Toxic Comment Classification

Disclaimer

The Presentation Slides contain text
that may be considered profane, vulgar, or offensive

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CONTENTS

CONTENTS

OVERVIEW

powered by Google

Toxic Comment Classification Challenge

Purpose | To make health environment for the Internet Users

Data Source | Wikipedia corpus dataset
collected through Google Human-labeling

Approximately 63M comments from web pages/
article from 2004 to 2015

OVERVIEW : Multiclass-Multilabel Classification

X_label

```
x.head(5)
```

	comment_text
0	Explanation₩nWhy the edits made under my usern...
1	D'aww! He matches this background colour I'm s...
2	Hey man, I'm really not trying to edit war. It...
3	"₩nMore₩nI can't make any real suggestions on ...
4	You, sir, are my hero. Any chance you remember...

Y_label

```
y.head(5)
```

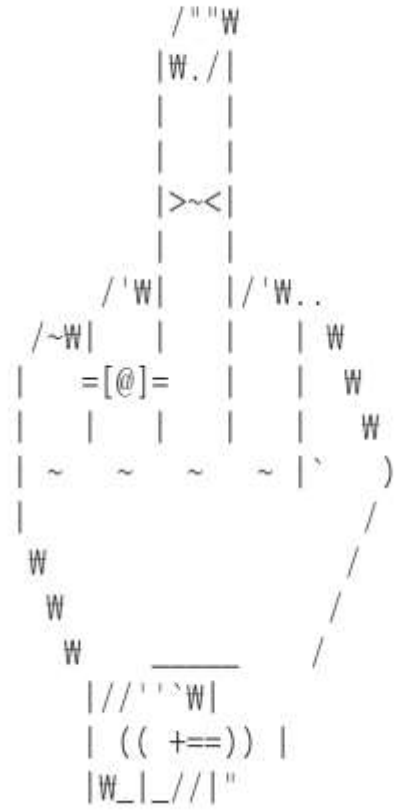
	toxic	severe_toxic	obscene	threat	insult	identity_hate
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0

SAMPLES : Stereotypical Sample

comment_text	toxic	severe_toxic	obscene	threat	insult	identity_hate
[redacted]UCKER BEFORE YOU [redacted] AROUND ON MY WORK	1	1	1	0	1	0

SAMPLES : Atypical Sample

"
SURPRISE!

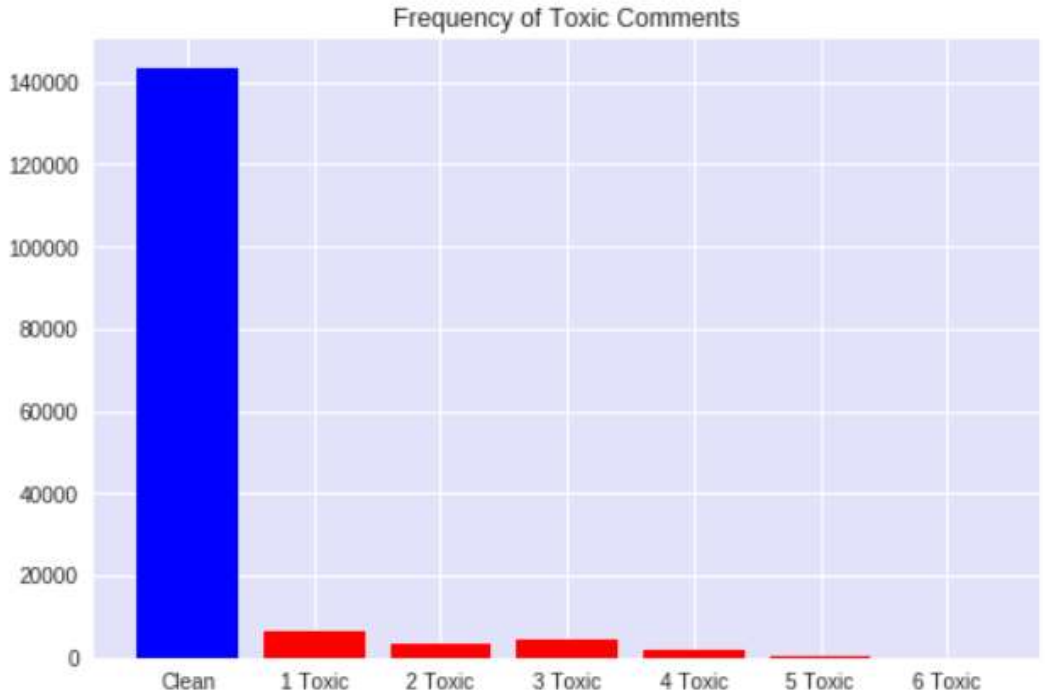


id	8b20912530eebd56
comment_text	"WnSURPRISE!Wn /""WWn ...
toxic	0
severe_toxic	0
obscene	0
threat	0
insult	0
identity_hate	0

Name: 152298, dtype: object

Visualization : The vast majority of comments are Non-toxic

The Proportion of Clean comments 〉 95%

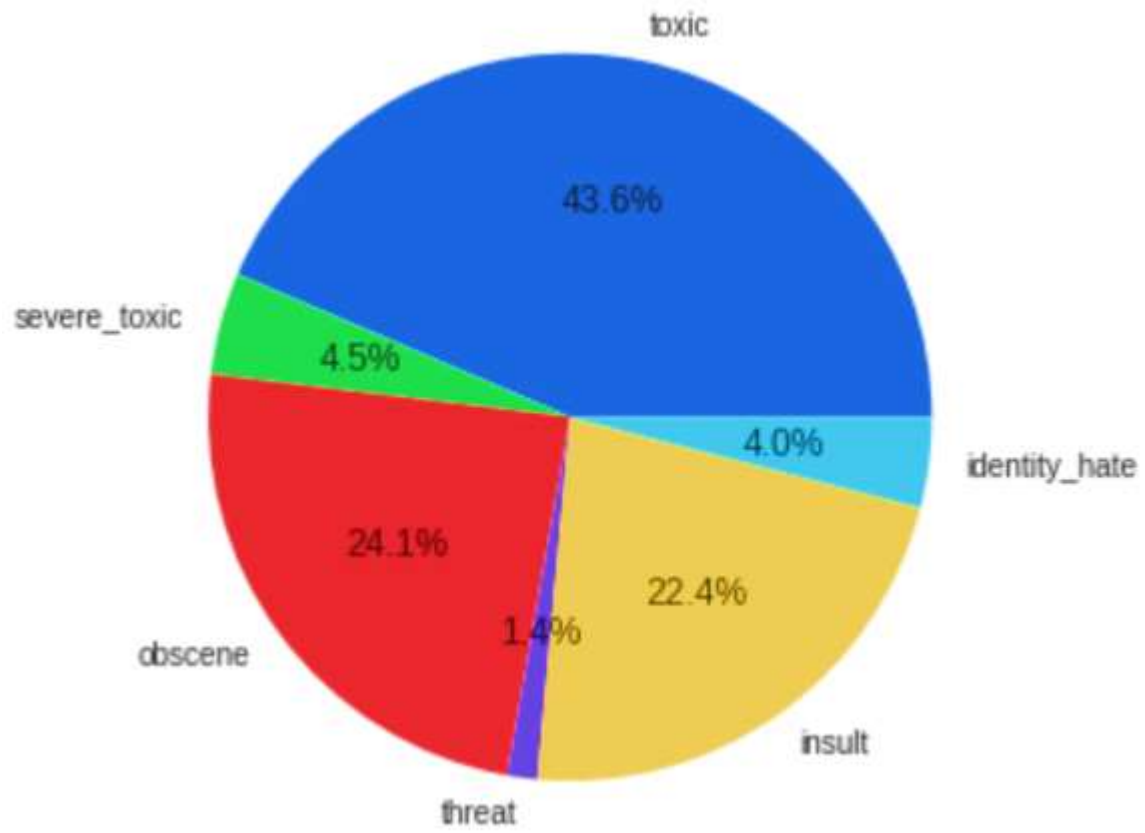



```
import numpy as np
from sklearn.metrics import accuracy_score
from sklearn.metrics import roc_auc_score

print("bare minimum acc_score:%0.3f"
      %(accuracy_score(y, np.zeros(y.shape))))
print('bare minimum roc_auc_score:%0.3f'
      %(roc_auc_score(y, np.random.rand(159571,6))))
```

