The Detoxifiers

Empower Fruitful Discussions

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Katharina Neumüller & Kristin Stöcker

The Detoxifiers

Dr. Daniel Guhr
Physicist
Data Scientist

My Background

PhD Physics, Univ. of Constance
System Engineer
Project manager

Looking for projects (freelancer) as

□ **Data Scientist**
□ **Data Analyst**

remote

The Detoxifiers

Ksenia Gerasimovich
Data Scientist
Consultant

My Background

Business Informatics B.Sc.
Finance MBA
Business analyst
Consultant: ERP, BI implementation

Looking for a job as

- □ **Data Scientist**
- □ **Data Analyst**

in Düsseldorf oder remote

The Detoxifiers

Katharina Neumüller
Data Scientist

My Background

Computational Linguistics
Web-Development
Project Management

Looking for a position as

- □ **Data Scientist**
- □ **Data Analyst**

in Cologne or remote

The Detoxifiers

Kristin Stöcker
Linguist
Data Scientist

My Background

M.A. Linguistics
Research Assistant at FU Berlin

Looking for a job as

- □ **Data Scientist**
- □ **Data Analyst**
- □ **Data Engineer**

} **in NLP**

in Berlin or remote

Attention

Trigger Warning

This presentation contains examples of profane, vulgar or offensive language that is likely to upset readers!

The Background

The perks of online communication

free speech/ anonymity

exchange of opinions

independent of time and location

The price of online communication

41% of US adults experienced online harassment*

30% of affected users stopped using an online service*

27% of witnesses refrained from posting online*

*Pew Research Center: The State of Harassment, 2021

Consequences for website operators

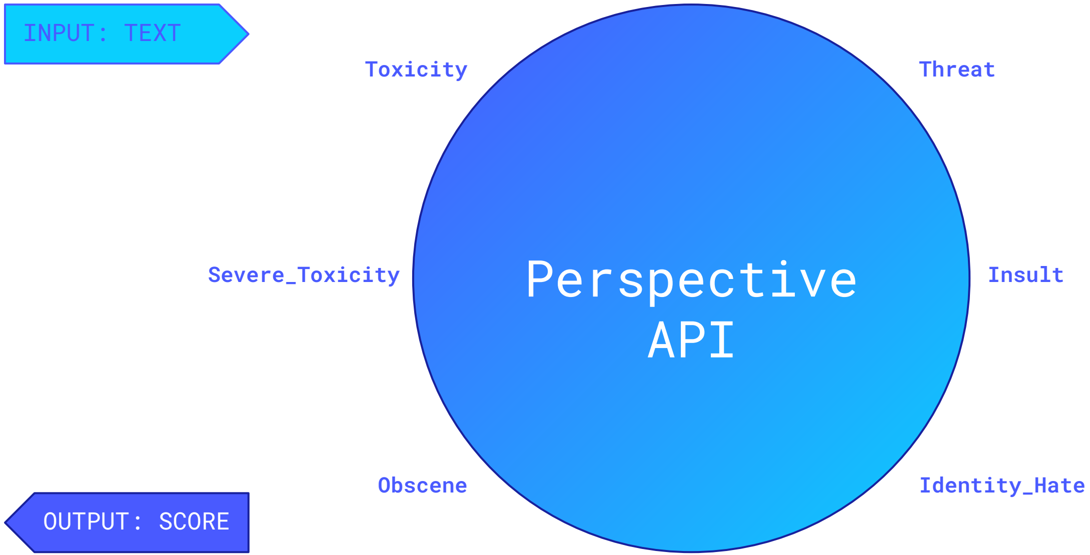
- content moderation presents enormous financial burden
- result: disabled comment sections
- New York Times: only 10% of articles allowed comments (before 2016)
- How can AI help to counter this problem?

JIGSAW Conversation.ai

Application of Perspective API in online communication

“Shut up.
You’re an idiot!”

