[COM4513-6513] Lab 4: Viterbi and Beam search

Registration Number : **180128033**

1 Introduction

In this assignment,we are implementing viterbi and beam search on structured perceptron to accelerate the argmax operation during both training and testing same as used in lab3.We are applying this approach on Phi1 function only.

2 Function viterbi

Let us consider a matrix, whose column are denoted by words of sentence while rows as the tags.We find probability of first word with each tag.The one with higher probability is the best tag and word combination.Now to find the next best word and tag combination, we add previous best word and tag combination with each word and tag combination of column2.The one with higher probability of previous and current tag combination the is best. We use this till the end of sentence to find the best word and tag combination.

Epoch	**Time for Epoch in Structured Binary Perceptron**	**Time for Epoch in viterbi**	**False Prediction**
1	67.21	0.31	1203
2	67.20	0.29	323
3	71.60	0.29	313
4	76.37	0.29	313
5	69.10	0.29	320

It is working fast after implementing viterbi in the code, above is the comparison in time taken by both algorithm in the able.In the both the of the cases the f1 score obtained is same 74.885.

3 Function beam search

Let us consider a matrix, whose column are denoted by words of sentence while rows as the tags.We find probability of first word with each tag.The one with higher probability is the best tag-word combination.Now to find the next best word and tag combination,we find the top k word-tag combination from previous out which we find the max word-tag combination.We add previous best word-tag combination with each word-tag combination of column2.We use this till the end of sentence to find the best word-tag combination.

Beam Search	**Time for Iteration1**	**Time for Iteration2**	**Time for Iteration3**	**Time for Iteration4**	**Time for Iteration5**
1	0.23	0.21	0.20	0.20	0.20
2	0.24	0.22	0.22	0.22	0.22
5	0.25	0.23	0.23	0.23	0.23
S.B.P	67.21	67.21	71.60	76.37	69.10

4 Discussion

Beam search is very fast when, we are using it for the top tag. It becomes same as viterbi on considering all 5 tag.Viterbi is faster than structured binary perceptron because, we calculate value for each word-tag and store it, so that it can be used again when needed whereas in structured binary perceptron we have to calculate each value again and again.