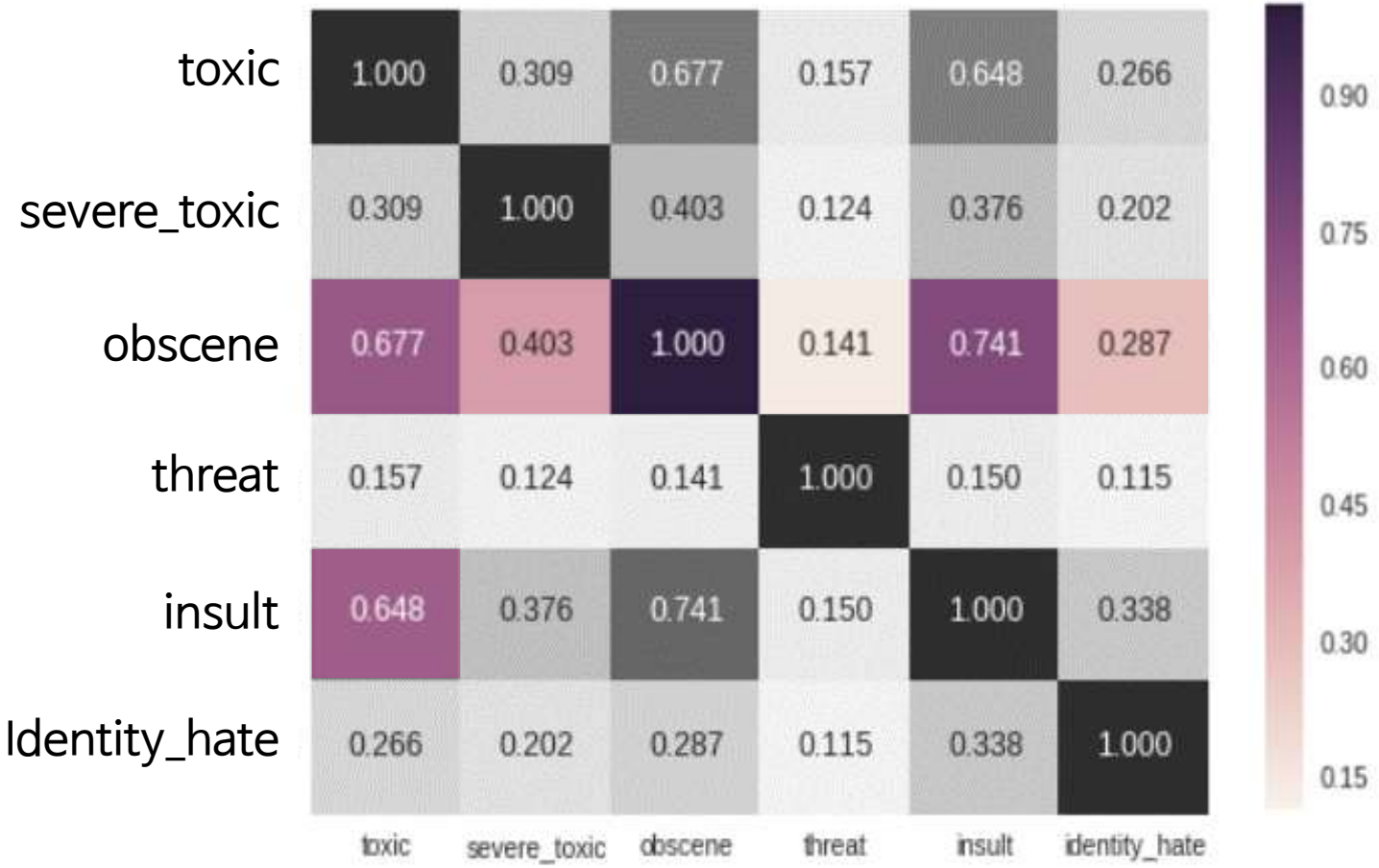
```
bare minimum acc_score:0.898
bare minimum roc_auc_score:0.503
```

Visualization : the Proportion of Each Label



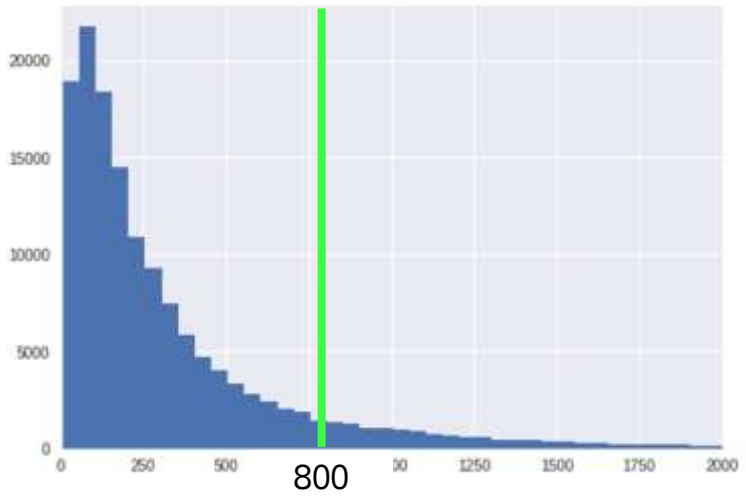
43.6%	Toxic
22.4%	Insult
24.1%	obscene
4.5%	severe_toxic
4.0%	identity_hate
1.4%	threat