Toxicity	0.99
Severe_Toxicity	0.81
Obscene	0.20
Threat	0.09
Insult	0.97
Identity_Hate	0.02



INPUT: TEXT

Toxicity

Threat

Severe_Toxicity

Perspective API

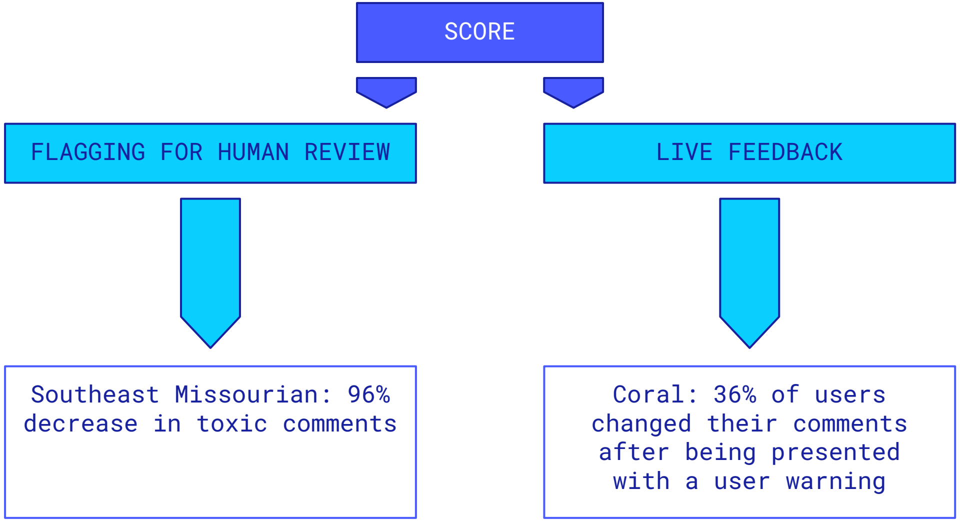
Insult

Obscene

Identity_Hate

OUTPUT: SCORE

One API,
many applications



SCORE

FLAGGING FOR HUMAN REVIEW

LIVE FEEDBACK

Southeast Missourian: 96% decrease in toxic comments

Coral: 36% of users changed their comments after being presented with a user warning

Toxic Comment Classification Challenge

- goal: multi-headed model capable of detecting different types of toxicity like threats, obscenity, insults, and identity-based hate
- dataset of 160.000 comments from Wikipedia's talk page edits
- train data labelled by humans

