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# Chunking via MEMM, CRF and Bi-LSTM

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# Assignment 1 (Finished)

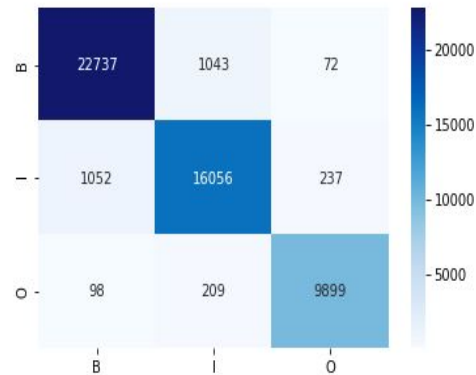
SVM was done, but implementation  
from scratch was left

This is now complete

Libraries used:

- Pandas
  - Numpy
  - Followed one-vs-rest-classifier  
approach.
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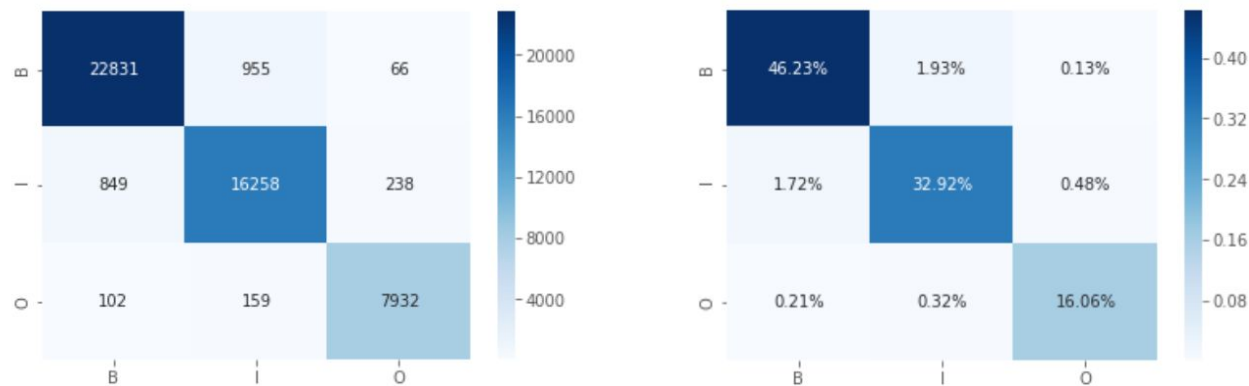
# MEMM-Results



TAG	PRECISION	RECALL	F1_SCORE
O	0.97	0.97	0.97
B	0.95	0.95	0.95
I	0.93	0.93	0.93

Overall Accuracy =  
94.16%

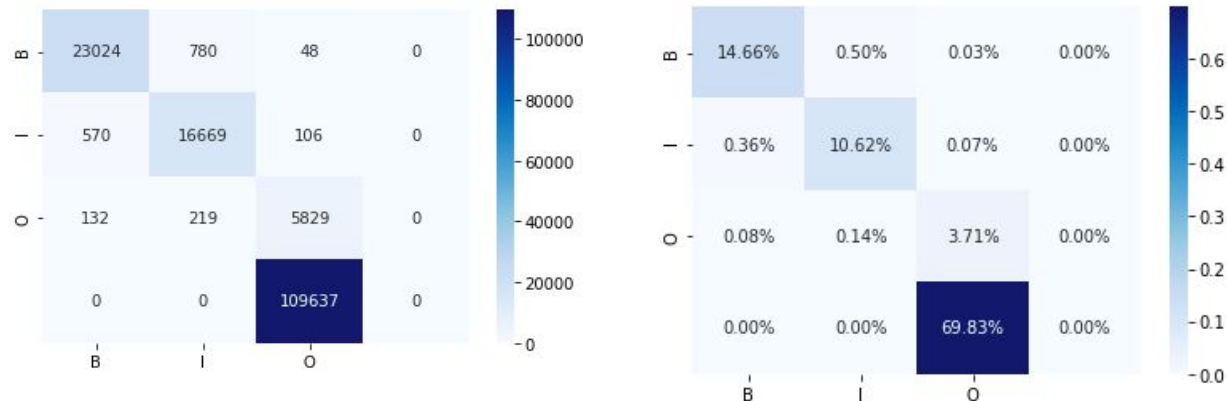
# CRF-Results



	precision	recall	f1-score
B	0.960	0.957	0.959
I	0.936	0.937	0.937
O	0.963	0.968	0.966