Visualization : the Correlation between Y_label



Visualization : the Length of Text

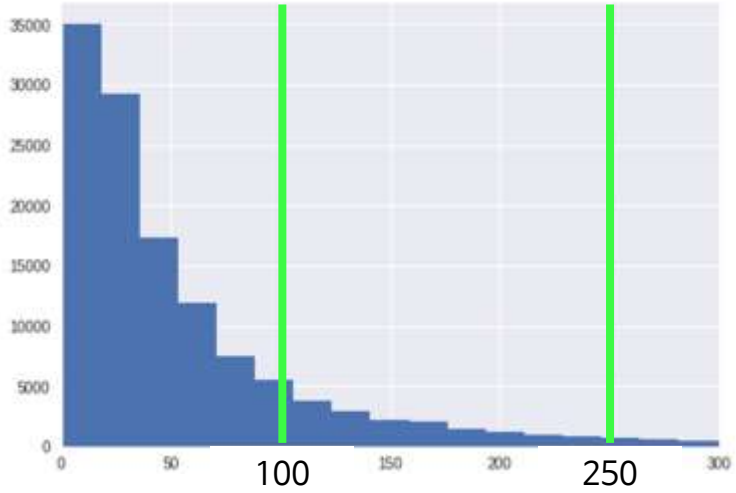
WORD_wise



Tokenization max length = 800

김호현

CHARCATER_wise



Tokenization max length = 250

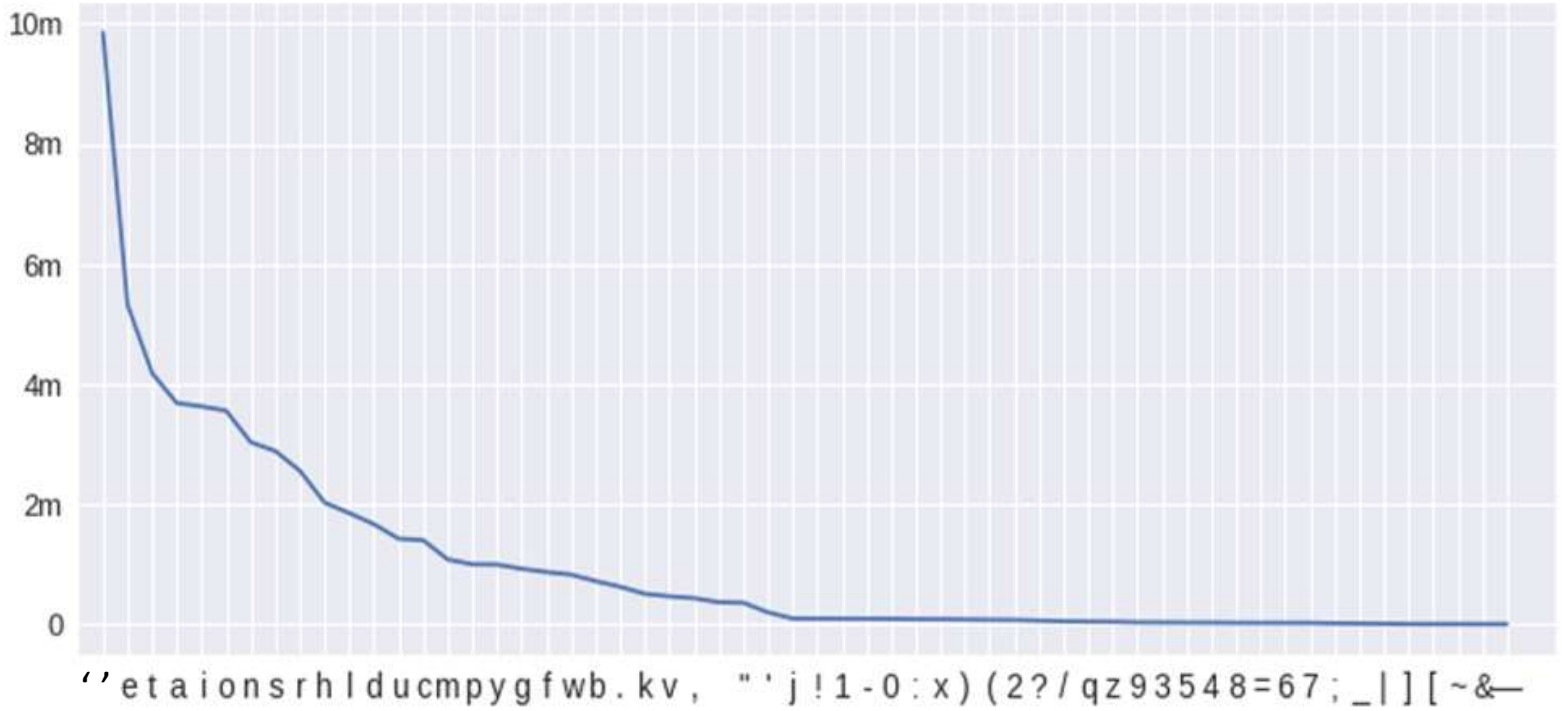
김호현

Tokenization max length = 100

서대원

Visualization : the Frequency of Character

Many Special Characters are Placed in High Rank



총 문자 수 : 1934

문자 출현 빈도 순위
‘ ‘ : 9850190
‘e’ : 5320996
‘t’ : 4179970
‘a’ : 3685571

Visualization : Special Characters

Visualization : Word Cloud

Clean

Toxic

Insult

Threat

Obscene

Severe Toxic

Identity_hate

1 Data Description

- Overview
- Example
- Y_Visualization
- X_Visualization

2 Preprocessing

- Tokenization
- TF-IDF

3 Model

- Model1
- Model2
- Model3
- Model4

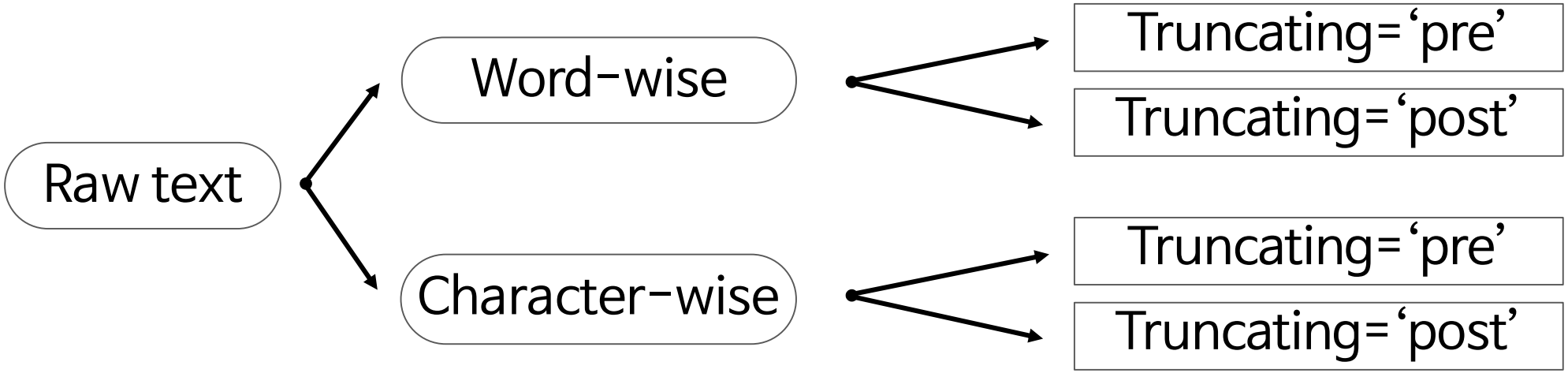
4 Result

- Lime Package

Tokenization

Step1. Tokenization

Step2. Padding

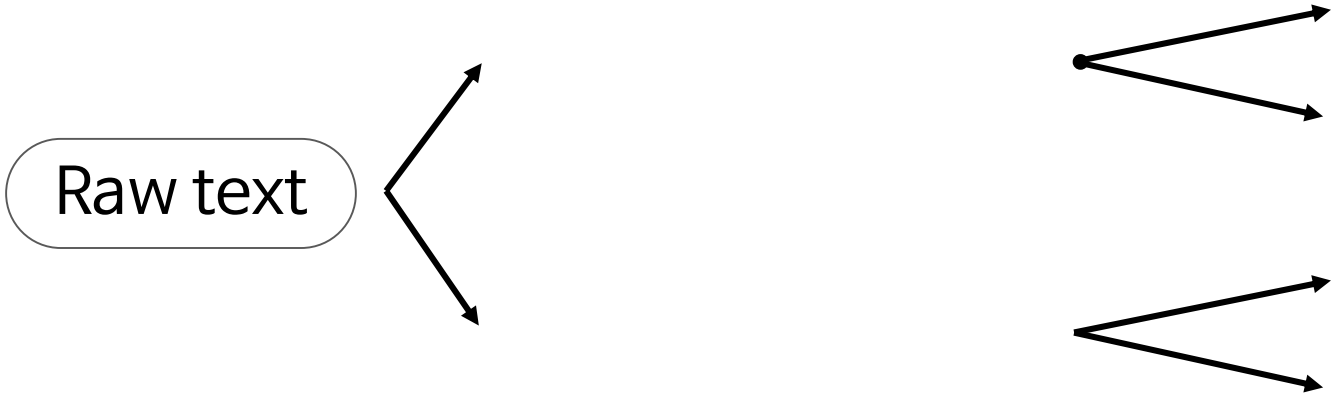


Tokenization

Shall I compare thee to a summer's day?
Thou art more lovely and more temperate.

Step1. Tokenization

Step2. Padding



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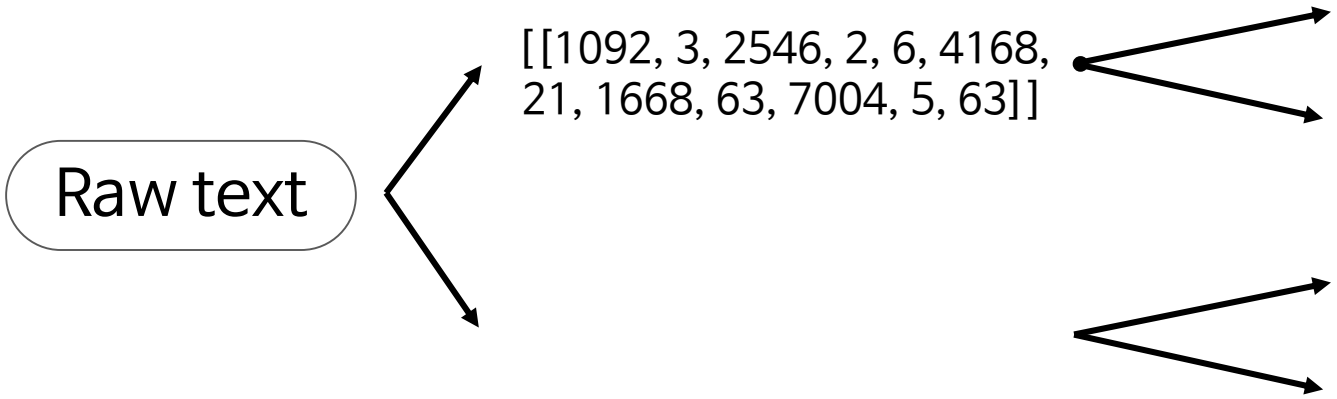

