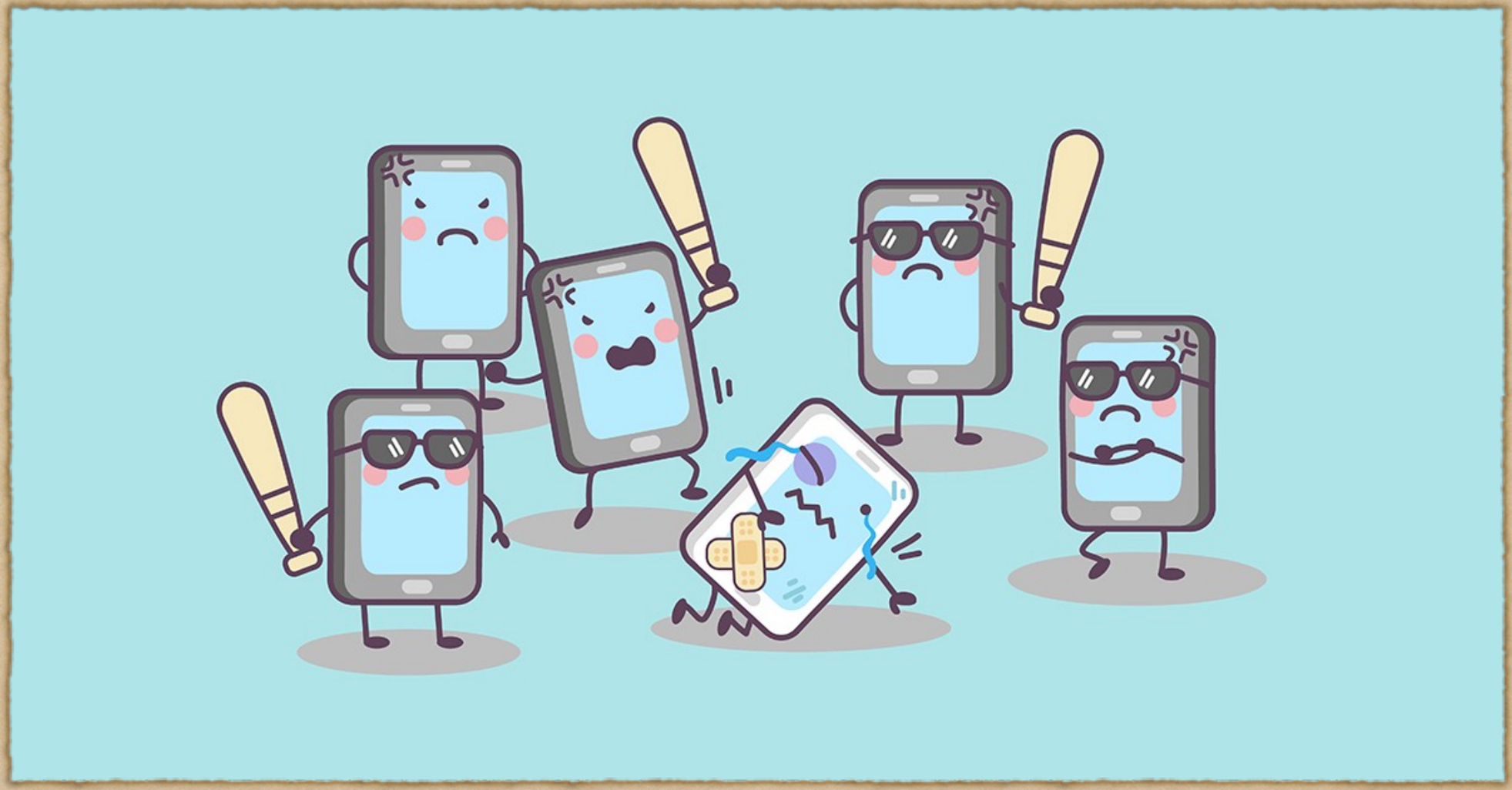


Toxic Comment Classification

