Detecting Toxic contents in online conversations

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Team P05

Introduction and Related Work

- Problem Statement:
  - How to facilitate online conversation ?
  - How to Handle toxic and divisive content ?
  - How to handle these online bullies ?

Solution: Classify their comments and suspend their accounts.

Introduction and Related Work

- Technology Stack:

Python + the following libraries:

- Nltk
- Wordcloud
- Sklearn
- Gensim
- Keras-Tensorflow

Introduction and Related Work

Related Work

[1] John Pavlopoulos & Prodromos Malakasiotis & Ion Androutsopoulos (2017) Deeper attention to abusive user content moderation. In EMNLP.

[2] Betty van Aken & Julian Risch & Ralf Krestel & Alexander Loser Challenges for Toxic Comment Classification: An In-Depth Error Analysis.

[3] Ellery Wulczyn & , Nithum Thain & , Lucas Dixon & Ex Machina: Personal Attacks Seen at Scale

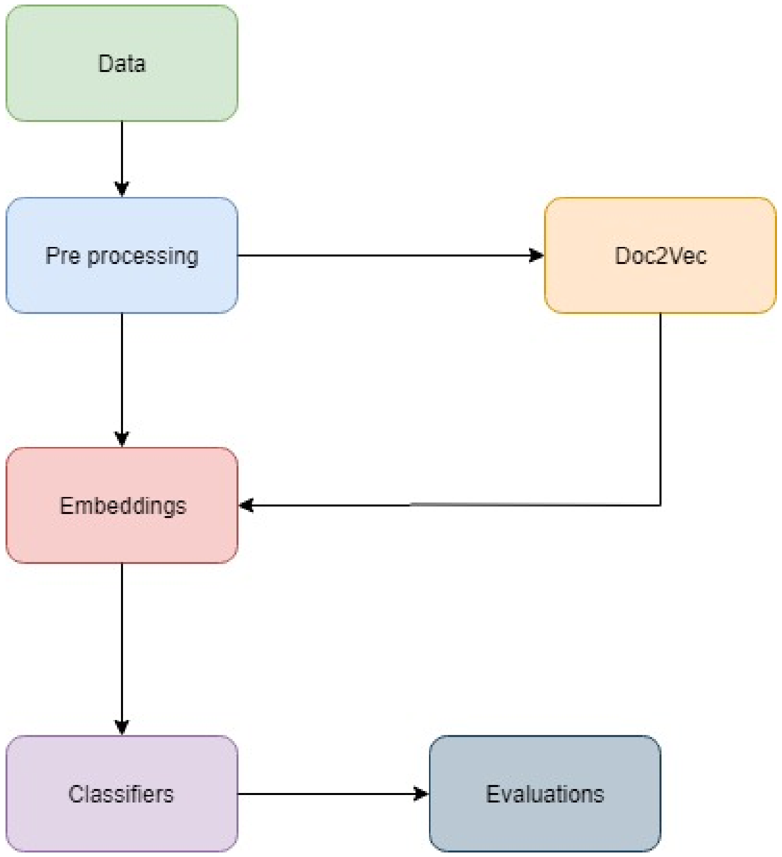
Introduction and Related work

Hypotheses

- Simple ensemble classifiers (like voting, average ,weighted average) and complex ensemble classifiers (like AdaBoost and Random Forest) would outperform shallow classifiers.
- Deep Neural Network classifiers > ensemble classifiers (simple & complex).