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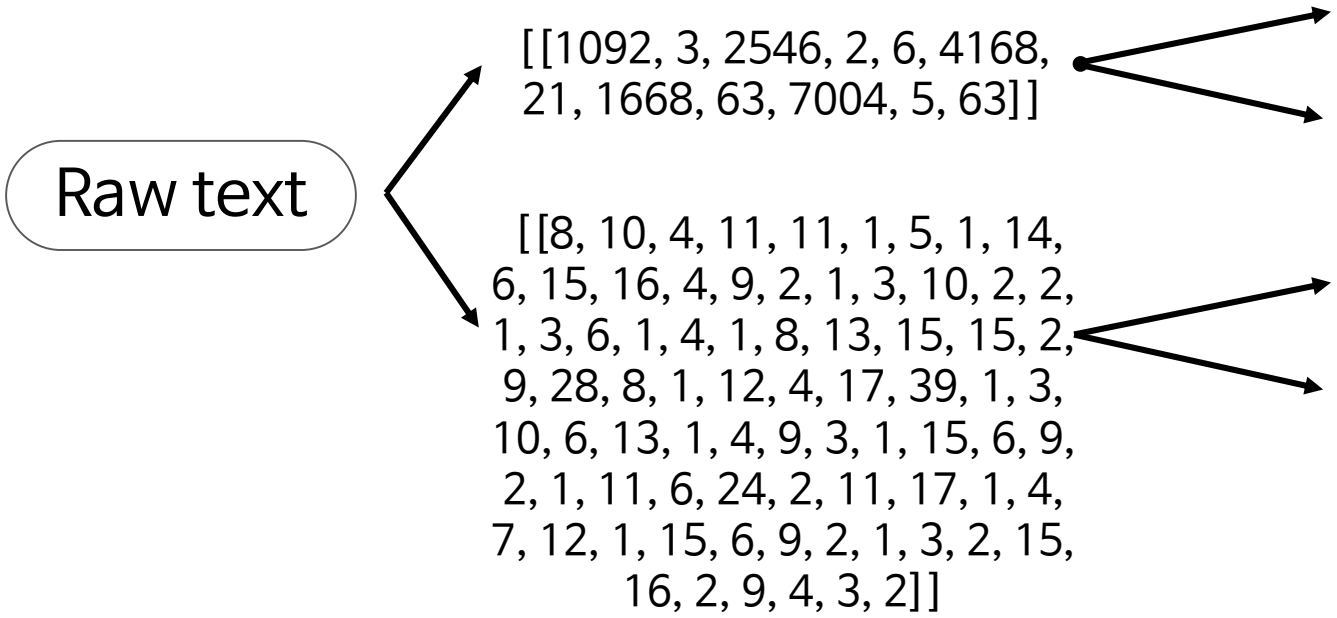

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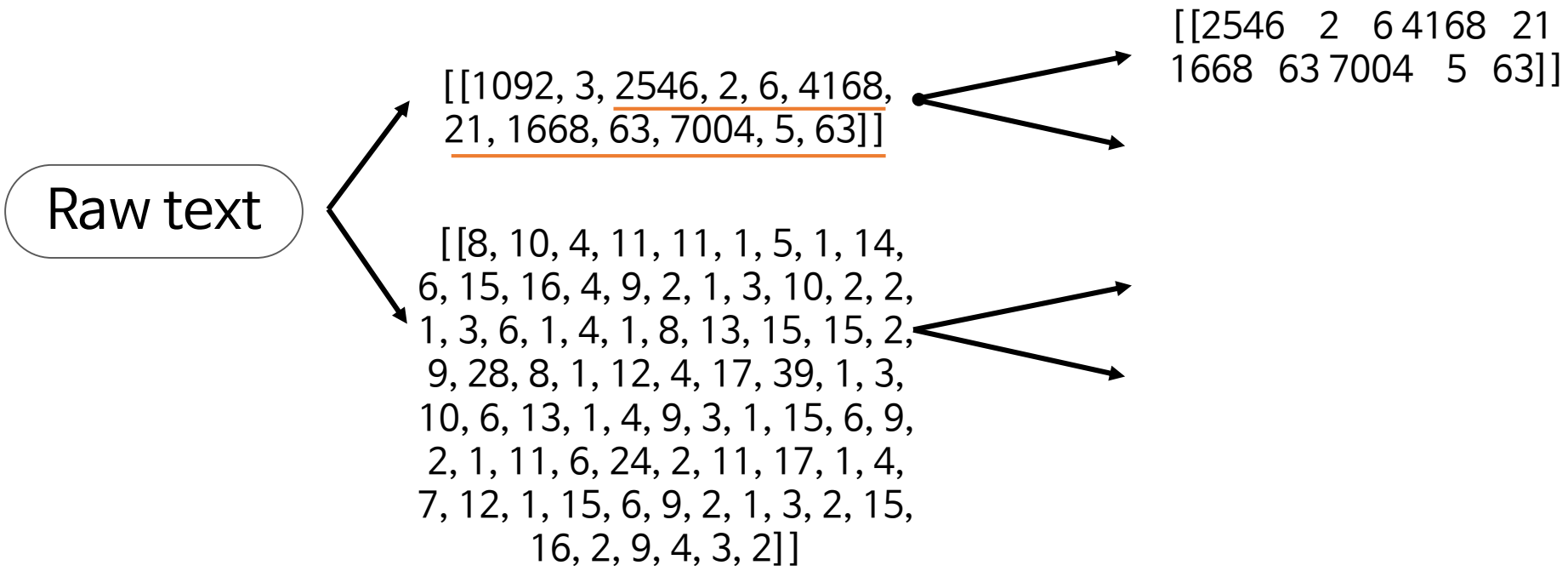

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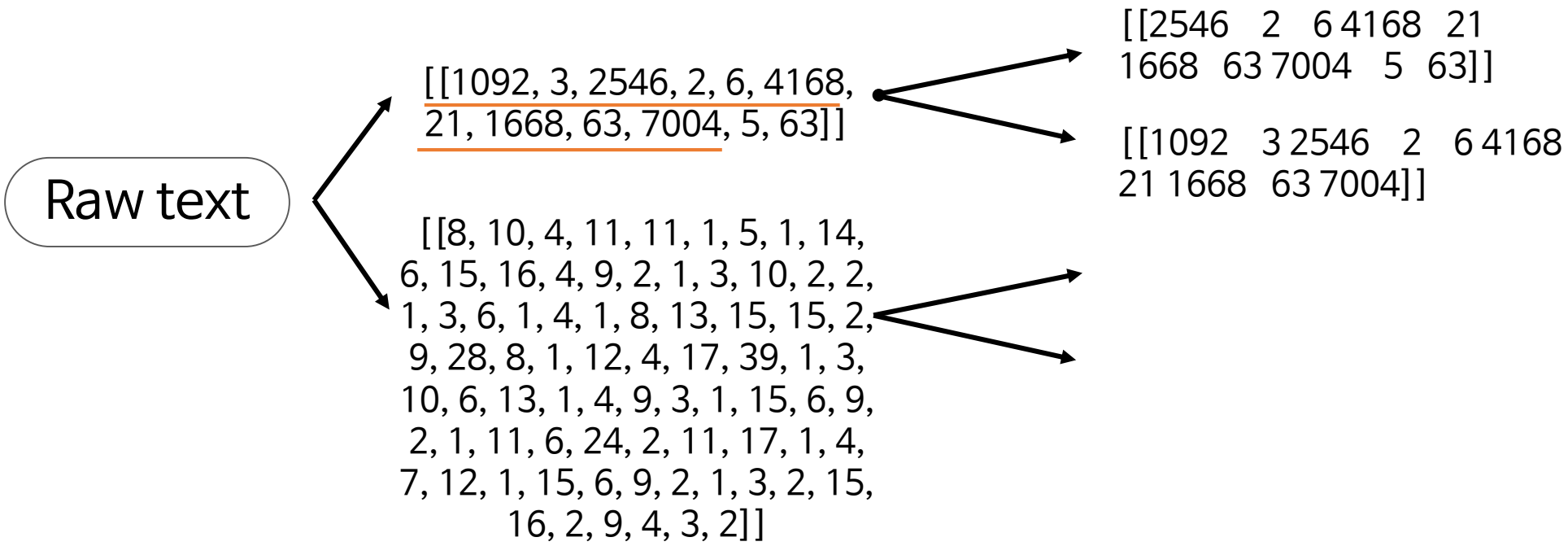

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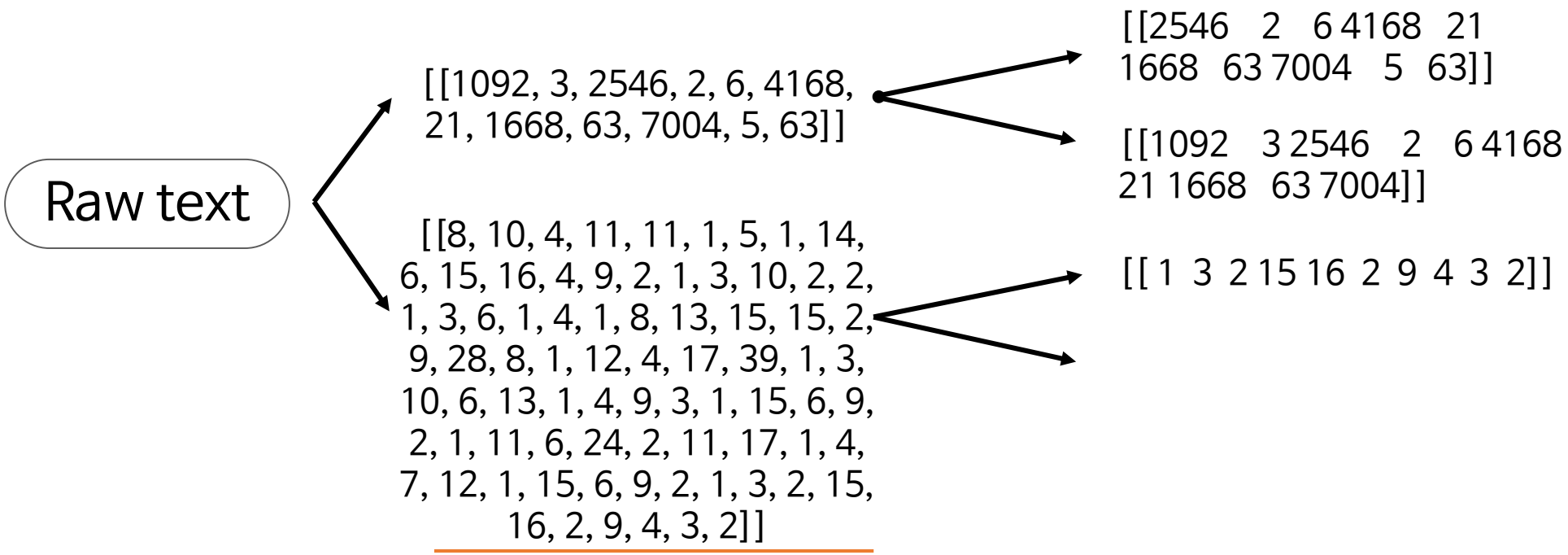
Step1. Tokenization