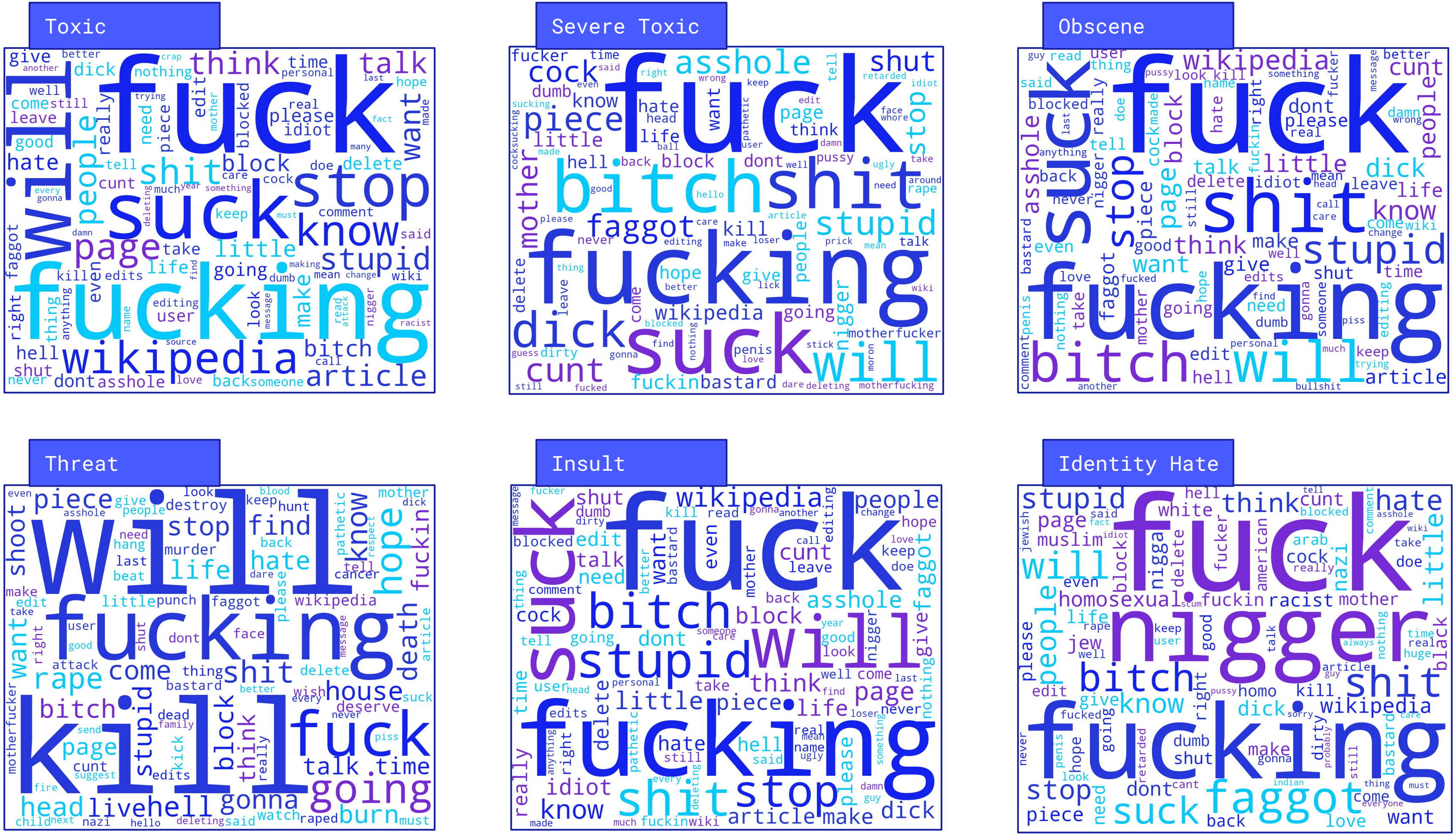
Featured Prediction Competition

$35,000 Prize Money

Toxic Comment Classification Challenge

Identify and classify toxic online comments

The Data


Toxic
fuck
fucking
suck
will
stop
know
wikipedia
stupid
think
page
shit
talk
people
article
little
block
hate
bitch
delete
want
give
dick
nothing
time
please
idiot
going
dont
asshole
back
someone
hell
shut
never
Severe Toxic
fuck
fucking
suck
bitch
shit
will
stupid
asshole
faggot
dick
cunt
cock
piece
shut
mother
kill
wikipedia
going
hope
stop
page
think
little
block
dont
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fuckin
bastard
motherfucker
motherfucking
nigger
Obscene
fuck
fucking
suck
shit
bitch
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stupid
wikipedia
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want
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people
asshole
block
dont
please
talk
give
edit
hell
know
Threat
will
kill
fucking
fuck
going
piece
stop
find
hate
life
hope
know
death
shoot
rape
come
shit
bitch
stupid
block
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time
house
head
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hate
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idiot
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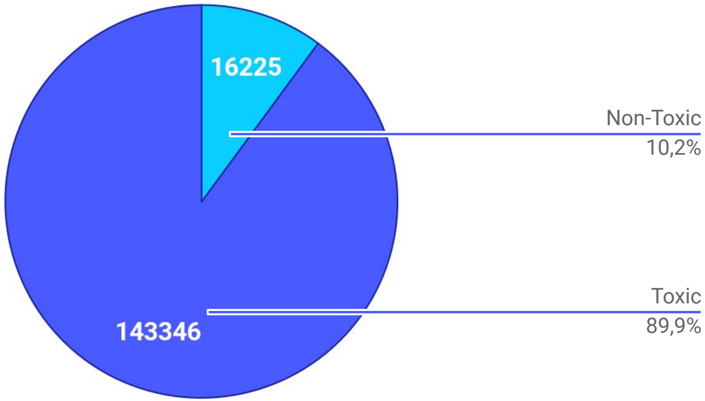
dick
Identity Hate
fuck
nigger
fucking
bitch
shit
faggot
suck
stupid
think
hate
cunt
will
page
muslim
white
homosexual
fuckin
racist
mother
people
jew
arab
cock
nazi
nigga
american
know
dick
wikipedia
stop
piece
dont
back
love
want