Method

Flow Chart



Natansh Negi (P-05)

Method

Data

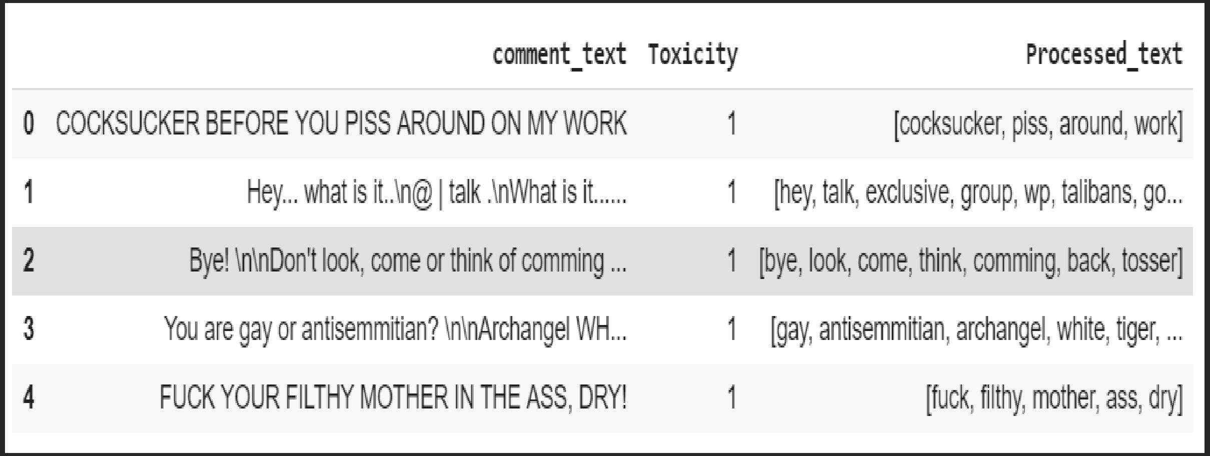
- Considered dataset of Quora and Jigsaw.
- Comprises mainly of 2 columns (**comment_text, Toxicity**)

Data Preprocessing

- Removed null data.
- Eliminated stop words.
- Tokenization & stemming
- Case, negation and punctuation handling
- Transformation
- Exploration (word Cloud)
- Sampling (stratified)