Overall Accuracy = 94.98%

# Bi-LSTM Results



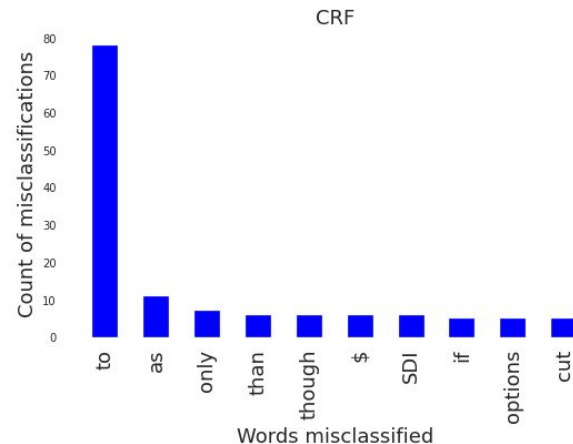
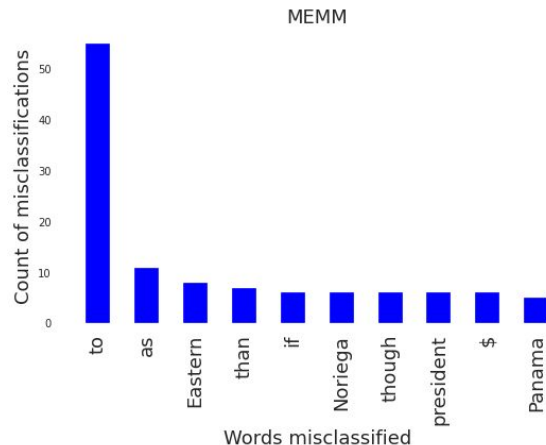
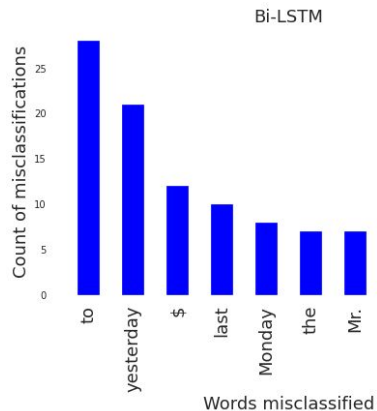
TAG	PRECISION	RECALL	F1_SCORE
B	0.97	0.97	0.97
I	0.94	0.96	0.95
O	0.05	0.94	0.1

Overall Accuracy =  
95.89%

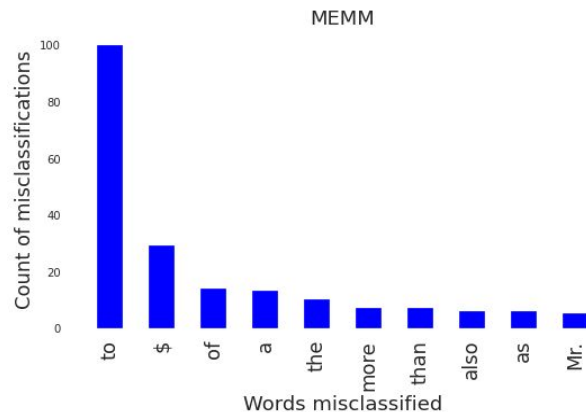
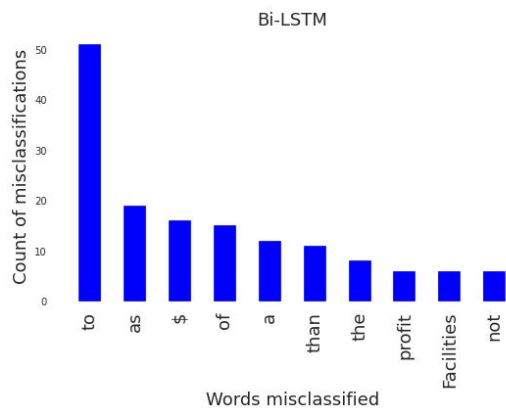
Ignore 'PAD' tag

# Error Analysis :

Words that should have 'B' tags but assigned 'I' (B-I misclassified)

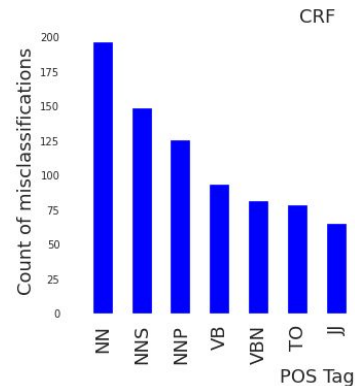
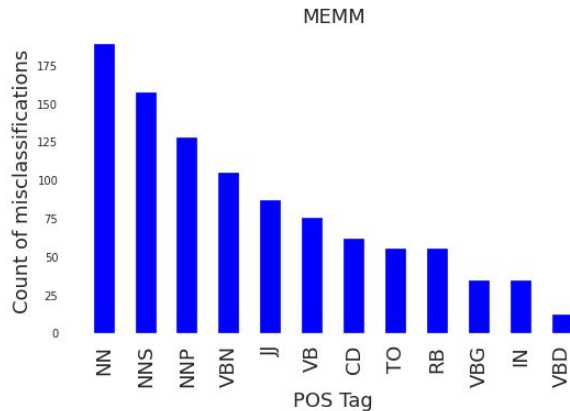
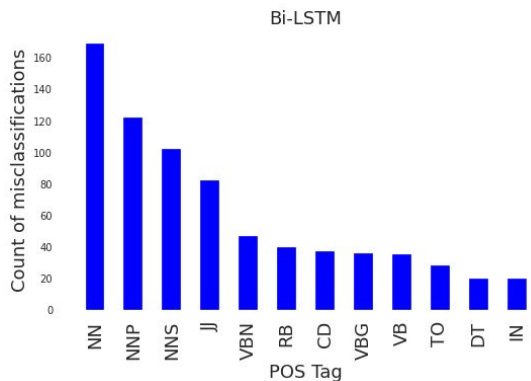