Step2. Padding



Tokenization

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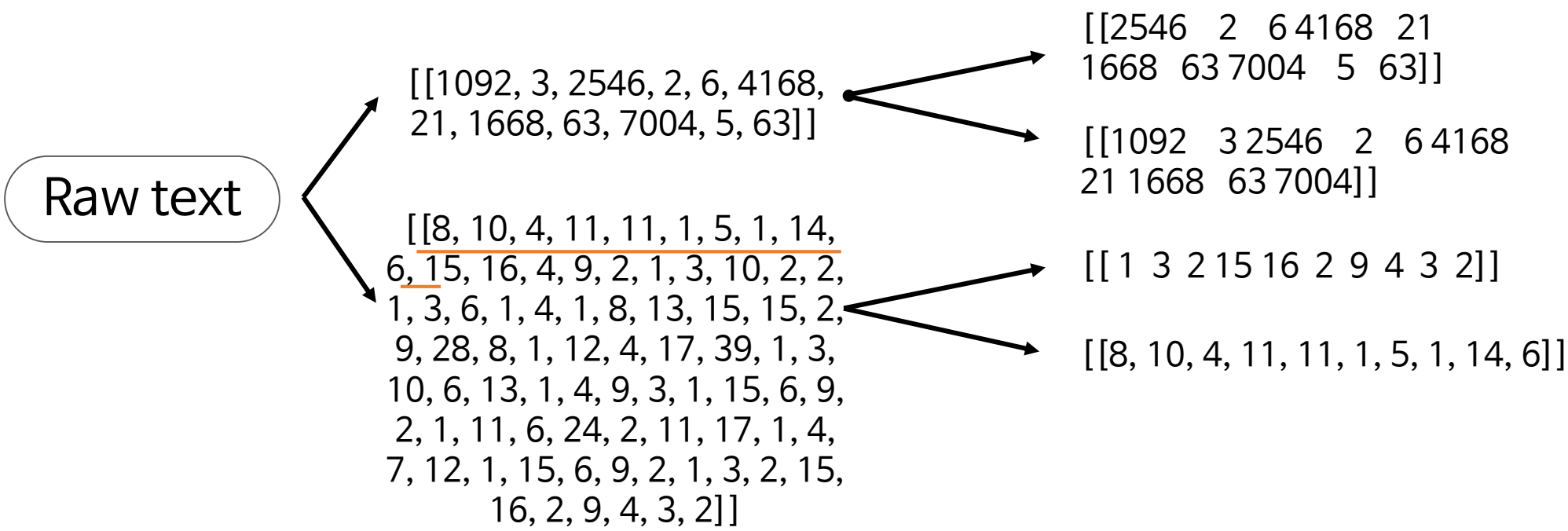
Step1. Tokenization

Step2. Padding



TF-IDF

Term Frequency

Number of times term t appears in a document
*
1/Total number of terms in the document

X

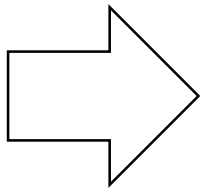
Inverse Document Frequency

log(
Total number of documents
*
1/Number of documents with term t in it
)

TF-IDF

```
word_vectorizer_example=TfidfVectorizer(
  sublinear_tf=True,
  strip_accents='unicode',
  analyzer='word',
  token_pattern=r'\w{1,}', #regex: only ascii letters and numbers
  stop_words='english',
  ngram_range=(1,1),
  max_features=20)
```

```
example=['——A simple Child, dear Brother Jim',
'That lightly draws its breath',
'And feels its life in every limb',
'What should it know of death?',
'I met a little cottage Girl:',
'She was eight years old, she said;',
'Her hair was thick with many a curl',
'That clustered round her head.',
'She had a rustic, woodland air,',
'And she was wildly clad:',
'Her eyes were fair, and very fair;',
'—Her beauty made me glad.']
```



```
array([[0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.70710678, 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.70710678, 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.57735027, 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.57735027,
        0.        ],
       [0.        , 0.57735027, 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 1.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.57735027, 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.57735027, 0.57735027, 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.70710678,
        0.        ],
       [0.        , 0.        , 0.70710678, 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.70710678, 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.70710678, 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.70710678, 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        1.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ],
       [0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        , 0.        , 0.        , 0.        , 0.        ,
        0.        ]])
```