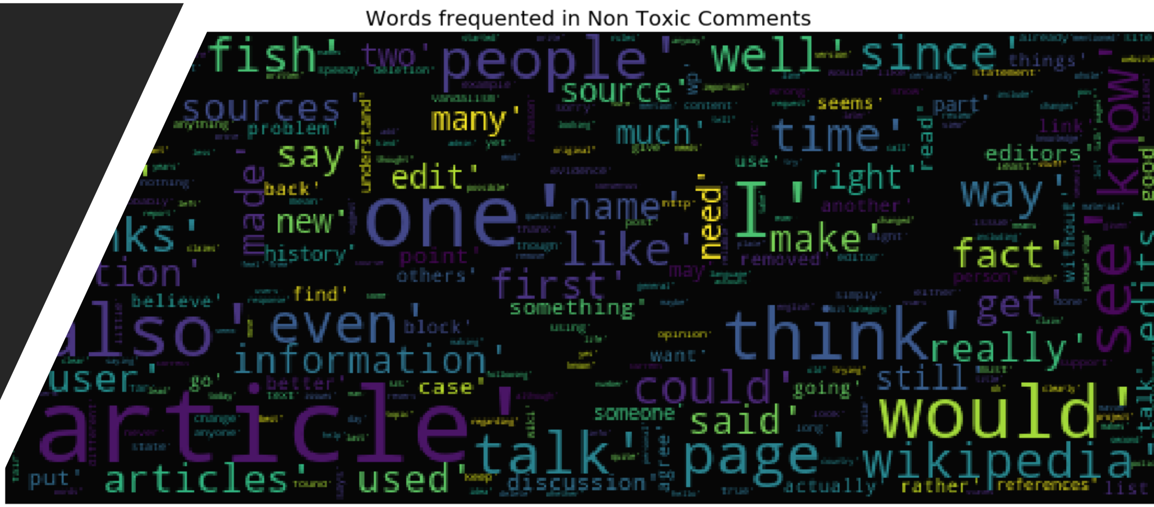
Method

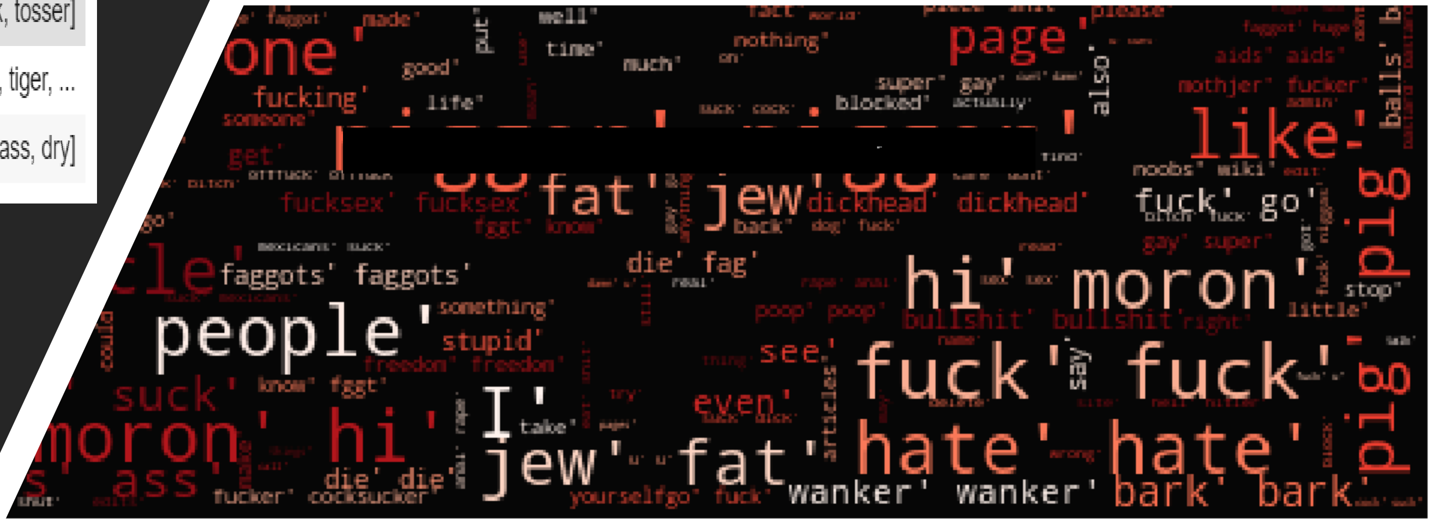
- Processed Data (left)
- Word Cloud (right)



	comment_text	Toxicity	Processed_text
0	COCKSUCKER BEFORE YOU PISS AROUND ON MY WORK	1	[cocksucker, piss, around, work]
1	Hey... what is it..\n@ | talk .\nWhat is it......	1	[hey, talk, exclusive, group, wp, talibans, go...
2	Bye! \n\nDon't look, come or think of comming ...	1	[bye, look, come, think, comming, back, tosser]
3	You are gay or antisemmitian? \n\nArchangel WH...	1	[gay, antisemmitian, archangel, white, tiger, ...
4	FUCK YOUR FILTHY MOTHER IN THE ASS, DRY!	1	[fuck, filthy, mother, ass, dry]

