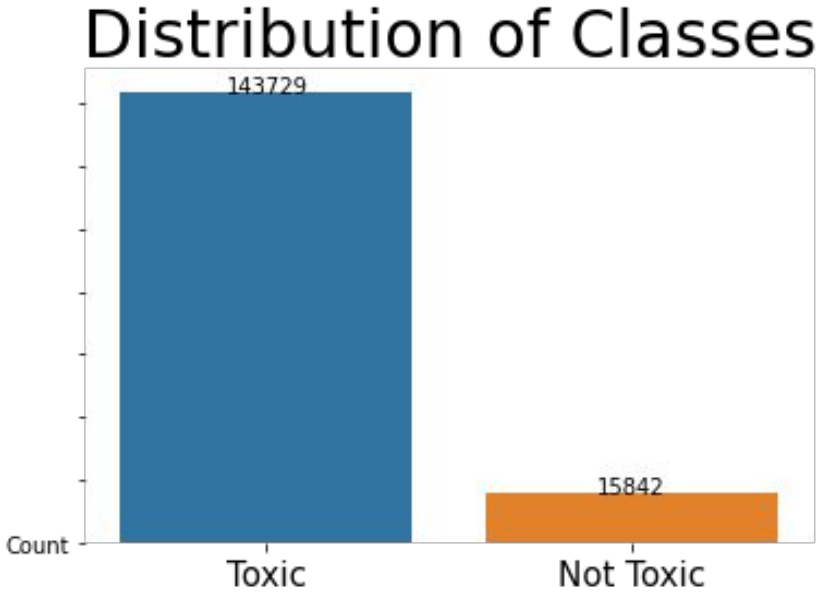
# About the challenge

- A kaggle competition where the dataset consists of a large number of wikipedia comments labeled by human raters for toxic behaviour.
- The six labels:
  - Toxic
  - Severe-toxic
  - Obscene
  - Threat
  - Insult
  - Identity hate

# Data Analysis

Significant class imbalancing

{0:143729, 1:15842}



# Steps Followed

1. Data preprocessing
    a. Remove numbers
    b. Strip punctuation
    c. Remove single characters
    d. Cleaned multiple spaces
    e. Vectorization
2. Resampling
    a. Oversampling minority classes

Resampled data

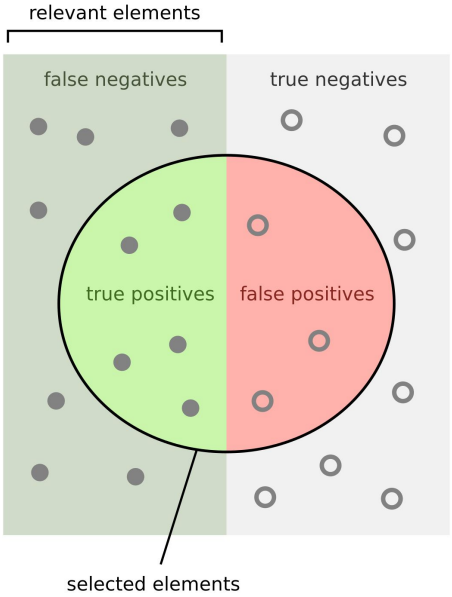
1 143729

0 143729

Name: label, dtype: int64

# Algorithms

# Evaluation Metrics

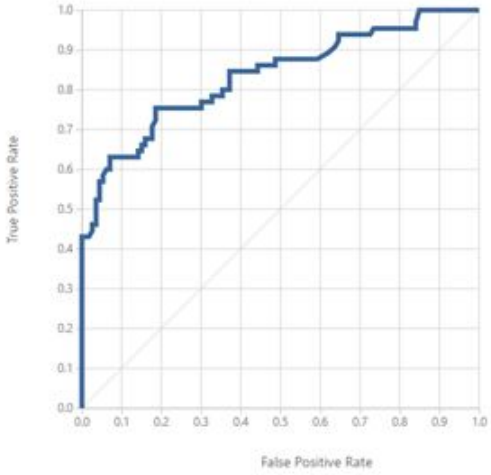




How many selected items are relevant?