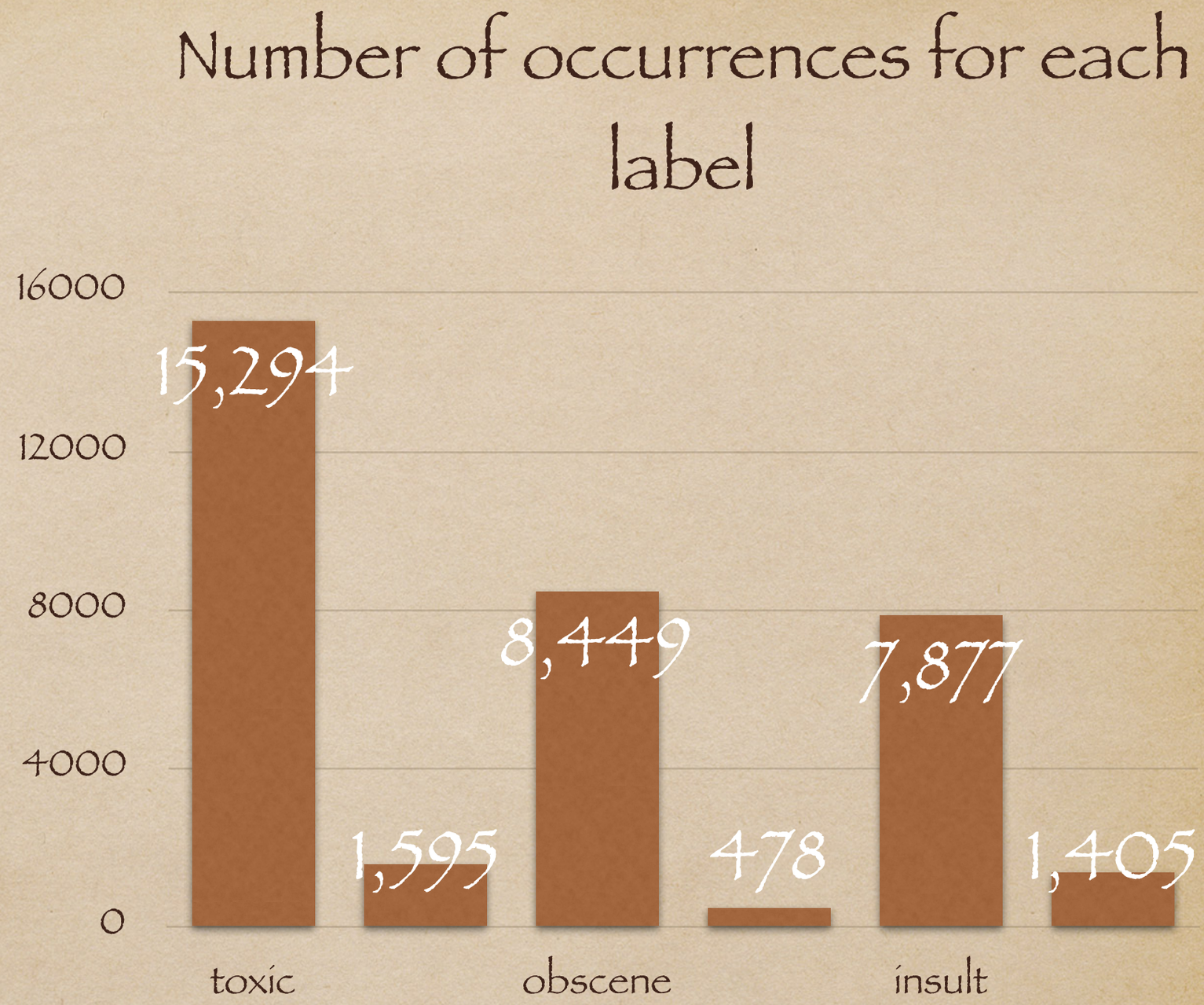
By Minh Ngoc Pham (Jean)