Words frequented in Non Toxic Comments



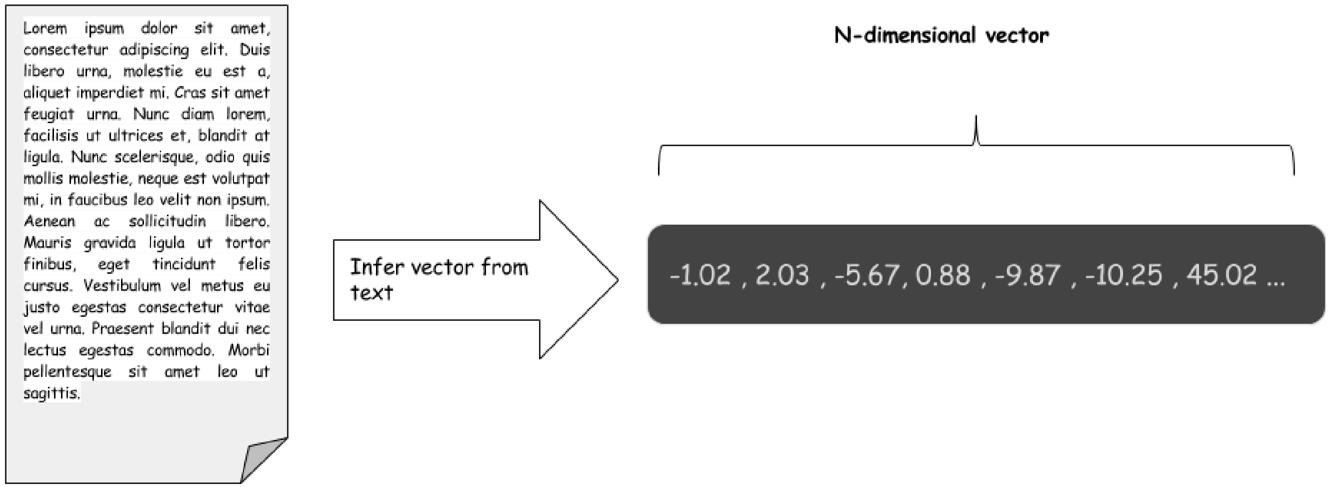


Mohd Sharique Khan (P-05)

Method

Doc2Vec

- Used to create a numeric representation of a document.
- They inherit the semantics of word vectors
- They take word order into account



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Infer vector from text

N-dimensional vector

-1.02 , 2.03 , -5.67, 0.88 , -9.87 , -10.25 , 45.02 ...

Method: Classifiers

Logistic Regression

Naïve Bayes

Decision Tree

Deep Neural Network

Ensemble simple (Logistic regression + Decision Tree)

Ensemble complex (Random Forest +Adaboost)

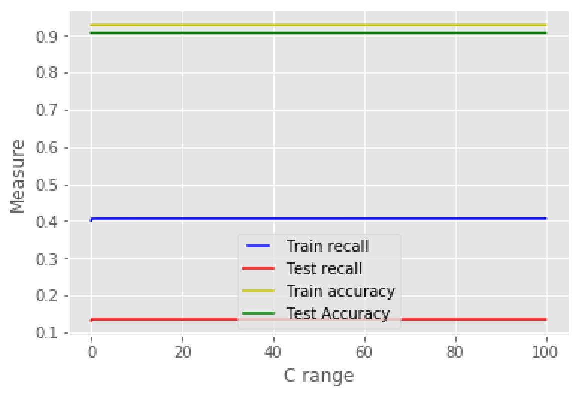
Method

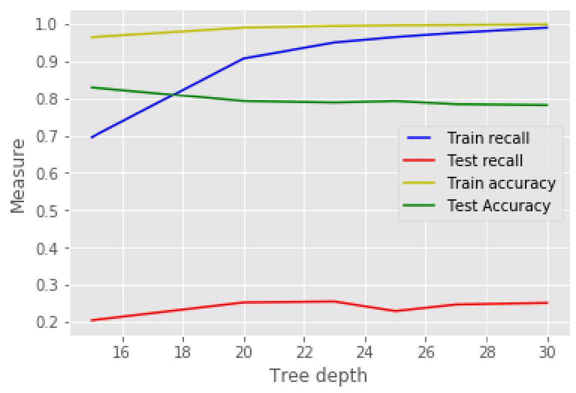
Hyperparameter approaches:

