



# Deep Learning based Sentiment classification

CSE4095 - Introduction to Language Processing

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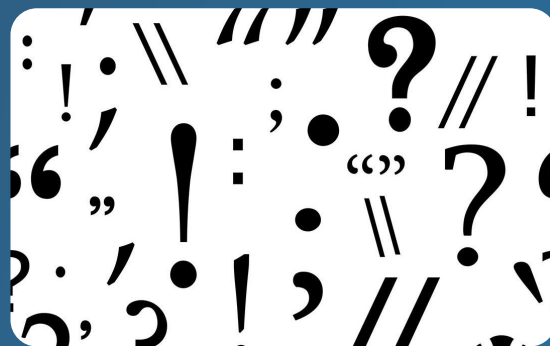
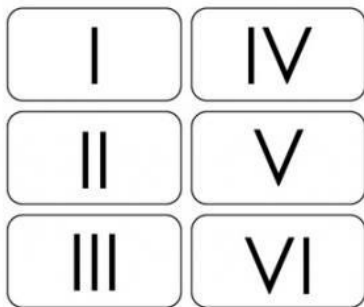
# Outline

- Introduction
- Preprocessing The Data
- Embedding layer
- Deep Learning Models
- Summary

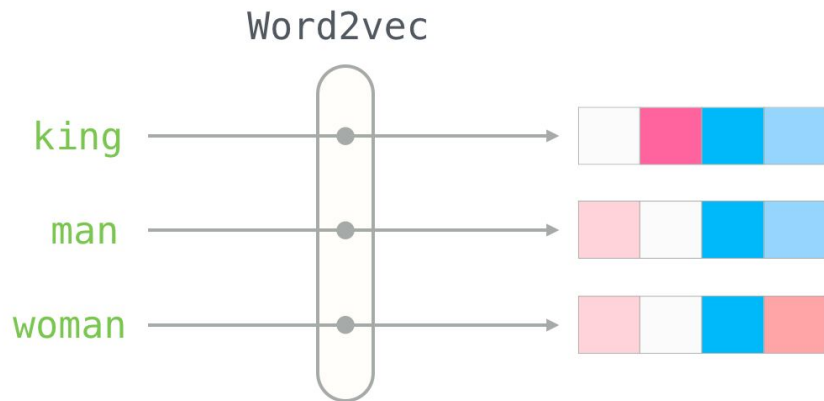
# Introduction

- Aim of the project
- Describing the dataset
- The produced results

# Preprocessing The Data



# Embedding Layer



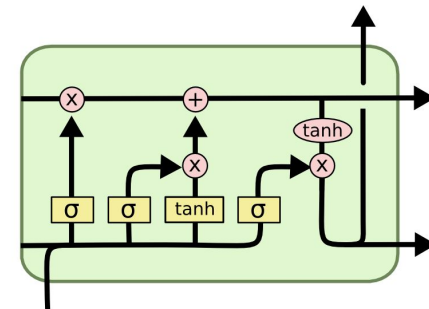
Keras

# LSTM

- Model architecture
- Loss function & Metrics

```
Epoch 1/10
188132/188132 [=====] - 109s 581us/step - loss: 0.2744 - acc: 0.9358 - f1_score: 0.9666
Epoch 2/10
188132/188132 [=====] - 117s 623us/step - loss: 0.1637 - acc: 0.9466 - f1_score: 0.9720
Epoch 3/10
188132/188132 [=====] - 102s 544us/step - loss: 0.1259 - acc: 0.9584 - f1_score: 0.9780
Epoch 4/10
188132/188132 [=====] - 109s 578us/step - loss: 0.1074 - acc: 0.9651 - f1_score: 0.9815
Epoch 5/10
188132/188132 [=====] - 105s 556us/step - loss: 0.0922 - acc: 0.9710 - f1_score: 0.9846
Epoch 6/10
188132/188132 [=====] - 128s 679us/step - loss: 0.0800 - acc: 0.9756 - f1_score: 0.9870
Epoch 7/10
188132/188132 [=====] - 117s 621us/step - loss: 0.0697 - acc: 0.9793 - f1_score: 0.9890
Epoch 8/10
188132/188132 [=====] - 128s 680us/step - loss: 0.0641 - acc: 0.9819 - f1_score: 0.9903
Epoch 9/10
188132/188132 [=====] - 103s 545us/step - loss: 0.0570 - acc: 0.9844 - f1_score: 0.9917
Epoch 10/10
188132/188132 [=====] - 101s 536us/step - loss: 0.0528 - acc: 0.9860 - f1_score: 0.9925
```