1 Data Description

- Overview
- Example
- Y_Visualization
- X_Visualization

2 Preprocessing

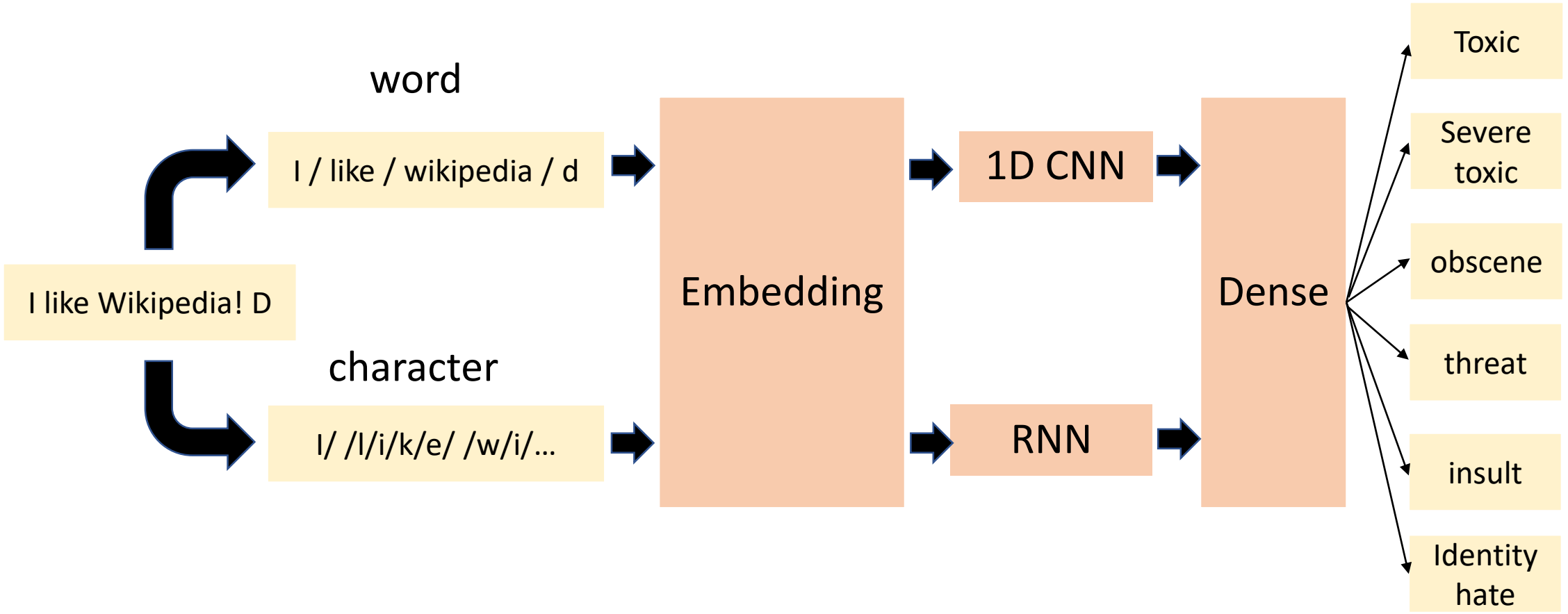
- Tokenization
- TF-IDF

3 Model

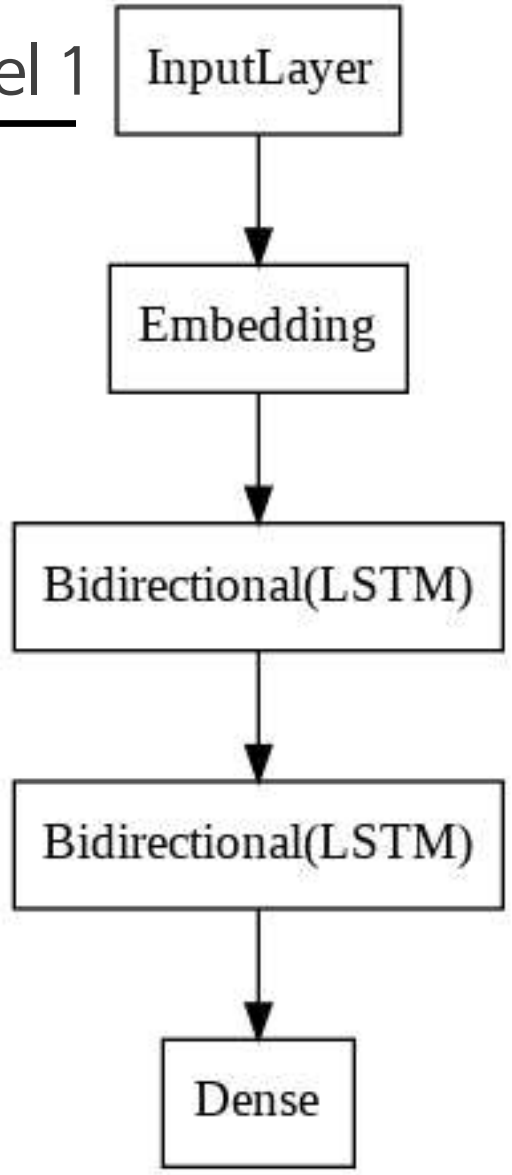
- Model1
- Model2
- Model3
- Model4

4 Result

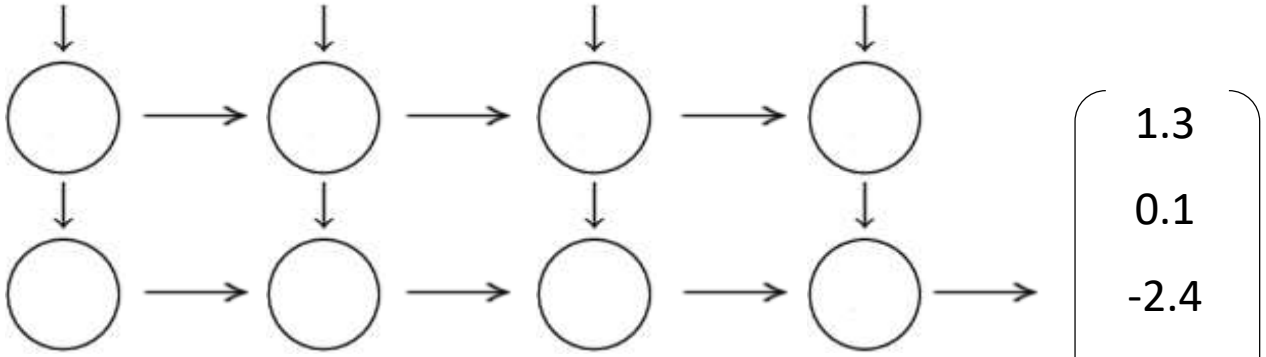
- Lime Package


word
I / like / wikipedia / d
I like Wikipedia! D
character
I/ /l/i/k/e/ /w/i/…
Embedding
1D CNN
RNN
Dense
Toxic
Severe toxic
obscene
threat
insult
Identity hate

Model 1



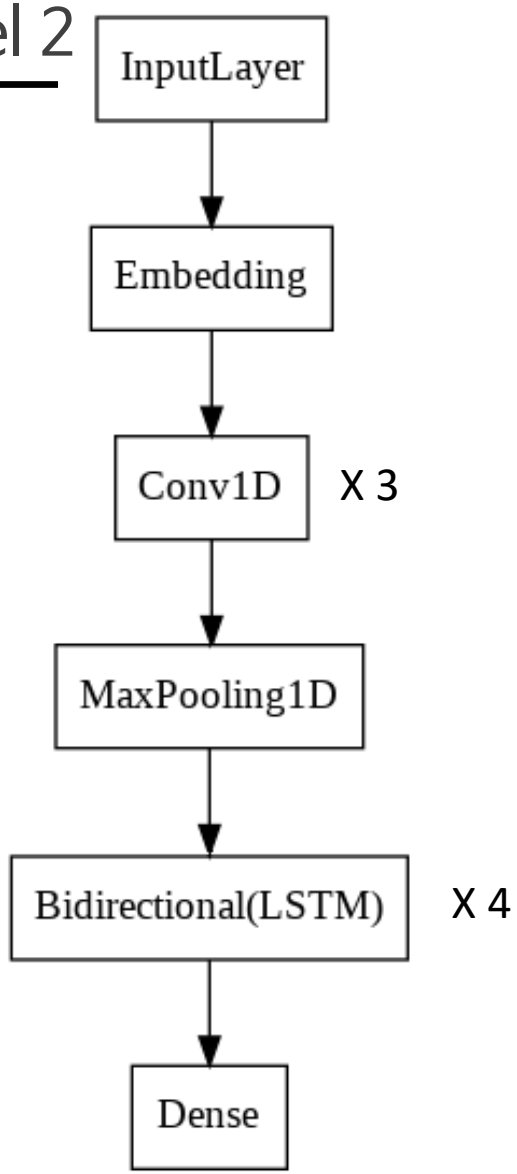
‘i’	‘like’	‘wikipedia’	‘d’
8	50	29	578
-0.08	-0.14	-0.1	-0.14
0.17	-0.08	-0.09	-0.25
0.04	0.14	0.05	0.11
0.06	0.04	0.08	0.06
…	…	…	…



1.3
0.1
-2.4
0.09
…

Roc_auc_score: 0.974

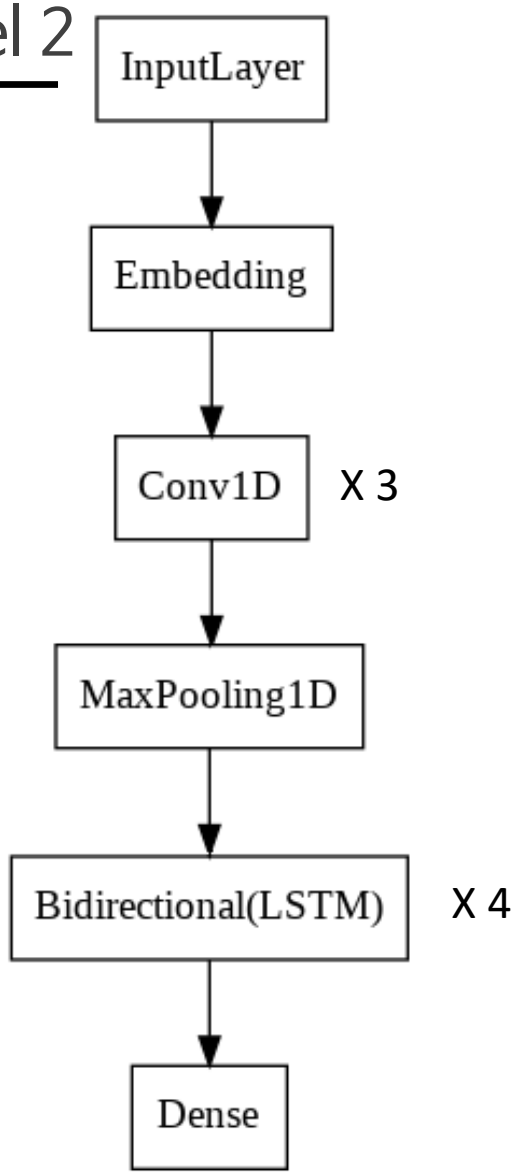
Model 2



'i'	' '	'l'	'l'	'k'	'e'
12	2	12	6	24	3
-0.08	-0.14	-0.08	-0.4	0.08	-0.2
0.17	-0.25	0.17	-0.2	0.05	-0.4
0.04	0.11	0.04	0.1	-0.02	0.09
0.06	0.06	0.06	0.08	0.03	0.1
...	...	...	...	...	...

1.3
0.1
0.6
...