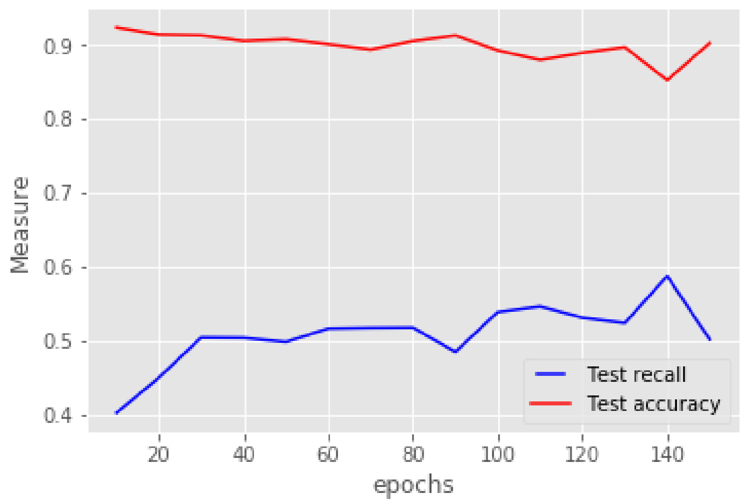
- Grid search
- Random Search

Hyperparameters tuned:

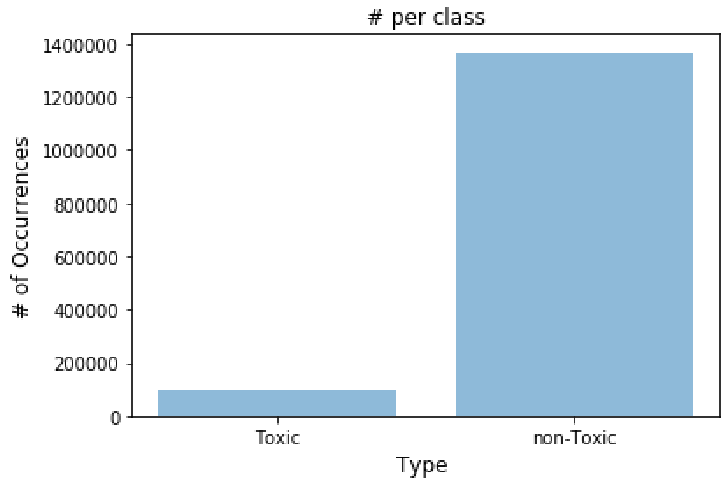
- Epochs (Deep Neural Network, Word2Vec)
- Max depth (Decision tree)
- C parameter (Logistic Regression)
- Vec_size, alpha (Word2Vec)







Results



Experiment 1:

When we used all the data from both the datasets for training and testing.

Accuracy ~ 94%

Is this good enough ?

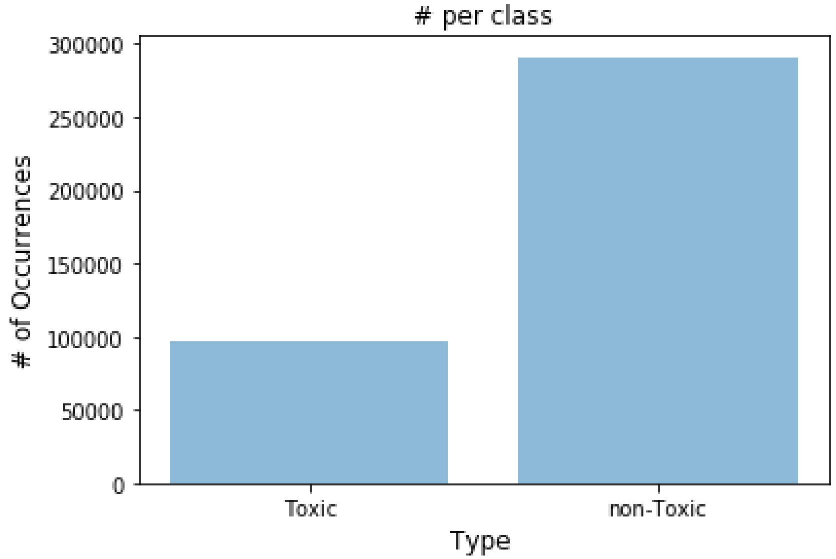
Results

Classifier	Accuracy	Precision	Recall	F-measure
Logistic	93.3%	75%	0.2%	0.4%
Naïve Bayes	92.9%	6.4%	0.4%	0.8%
Decision Tree	93.0%	NaN	0%	NaN
Ada Boost	91.32%	26%	1.7%	3.19%
Deep Neural Network	95.20%	4.2%	17.53%	6.7%
Ensemble (simple)	93.77%	67.13%	1.2%	2.35%
Ensemble (complex)	93.95%	31.65%	2.2%	4.1%