Precision = $\frac{\text{true positives}}{\text{true positives} + \text{false positives}}$

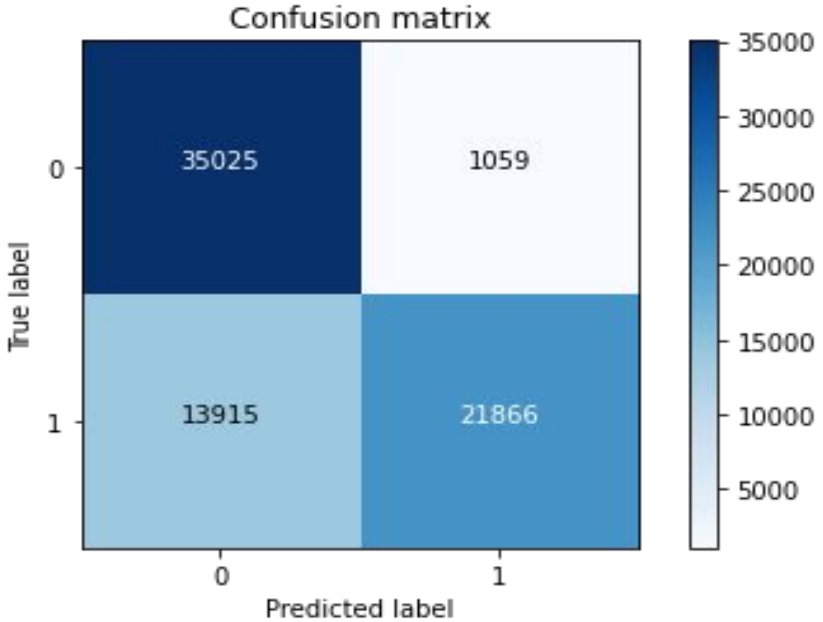
How many relevant items are selected?

Recall = $\frac{\text{true positives}}{\text{true positives} + \text{false negatives}}$



# Decision Trees

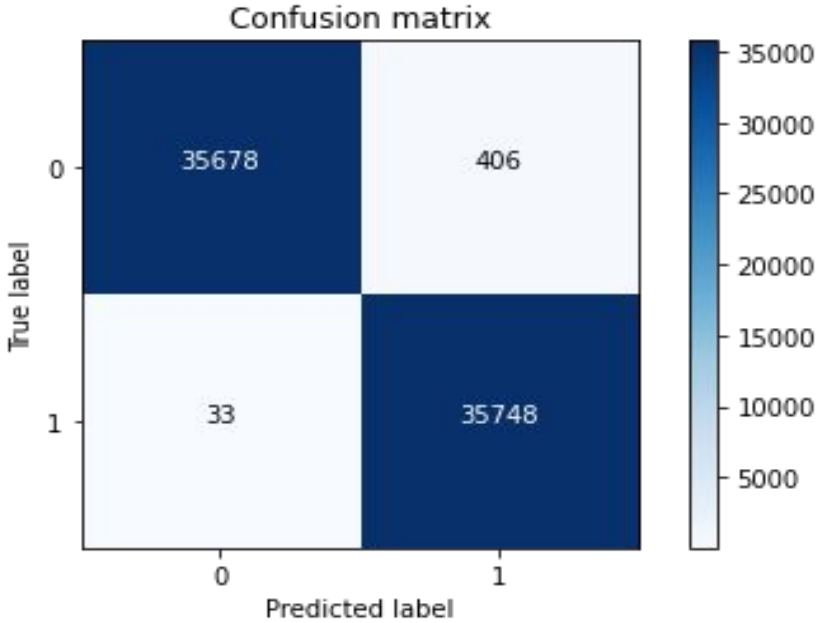
# Performance




- Accuracy - 0.79
- Precision - 0.95
- Recall - 0.61
- F1 score - 0.74
- Area under ROC curve - 0.79
- Cross Validation scores - [0.79372782 0.79224936 0.79431921 0.79363726 0.79233271]