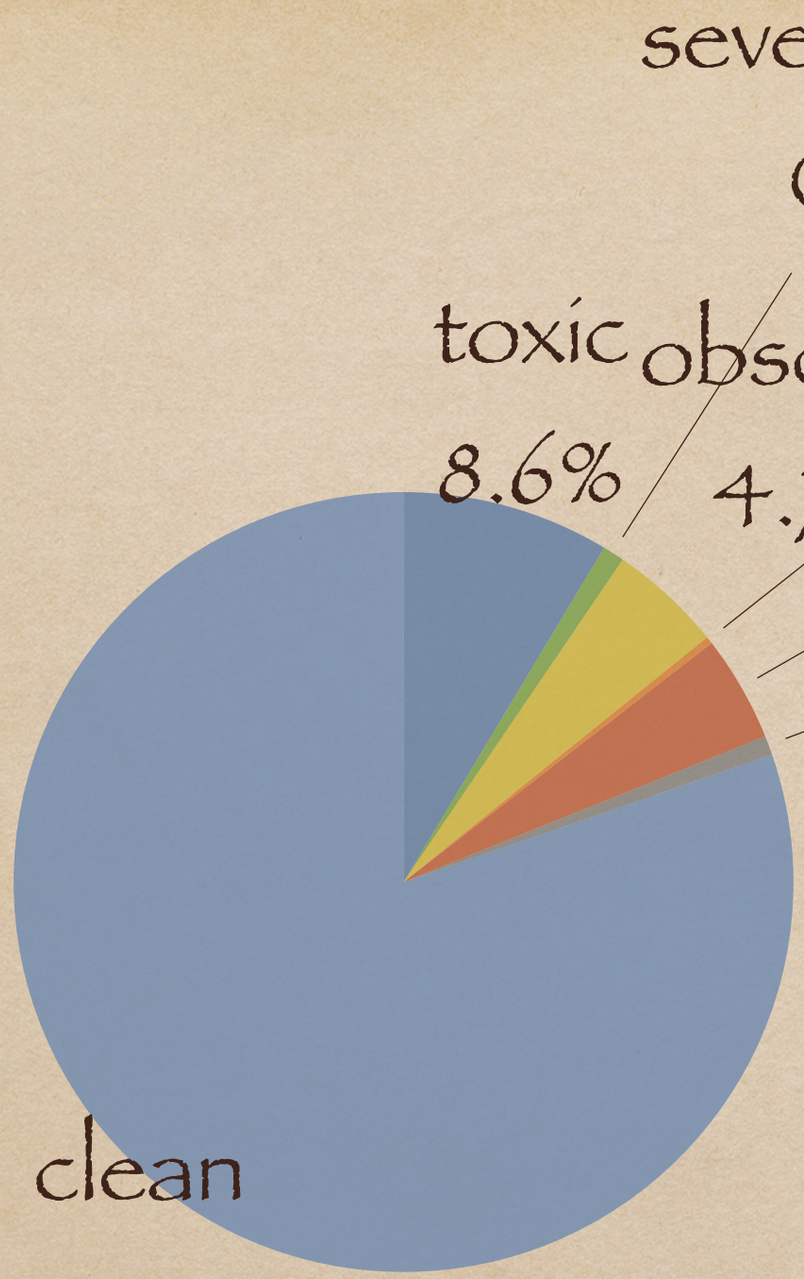
Project Introduction

kaggle

- Toxic Comment Classification Challenge
- Published in 2018
- 159,571 comments in training set
- 63,978 comments in test set

- Highest count in toxic comments
- There are a lot of clean comments





- 80.3% of the comments in the training test are clean
- Class imbalance issue

- High number of comment with NO label
- There are only 31 labels classified as all of the 6 labels

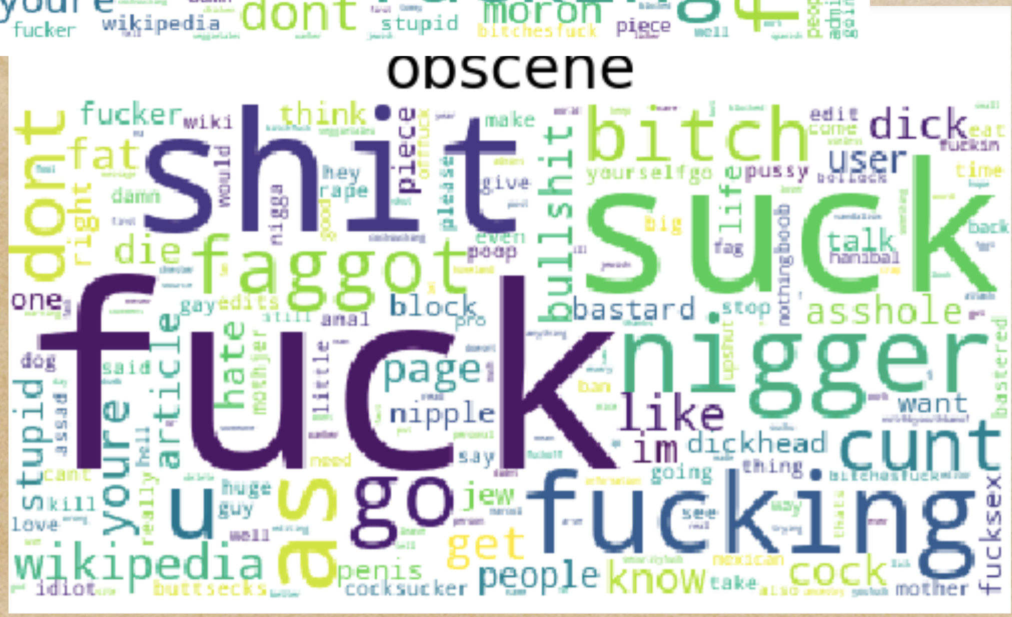
Word Cloud


toxic
fuck
dont
like
shit
nigger
fucking
wikipedia
faggot
page


severe_toxic
suck
shit
fuck
as
bitch
nigger
fucking
faggot
cunt


insult
fuck
suck
nigger
shit
fucking
faggot
bitch
fat


threat
die
as
kill
going
must
block
wale


opscene
fuck
shit
suck
faggot
nigger
fucking
bitch
cunt


identity_hate
nigger
fat
jew
gay
faggot
fuck
nigga
die

Method used

Training set: 159,571 comment

Splitting into training set and evaluation set

67% Training Set and 33% Evaluation Set

Test set: 63,978 comments

Vectorize both the Training set and the test set (using CountVectorizer and TFIDF)