Accuracy:0.9407437331121459, F1\_score: 0.9678729179765574



LSTM

Testing on TBMM dataset

Example

Sayın Başkanım, bu gündem dışı konuşma için, bana konuşma fırsatı verdiğiniz için de size, ayrıca teşekkür ediyorum.

```
#####  
Positive: 0.999163031578064  
#####
```

# Sentiment Analysis on TBMM Corpus

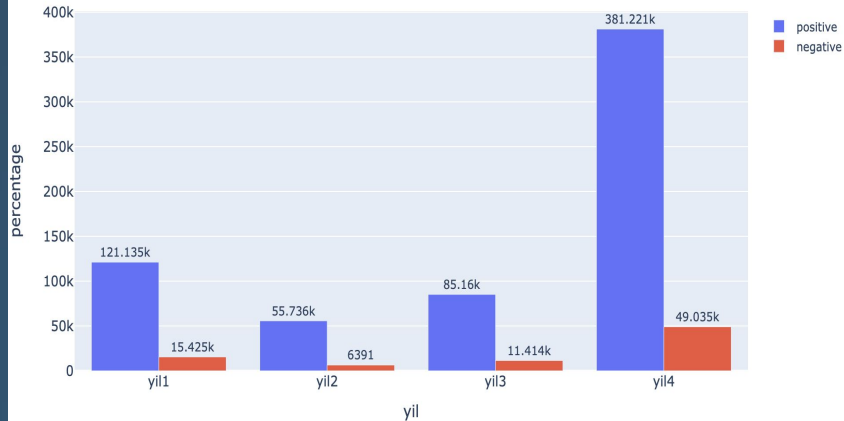
Donem 20



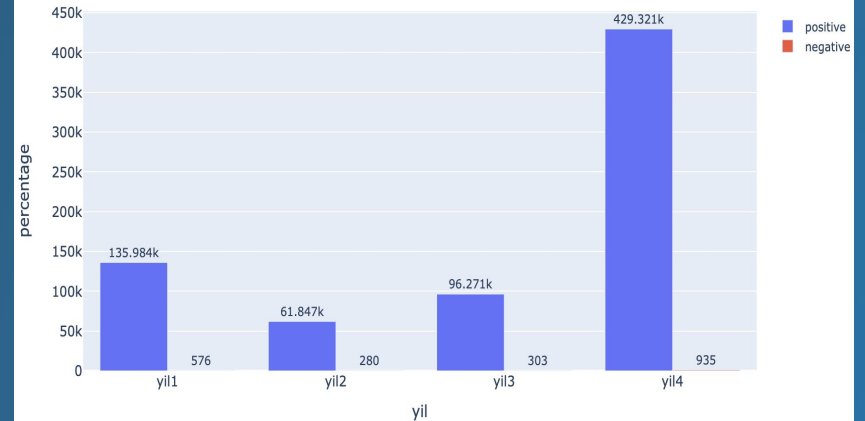
Keras

Word2Vec

Sentiment Analysis on TBMM Corpus- Donem20



Sentiment Analysis on TBMM Corpus- Donem20





# Sentiment Analysis on TBMM Corpus

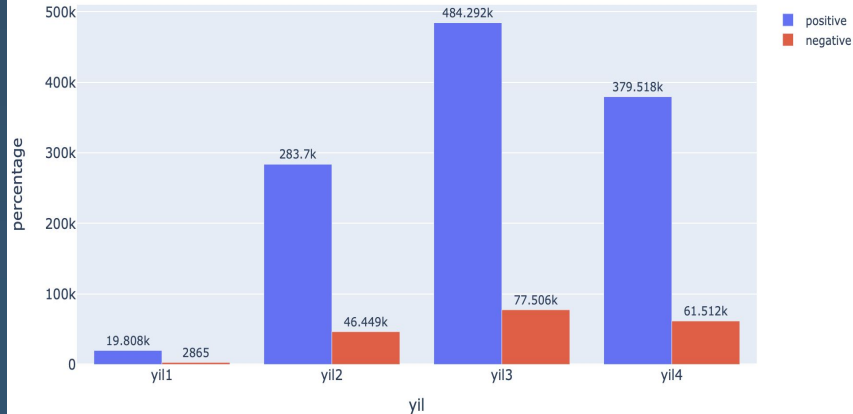
Donem 27



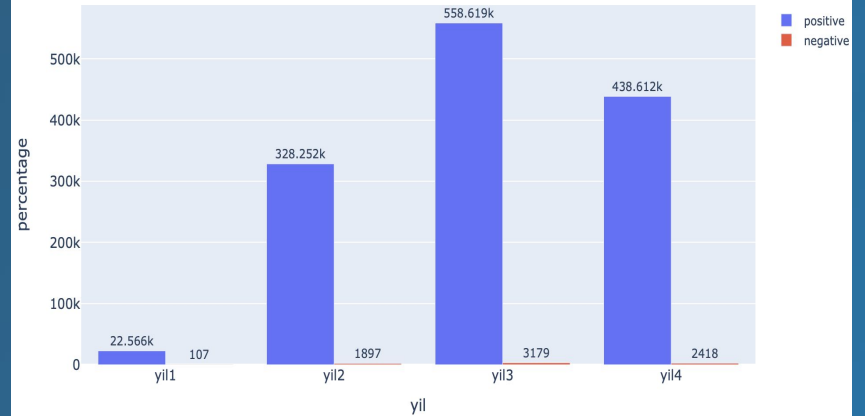
Keras

Word2Vec

Sentiment Analysis on TBMM Corpus- Donem27



Sentiment Analysis on TBMM Corpus- Donem27



## Transformers/pre-trained models



- BERT Base Turkish Sentiment Cased

### Results

#### Results

```
"05/10/2020 17:00:43 - INFO - transformers.trainer - *****Running Evaluation *****  
05/10/2020 17:00:43 - INFO - transformers.trainer - Num examples = 7999  
05/10/2020 17:00:43 - INFO - transformers.trainer - Batch size = 8  