Words that should have 'I' tags but assigned 'B' (I-B misclassified)

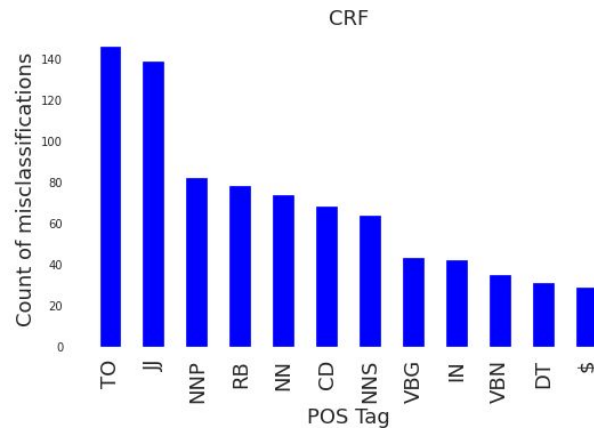
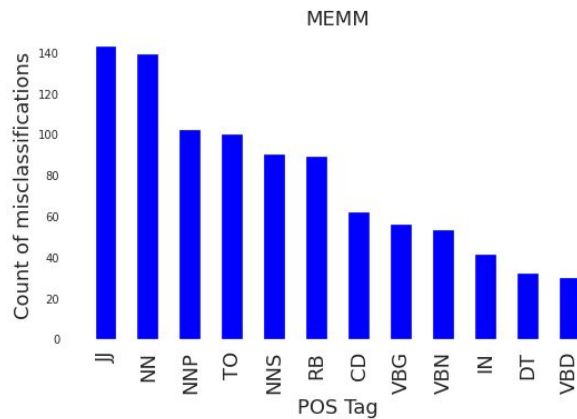
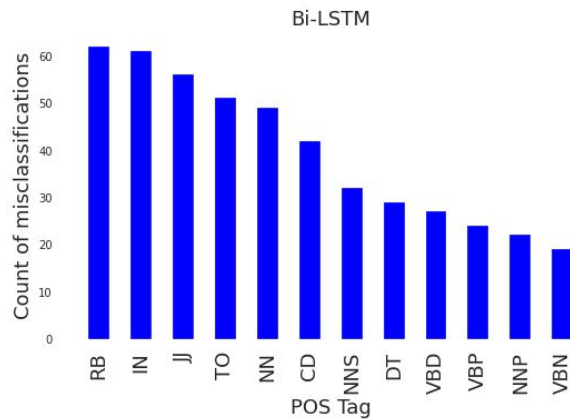


# Error Analysis :

POS Tags that should have 'B' tags but assigned 'I' (B-I misclassified)



POS Tags that should have 'I' tags but assigned 'B' (I-B misclassified)



# Error Analysis :

Ambiguity in chunk parse with respect to 'to' word (common in all the models) :

**Example :** Experts always insisted that his allegiance was first **to** the Americans. (B-I misclassified)  
Medicine in the 19th century was dedicated mostly **to** combating sepsis. (B-I misclassified)

that it might have **to** take a charge against earnings (I-B misclassified)  
Lt. Col. Noriega has elected **to** postpone his visit to Washington (I-B misclassified)

Other examples :

**'As'**

that he estimated will cost taxpayers **as** much **as** \$ 2 billion (1st 'as' correctly classified  
as 'B', second misclassified as 'B', difficulty in capturing long chunks)

Actual CHUNK should be = B B B B I B **B I I I I I** O O  
Predicted CHUNK = B B B B I B **B I B B I I** O O

**'Defense' -NN tag (Most commonly misclassified among all the models)**

Carlucci\_NNP , 59\_CD years\_NNS old\_JJ , served\_VBN as\_IN **defense\_NN** secretary\_NN in\_IN the\_DT  
Reagan\_NNP administration\_NN . (B-I misclassified by CRF, MEMM, correctly classified by Bi-LSTM)

ACTUAL CHUNK = I O B I B O **B B B I B B** I I O O  
Predicted CHUNK = I O B I B O **B B I I B B** I I O O

Misclassified examples also exist with respect to 'and' and ',' incorrectly misclassified as O-I or I-O ,B-O and O-B, but since the number it is few in number, we have not shown it explicitly.