

# \* \* \* PGM: Final Project Presentation \* \* \*

## PoS-Tagging and NER

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# Agenda

① Task Description

② Process and Tools

③ Results and Comparison

# Task Description

- The task was to use probabilistic graphical models for:
  - PoS-Tagging (Part-of-Speech Tagging)
  - Named Entity Recognition (NER)
- We used the following models:
  - Naïve Bayes (baseline model)
  - HMMs (Hidden Markov models)
  - CRFs (Conditional Random Fields)

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}$$

# Process and Tools

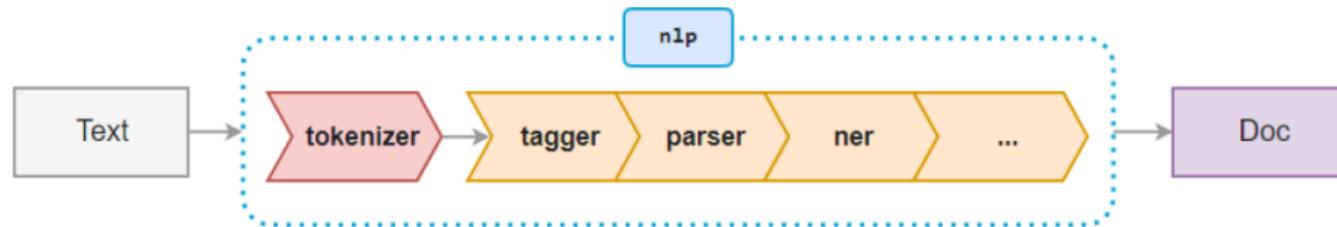


Figure: NLP-Pipeline

- POS tagging is one of the earliest stages in the NLP pipeline and serves as input for most downstream tasks
- E.g. NER: POS tags can be used as a feature

# Results

## POS Tagging

Naïve Bayes [POS]

Features	F1 score	Accuracy
w, l, s	0.927	0.927 / 0.240
w, l, s, uwf	0.928	0.928 / 0.241
w, l, s, bf	0.957	0.957 / 0.467
w, l, s, uwf, bf	0.949	0.949 / 0.369

HMM [POS]

Features	F1 score	Accuracy

Legend:

w: word, l: lowercase word, s: stem, uwf: unknown word features, bf: bigram features, pos: part of speech tags

# Results (Ctd.)

## POS Tagging

CRF [POS]		
Features	F1 score	Accuracy
w, l, s	0.973	0.973 / 0.605
w, l, s, uwf	0.980	0.980 / 0.680
w, l, s, bf	0.980	0.980 / 0.677
w, l, s, uwf, bf	0.984	0.984 / 0.734

### Legend:

w: word, l: lowercase word, s: stem, uwf: unknown word features, bf: bigram features, pos: part of speech tags

# Results (Ctd.)

## Named Entity Recognition

Naïve Bayes [NER]		
Features	F1 score	Accuracy
w, l	0.921	0.921 / 0.262
w, l, uwf	0.922	0.922 / 0.237
w, l, uwf, pos	0.921	0.921 / 0.240
w, l, uwf, pos, bf	0.929	0.929 / 0.288

HMM [NER]		
Features	F1 score	Accuracy

### Legend:

w: word, l: lowercase word, s: stem, uwf: unknown word features, bf: bigram features, pos: part of speech tags

# Results (Ctd.)

## Named Entity Recognition

CRF [NER]			
Features	F1 score	Acc word	Acc sent

**Legend:**

w: word, l: lowercase word, s: stem, uwf: unknown word features, bf: bigram features, pos: part of speech tags

# Result Comparison

- Naive Bayes confuses per-ord with eve-ord, but HMM does not  
⇒ context knowledge!
- Naive Bayes predicts per-tit very often
- Naive Bayes confuses tim-clo and tim-dat often
- HMM incorrectly predicts DET tag (POS) very often
- HMM incorrectly predicts O tag (NER) very often

# Thank you very much for the attention!

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**Do you have any questions?**