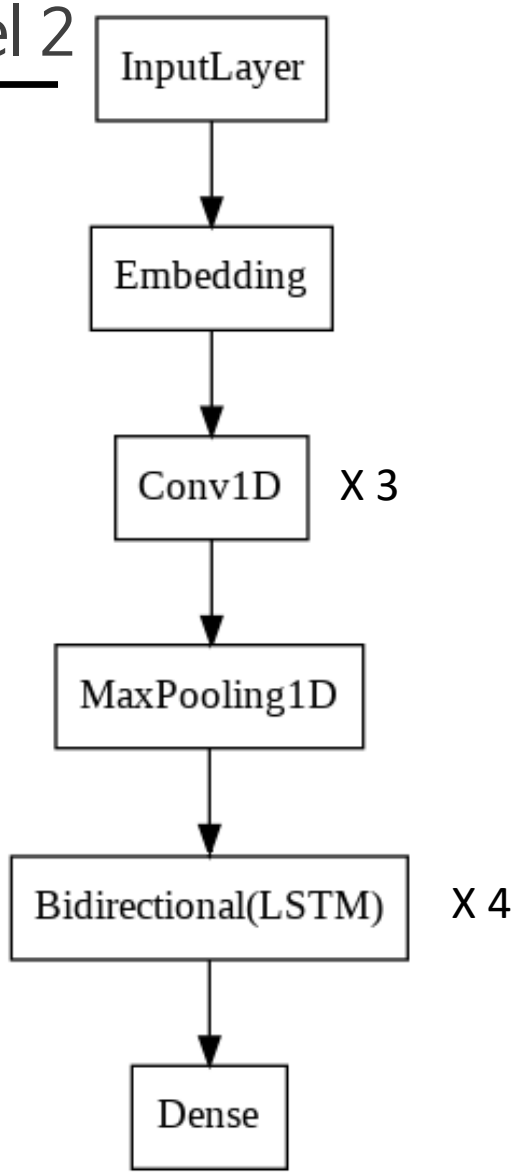
Model 2



‘i’	‘ ‘	‘l’	‘l’	‘k’	‘e’
12	2	12	6	24	3
-0.08 0.17 0.04 0.06 …	-0.14 -0.25 0.11 0.06 …	-0.08 0.17 0.04 0.06 …	-0.4 -0.2 0.1 0.08 …	0.08 0.05 -0.02 0.03 …	-0.2 -0.4 0.09 0.1 …

1.3	0.51
0.1	-0.9
0.6	0.15
…	…

Model 2

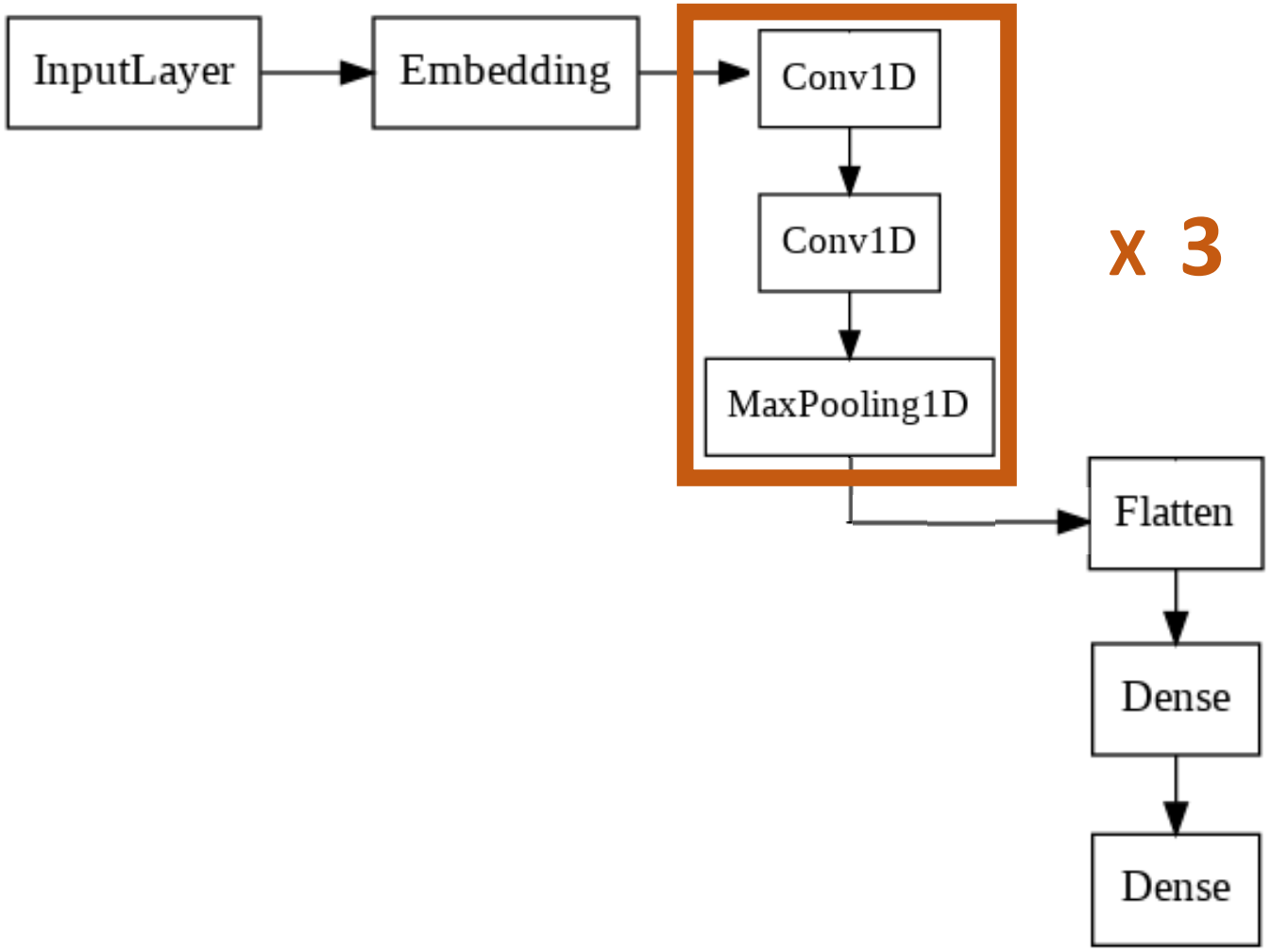


‘i’	‘ ’	‘l’	‘l’	‘k’	‘e’
12	2	12	6	24	3
-0.08 0.17 0.04 0.06 …	-0.14 -0.25 0.11 0.06 …	-0.08 0.17 0.04 0.06 …	-0.4 -0.2 0.1 0.08 …	0.08 0.05 -0.02 0.03 …	-0.2 -0.4 0.09 0.1 …

1.3 0.1 0.6 …	0.51 -0.9 0.15 …	-0.08 0.17 0.04 …

Roc_auc_score: 0.980

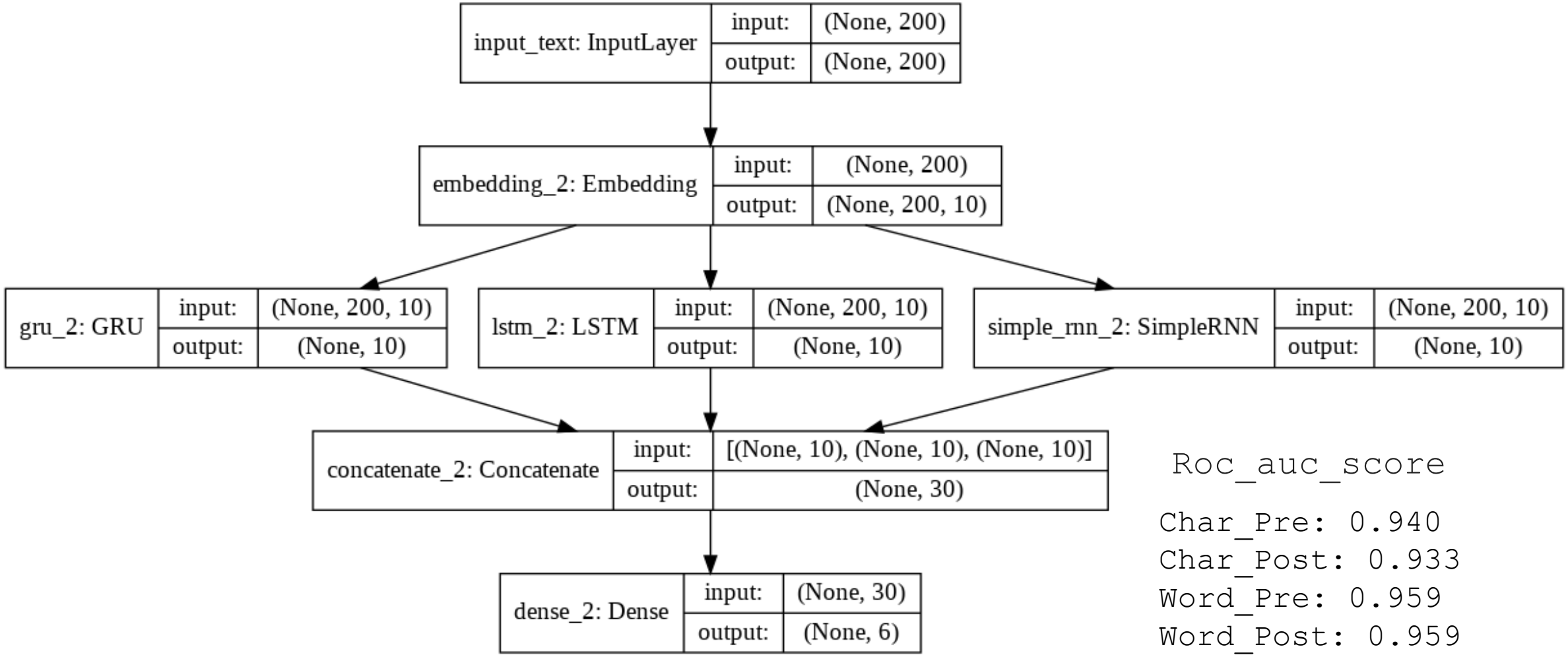
Model 3



activation = **'sigmoid'**

`Roc_auc_score: 0.977`

Model 4



Roc_auc_score

Char_Pre: 0.940
Char_Post: 0.933
Word_Pre: 0.959
Word_Post: 0.959
Ensemble: 0.971