Results

- Experiment 2:

  Took 1:3 dataset for training our models



Classifier	Accuracy	Precision	Recall	F-measure
Logistic	65.18%	48.5%	71.96%	57.94%
Naïve Bayes	34.58%	33.7%	99.6%	50.3%
Decision Tree	66.66%	NaN	0%	NaN
Ada Boost	62.8%	31.11%	17.20%	22.15%
Deep Neural Network	78%	42.12%	47.33%	44.57%
Ensemble (Simple)	66.66%	NaN	0%	NaN
Ensemble (complex)	63.9%	NaN	0%	NaN

Results

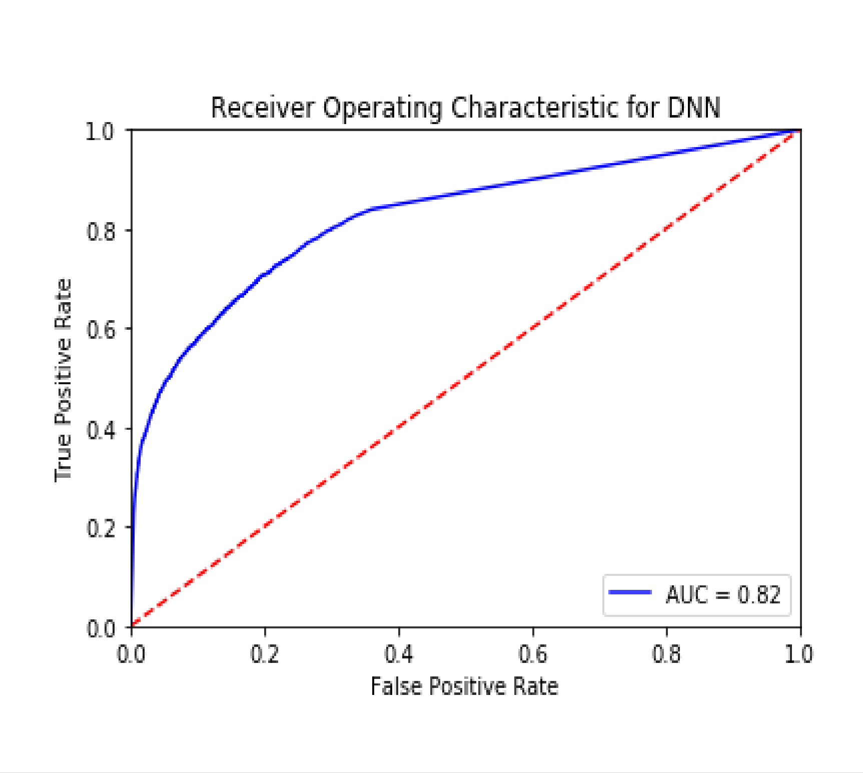
. . . . Experiment N

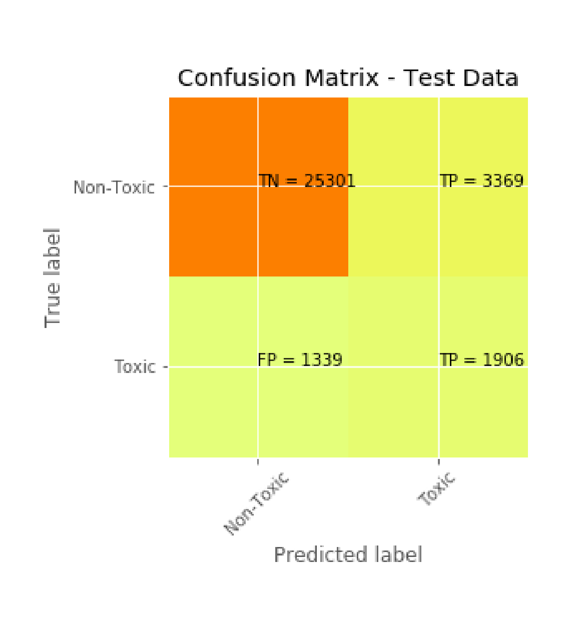
Results

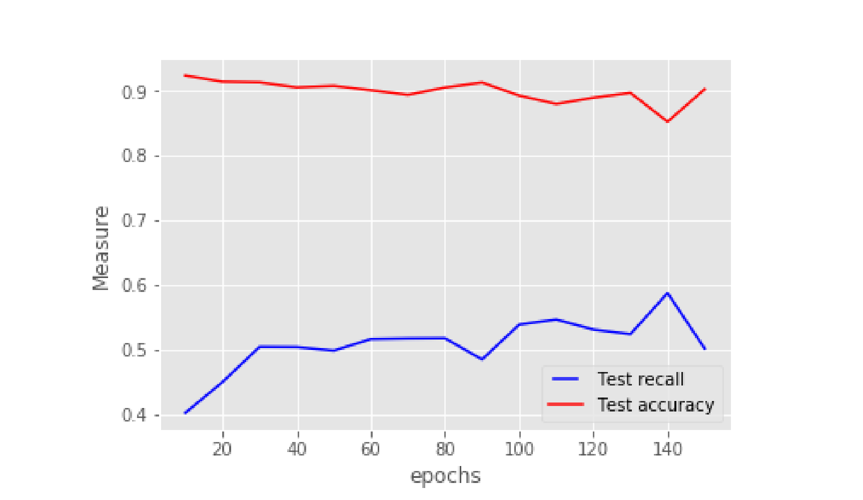
Results from our Best model (DNN)