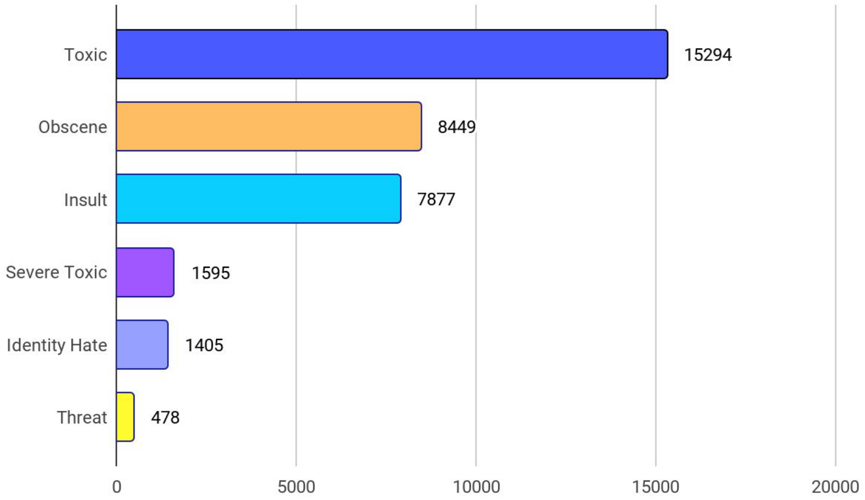
Data

Toxicity Distribution

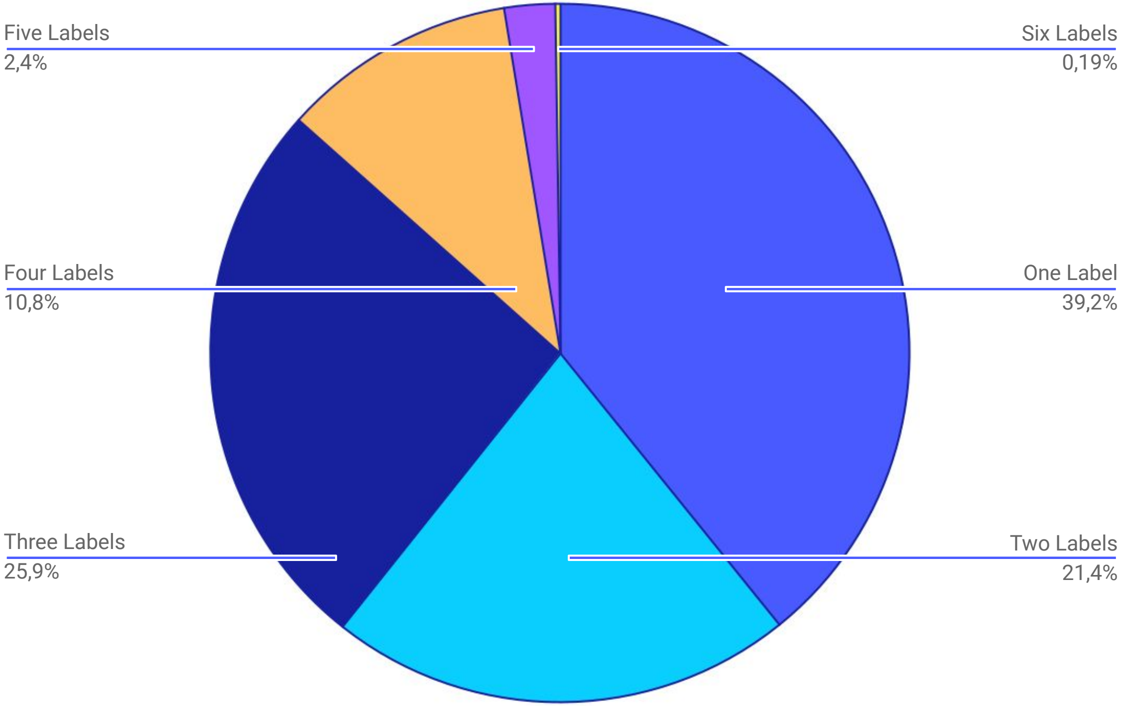


Dataset of 159571 Samples

Category Counts

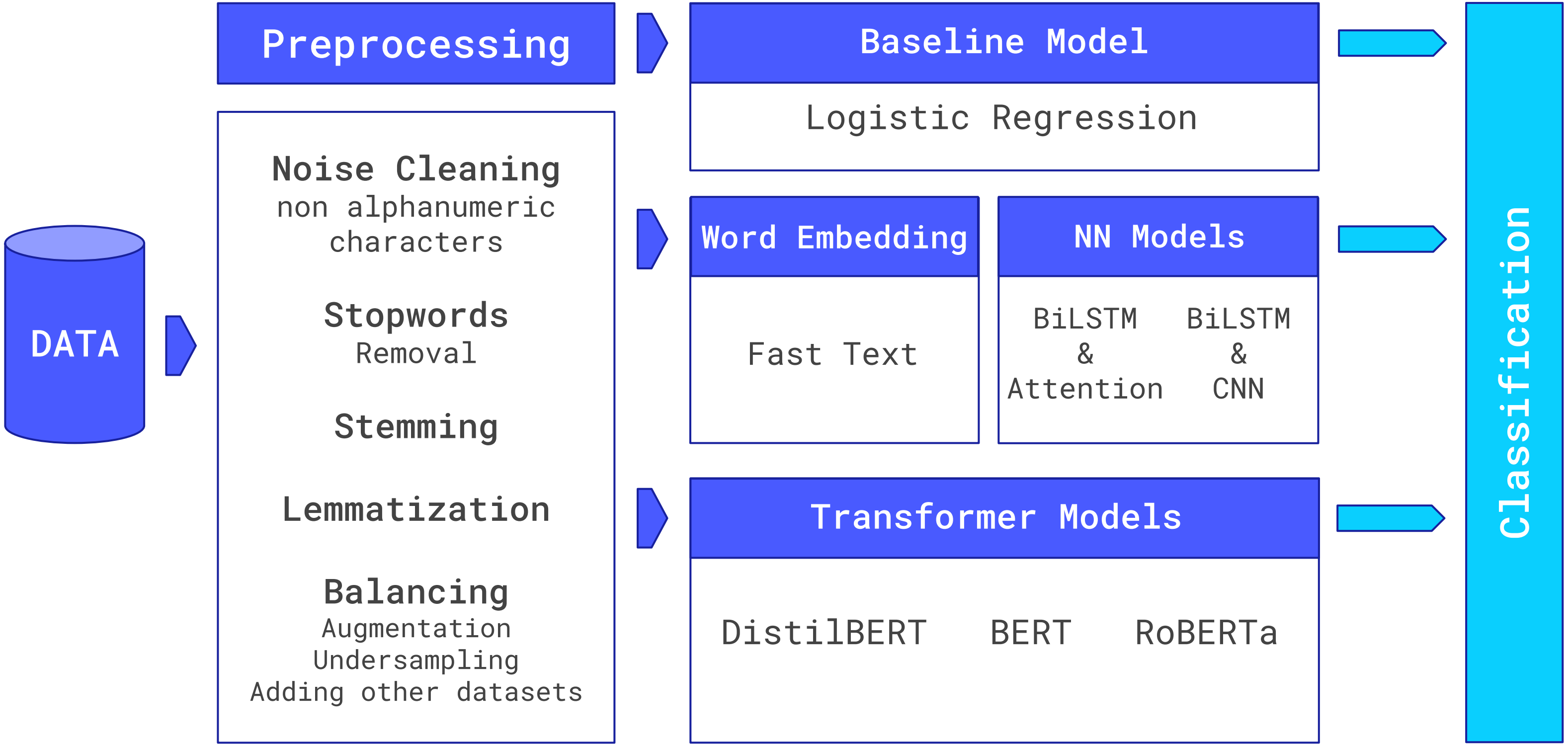


Comments with multiple labels



Approach & Results

A Modular Approach



DATA

Preprocessing

Noise Cleaning
non alphanumeric