# Random Forest

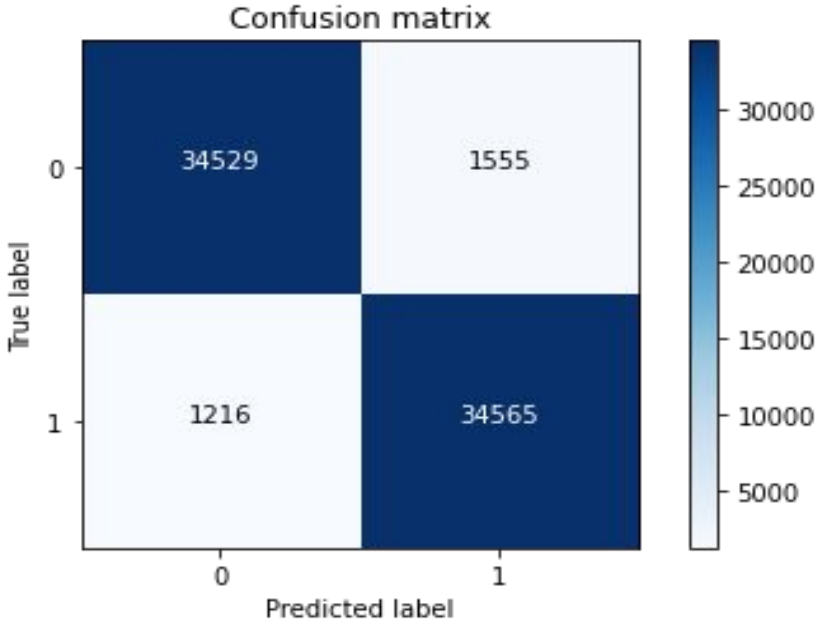
# Performance




- Accuracy - 0.99
- Precision - 0.98
- Recall - 0.99
- F1 score - 0.99
- Area under ROC curve - 0.99
- Cross Validation Score - [0.99443401 0.99476449 0.99486885 0.99415561 0.99441652]

# Logistic Regression

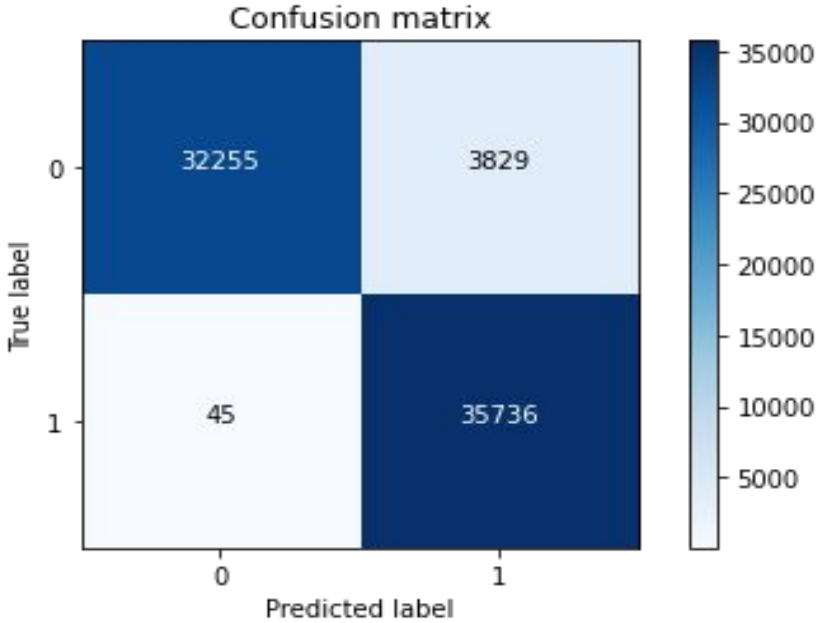
# Performance




- Accuracy - 0.96
- Precision - 0.95
- Recall - 0.96
- F1 Score - 0.96
- Area under ROC curve - 0.96
- Cross Validation score - [0.96098588 0.96143811 0.96265567 0.96168096 0.96260284]

# K Nearest Neighbor Classification

# Performance




- Accuracy - 0.94
- Precision - 0.90
- Recall - 0.99
- F1 Score - 0.94
- Area under ROC curve - 0.94
- Cross Validation Score - [0.89854241 0.92727684 0.93002505 0.92231828 0.89916683]

# Hyper Parameter Tuning

## Grid Search on Logistic Regression

- Tuned Logistic Regression Parameters: {'C': 31.622776601683793}
- Best score is 0.9817190729406505

## Randomized Search on Decision Tree

- Tuned Decision Tree Parameters:{'criterion': 'entropy', 'max_depth': None, 'max_features': 25}
- Best Score is 0.9686667225337686

# Scope for future