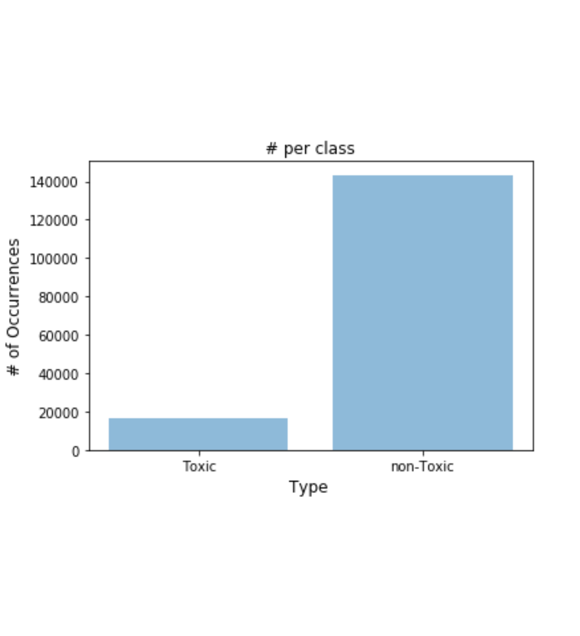
- Hyperparameters
- Confusion Matrix
- ROC and AUC

Accuracy	85.25%
Precision	36.13%
Recall	58.74%
F- Measure	44.74%
AUC	0.82









Key Learning

- Inconsistency of data plays a big role in model generation.
- Large quantities of data cannot not guarantee a good model.
- Selecting the right type of data and hyperparameters is important.
- DNN>Ensemble>shallow classifiers. (Hypotheses proved).

Future Work

We can segregate the toxic comments according to their severity. Eg(Insult , Racism, Aggression etc.)

Compare our results with any unsupervised classifier.