Evaluation: 100% 1000/1000 [00:34<00:00, 29.04it/s]  
05/10/2020 17:01:17 - INFO - __main__ - ***** Eval results sst-2 *****  
05/10/2020 17:01:17 - INFO - __main__ - acc = 0.9539942492811602  
05/10/2020 17:01:17 - INFO - __main__ - loss = 0.16348013816401363"
```

## Transformers/pre-trained models

Testing on TBMM dataset

Example

Kocaeli Milletvekili Şevket Kazan ve 75 arkadaşının, Türkiye Elektrik Dağıtım A.Ş.'nin (TEDAŞ) bazı ihalelerinde usulsüzlük ve yolsuzluk yapıldığının tespit edilmesine karşın gerekli işlemleri yapmayarak ihalelerin belli firmalara verilmesini sağlamak suretiyle Devleti zarara uğratarak görevini kötüye kullandığı ve bu eyleminin Türk Ceza Kanununun 240 ıncı maddesine uyduğu iddiasıyla eski Başbakan Tansu Çiller hakkında Meclis soruşturması açılmasına ilişkin önergesi.

negative

0.967

positive

0.033

# Summary

- Sentiment Analysis
- The results found
- What's next?

# References

- <https://github.com/ozturkaslii/analyze-turkish-sentiment>
- <https://huggingface.co/savasy/bert-base-turkish-sentiment-cased>

Thank you  
for listening ! :)