characters

Stopwords
Removal

Stemming

Lemmatization

Balancing
Augmentation
Undersampling
Adding other datasets

Baseline Model

Logistic Regression

Word Embedding

Fast Text

NN Models

BiLSTM & Attention

BiLSTM & CNN

Transformer Models

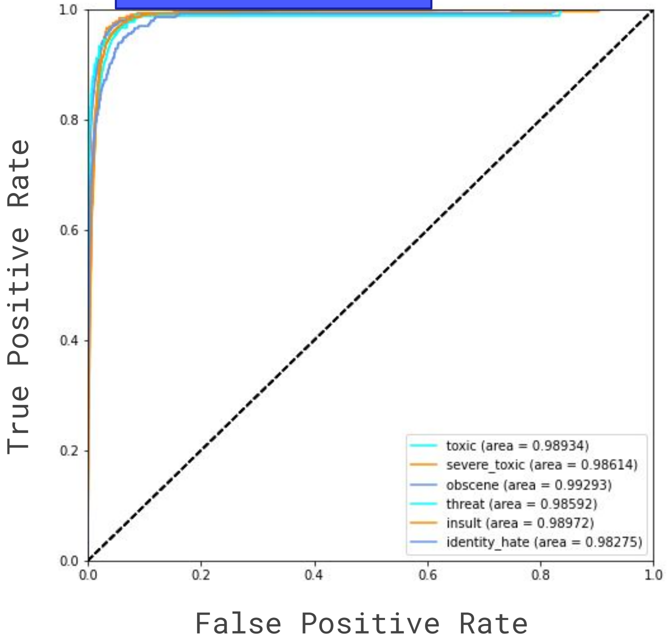
DistilBERT BERT RoBERTa

Classification

RoBERTa Classification Results

labels	precision	recall	f1-score	support
toxic	0.94	0.90	0.92	3102
severe_toxic	0.60	0.45	**0.51**	**345**
obscene	0.86	0.91	0.88	1772
threat	0.64	0.69	**0.66**	**102**
insult	0.78	0.88	0.83	1613
identity_hate	0.65	0.72	**0.69**	**277**
micro avg	0.85	0.87	0.86	7211
macro avg	0.75	0.76	**0.75**	7211

