Pos-tagging

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December 1, 2020

Assignment-1 - HMM

Error analysis and Confusion Matrix of hidden markov model

	Average accuracy (%)
Overall	94.63
.	99.53
ADJ	98.52
ADP	98.84
ADV	98.99
CONJ	99.96
DET	99.12
NOUN	96.94
NUM	99.83
PRON	99.51
PRT	99.46
VERB	98.65
X	99.90

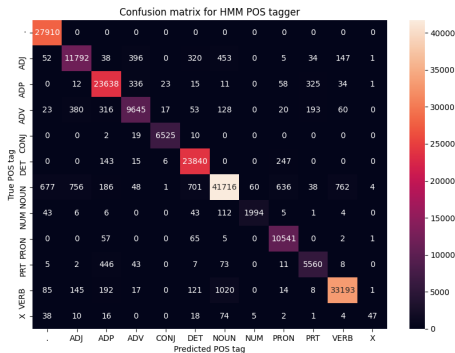

Confusion matrix for HMM POS tagger
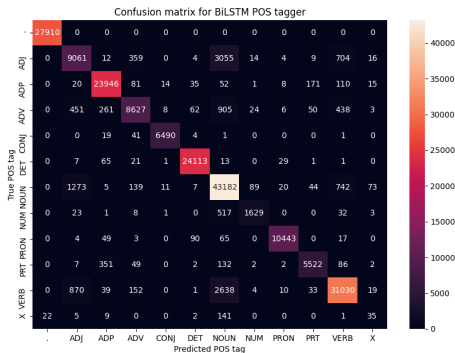
Table: Tag wise metrics

Error Analysis

- NOUN misclassified as ADJ: 70% of errors in this category have the sequence NOUN NOUN misclassified as ADJ NOUN. Can be attributed to $P(NOUN|ADJ)$ being much higher than $P(NOUN|NOUN)$
- NOUN misclassified as VERB: About 20% of this error category consists of possible gerunds (words ending with *-ing*)
- Unseen words make up a large portion of the errors

BiLSTM

	Average accuracy (%)
Overall	92.29
.	99.996
ADJ	96.29
ADP	99.37
ADV	98.48
CONJ	99.94
DET	99.83
NOUN	94.81
NUM	99.55
PRON	99.84
PRT	99.58
VERB	97.07
X	99.83

Table: Tag wise metrics

Confusion matrix for BiLSTM POS tagger

Error analysis

- **NOUN misclassified as ADJ:** 71.88% of this error category constitutes of bigrams with true labels (NOUN NOUN) getting misclassified as (ADJ NOUN). HMM also had 70% of such cases in this category. This tells us that the network could possibly have encoded the information that *"the word preceding a NOUN is more likely to be an ADJ than a NOUN."*

SVM

Error analysis and Confusion Matrix of SVM model

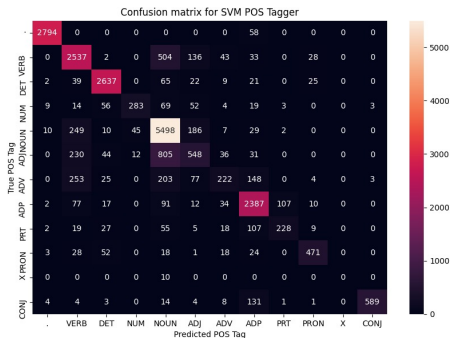|	Average accuracy (%)
Overall	80.03
.	99.60
ADJ	92.73
ADP	95.82
ADV	96.09
CONJ	99.23
DET	98.16
NOUN	89.57
NUM	98.74
PRON	99.03
PRT	98.44
VERB	97.70
X	99.96

Table: Tag wise metrics

Confusion matrix for SVM POS Tagger

Error analysis

- **Accuracy of PRT = 0.48**
  This is mainly because of contracted forms like : you're , we're , you'll , misclassified as NOUN , VERB.

- **Exceptions in using suffixes**
  words with -ing suffix are classified as VERB but words like - 'meeting' should be NOUN but misclassified.