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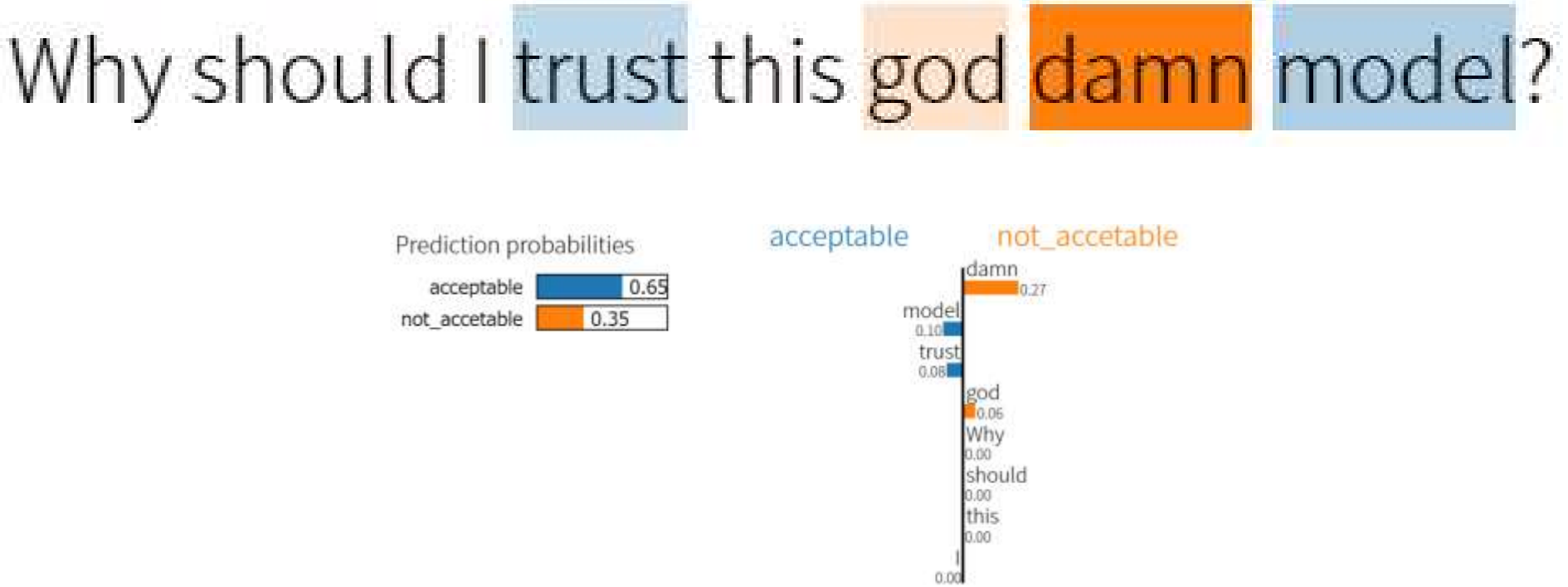

Why should I trust this god damn model?
Prediction probabilities
acceptable 0.65
not_accetable 0.35
acceptable
not_accetable
damn 0.27
model 0.10
trust 0.08
god 0.06
Why 0.00
should 0.00
this 0.00
I 0.00

Model Interpreptation : Unboxing the Black box

Which Part of the Text did make it Toxic?

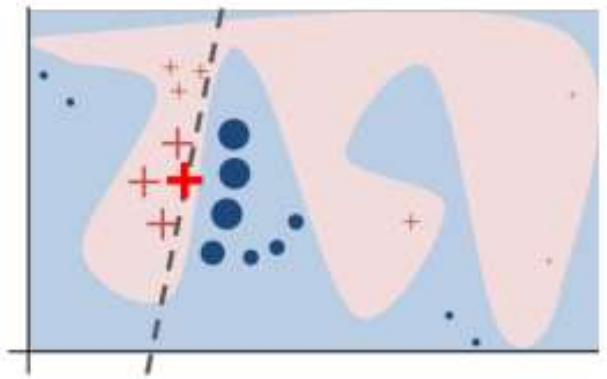
Credibility Can we rely on the model?

Masking Where should we mask if necessary?

`from LIME.lime_text import LimeTextExplainer`

Local Interpretable

Instead of analyzing the whole model,
Let's figure out how the model work
in the neighbor of boundaries



Model-agnostic Explanation

Both Machine-Learning and Deep-Learning models
are explainable

Paper : "Why Should I Trust You?": Explaining the Predictions of Any Classifier / github : Introduction to Local Interpretable Model-Agnostic Explanations / GitHub : https://github.com/marcotcr/lime

Please educate me as to how this article is a copyright infringement and, if so, from which source. Once this has been established could you explain how best to rectify the situation. Thank you

Prediction probabilities

acceptable 0.90

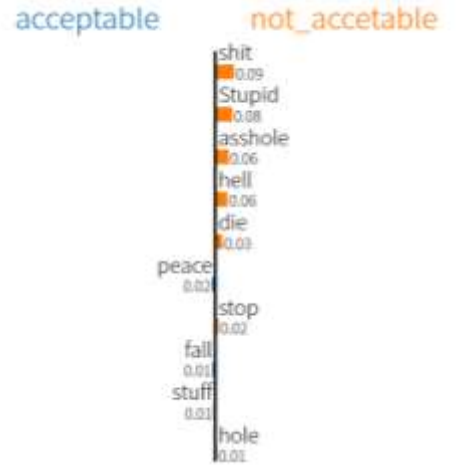
not_accetable 0.10

Stupid peace of shit stop deleting my stuff asshole go die and fall in a hole go to hell!

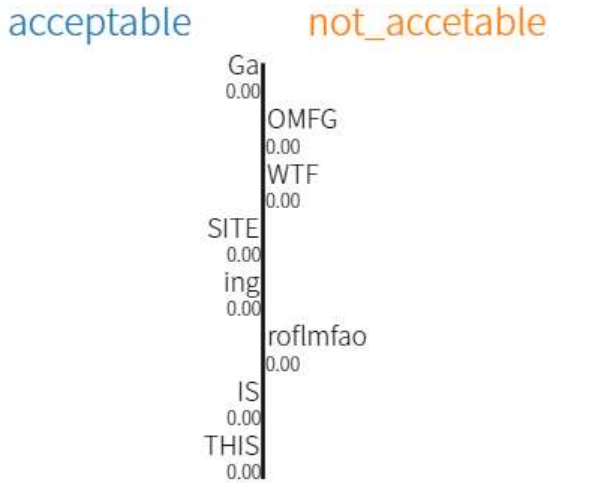
Prediction probabilities

acceptable 0.00

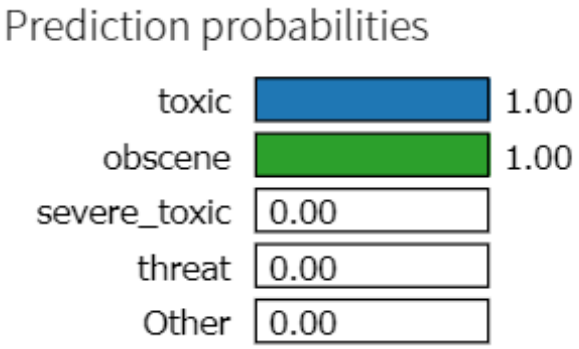
not_accetable 1.00



!!!roflmfao! OMFG!!! WTF??? THIS SITE IS ****ing Ga*!!! OMFG!!! roflmfao! WTF??? !!!**



Fuck you, Smith. Please have me notified when you die. I want to dance on your grave.




Q&A