ROC AUC

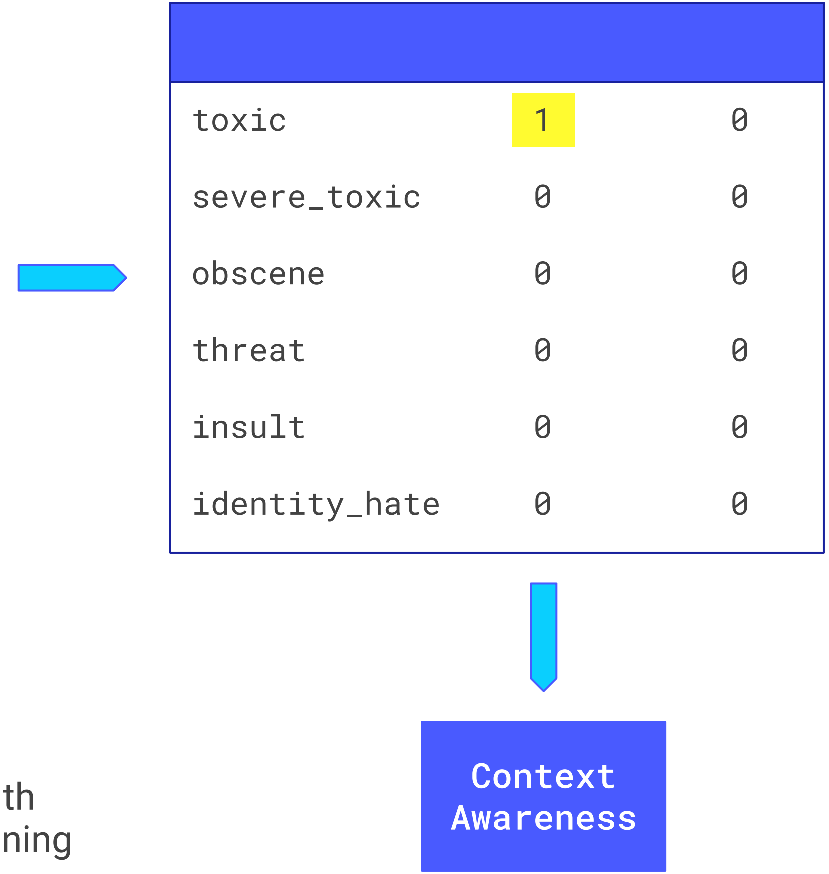


mean column-wise ROC AUC		
	train	0.98780
	test	0.98482

Error Analysis

Contextual Issues

“I’m glad you have gone do not come back”