Train the training sets on different machine learning models

Find the parameters that give the best result on the evaluation set

Using the best parameters and dataset (Counvectorize or TFIDF) to run the model on the Test set to give probability prediction

Pick the model with the highest average ROC-AUC across all 6 labels

Logistic Regression

	OneVsRestClassifier (with C=1, estimator penalty =l1)- TFIDF	ClassifierChain ((with C=1, estimator penalty =l1) - TFIDF	OneVsRestClassifier (with C=1, estimator penalty =l2) - TFIDF	OneVsRestClassifier (with C=1, estimator penalty =l2) - CountVectorizer
Toxic	0.968258	0.968258	-	0.799235
Severe Toxic	0.984863	0.980751	-	0.765841
Obscene	0.981258	0.970786	-	0.778556
Threat	0.979104	0.965633	-	0.619170
Insult	0.971562	0.947265	-	0.774192
Identity	0.970317	0.955580	-	0.671779
Average	0.975894	0.964712	0.977498	0.734796

	TFIDF Vectorizer data for only ‘words’	TFIDF Vectorizer data for both ‘word’ and ‘char’
Result on evaluation dataset	0.9759	0.9831
Result on Test dataset	0.9729	0.979

Naive Bayes

	MultinomialNB() with alpha = 0.1	MultinomialNB() with alpha = 1	MultinomialNB() with alpha = 5	MultinomialNB() with alpha = 10	MultinomialNB() with alpha = 50
Average ROC-AUC	0.943539	0.853696	0.781917	0.762324	0.737935

	Toxic	Severe Toxic	Obscene	Threat	Insult	Identity Hate	Average
With TFIDF dataset	0.954660	0.973322	0.958055	0.912945	0.957876	0.933435	**0.948382**
With CV dataset	0.917226	0.929333	0.919417	0.848131	0.916570	0.864621	**0.899216**

Predictive Power on Test set: 0.9364

Decision Tree Classifier

	max_depth=10, criterion = ‘gini’ - TFIDF dataset	max_depth=10, criterion=‘entropy' - TFIDF dataset	OneVsRestClassifier, max_depth=10,criterion=‘entropy’ - CountVectorize dataset	ClassifierChain, max_depth=10,criterion=‘entropy’ - CountVectorize dataset	OneVsRestClassifier, max_depth=15,criterion=‘entropy’ - CountVectorize dataset
Toxic	0.740011	0.841011	0.788924	0.788485	0.827153
Severe Toxic	0.805550	0.736647	0.800206	0.823473	0.684435
Obscene	0.841200	0.858569	0.862610	0.830148	0.858615
Threat	0.614732	0.703729	0.719132	0.558249	0.680063
Insult	0.766586	0.843947	0.836273	0.836210	0.822210
Identity Hate	0.747754	0.769022	0.780570	0.659727	0.777247
Average	**0.752639**	**0.792154**	**0.780570**	**0.749382**	**0.774954**

Predictive Power on Test set: 0.7941

Random Forest Classifier

	OneVsRestClassifier, n_estimators = 100, max_depth=15 - TFIDF dataset	ClassifierChain, n_estimators = 100, max_depth=15 - TFIDF dataset	OneVsRestClassifier, n_estimators = 100, max_depth=15 - CV dataset	OneVsRestClassifier, n_estimators = 1000, max_depth=15 - TFIDF dataset	OneVsRestClassifier, n_estimators = 1000, max_depth=10 - TFIDF dataset
Toxic	0.933500	0.933731	0.920494	0.936943	0.925093
Severe Toxic	0.979556	0.977144	0.973829	0.982700	0.981119
Obscene	0.976782	0.974873	0.963179	0.979460	0.974446
Threat	0.921531	0.928160	0.928774	0.951529	0.950142
Insult	0.960064	0.959790	0.943864	0.963969	0.957683
Identity Hate	0.946986	0.948915	0.934240	0.961600	0.956791
Average	**0.953070**	**0.953769**	**0.944063**	**0.962700**	**0.957546**

Predictive Power on Test set: 0.9668