toxic	1	0
severe_toxic	0	0
obscene	0	0
threat	0	0
insult	0	0
identity_hate	0	0

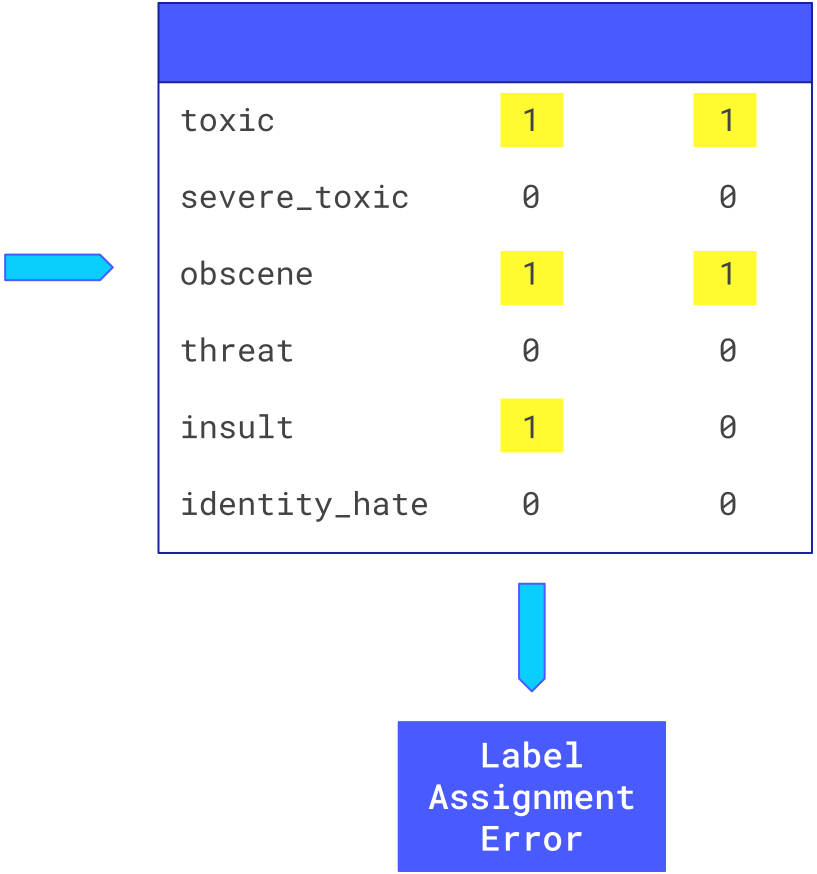
Context Awareness

PROBLEM Lack of context in training samples

SOLUTION Additional labeling of comments with frequent word repetitions and retraining

Subjectivity in labelling

“And I know I am a dickhead”



toxic	1	1
severe_toxic	0	0
obscene	1	1
threat	0	0
insult	1	0
identity_hate	0	0

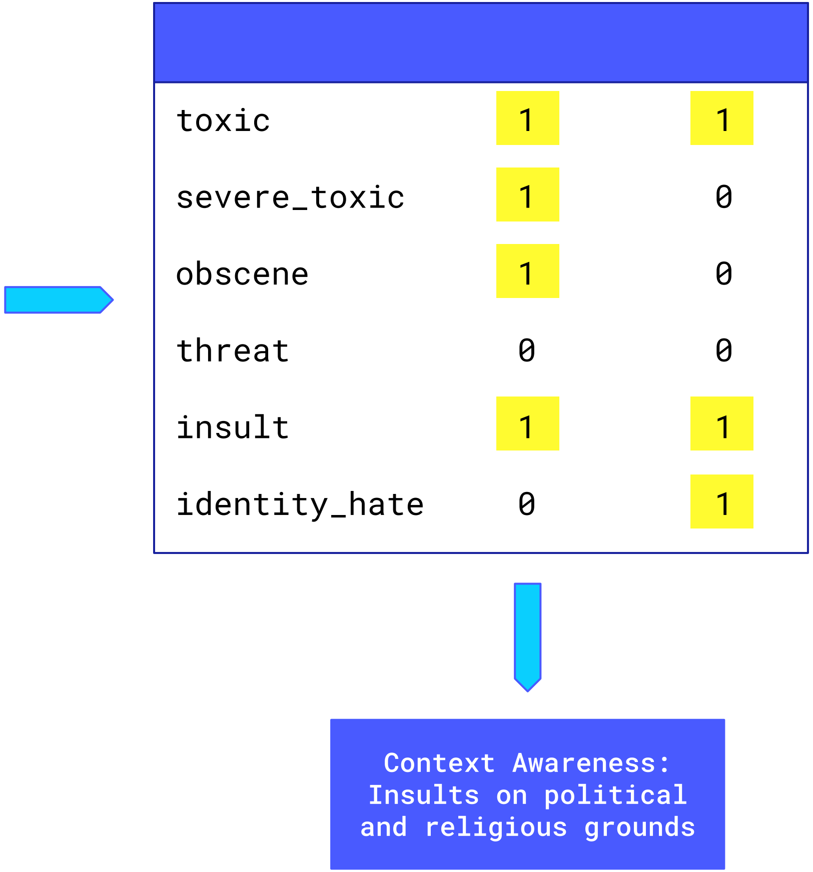
Label Assignment Error

PROBLEM Correct model predictions

SOLUTION Pseudolabelling

Lack of profanity and context to train the model

“islams you motha fers”



toxic	1	1
severe_toxic	1	0
obscene	1	0
threat	0	0
insult	1	1
identity_hate	0	1

Context Awareness:
Insults on political
and religious grounds

PROBLEM Context awareness exists, but in insufficient volume

SOLUTION More samples for training

Outlook

- Try out other Transformers - XLNet
- More training data (from other sources like Twitter)
- Further fine-tuning
- Ensemble models
- Out-Of-Vocabulary Words
  - Training own embeddings

Thank you

Questions, comments and discussions are welcome.