Terna Engineering College Computer Engineering Department Program: Sem VIII

Course: Natural Language Processing

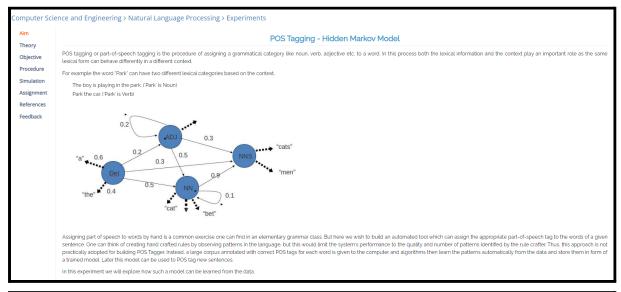
Experiment No. 6

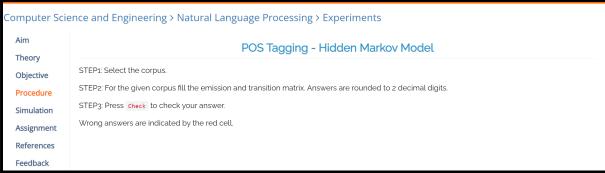
A.1 Aim: Perform and analyse POS Tagging - Hidden Markov Model using a virtual lab.

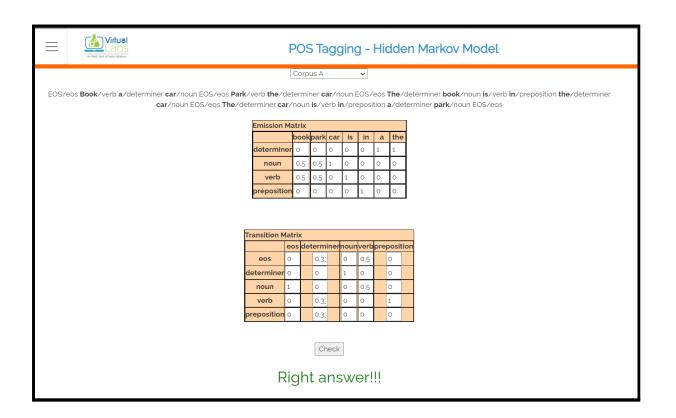
PART B (PART B: TO BE COMPLETED BY STUDENTS)

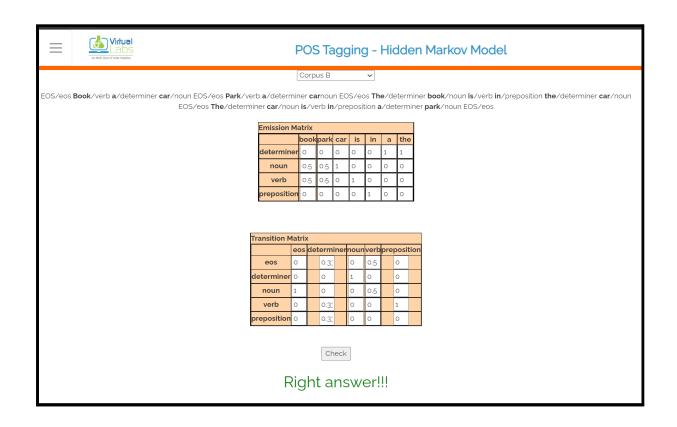
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Class: BE COMPS B	Batch: B3
Date of Experiment: 28/02/2022	Date of Submission: 28/02/2022
Grade:	

B.1 Virtual Lab (Input & Output):









B.2 Observations and learning:

- HMM (Hidden Markov Model) is a Stochastic technique for POS tagging. Hidden Markov models are known for their applications to reinforcement learning and temporal pattern recognition such as speech, handwriting, gesture recognition, musical score following, partial discharges, and bioinformatics.

B.3 Conclusion:

- We have successfully performed and analysed POS Tagging - Hidden Markov Model using a virtual lab.

B.4 Question of Curiosity

Q1. How is CRF used in POS tagging?

ANS:

- A CRF is a sequence modelling algorithm that is used to identify entities or patterns in text, such as POS tags. This model not only assumes that features are dependent on each other but also considers future observations while learning a pattern. In terms of performance, it is considered to be the best method for entity recognition.
- Since these models take into account previous data, we use features that are
 modelled from the data to feed into the CRF. These feature functions
 express the certain characteristics of the sequence that the data point
 represents, such as the tag sequence noun -> verb -> adjective.

Q2. Find HMM probabilities for the following corpus. Draw HMM diagram for the same?

EOS/eos Book/verb the/determiner car/noun

EOS/eos The/determiner book/noun is/verb in/preposition the/determiner car/noun EOS/eos The/determiner car/noun is/verb in/preposition a/determiner park/noun EOS/eos

	Virtual An Mic Good of Incia Virtualve		РО	S Ta	agg	ging	g -	Hic	dden Markov Model		
			Cor	pus B			~				
EOS/eos	EOS/eos Book/verb a/determiner car/noun EOS/eos Park/verb a/determiner car/noun EOS/eos The/determiner book/noun is/verb in/preposition the/determiner car/noun EOS/eos The/determiner car/noun is/verb in/preposition a/determiner park/noun EOS/eos										
	Emission Matrix										
			boo	kparl	car	is	in	a	the		
		determine	er o	0	0	0	0	1	1		
		noun	0.5	+-	+	0	0	0	0		
		verb	0.5	+	0	1	0	0	0		
		preposition	n o	0	0	0	1	0	0		
		Transition M		otorn	inor	noun	work	bror	position		
			o u	0.3		o	0.5		O		
		determiner	_	0	,	1	0	-	0		
			1	0		0	0.5		0		
		verb	0	0.3		0	0		1		
		preposition	0	0.3	3	0	0		0		
	Check										
	Right answer!!!										

Q3. Find HMM probabilities for the following corpus.

EOS/eos He/pronoun accepts/verb the/determiner cricket/noun as/preposition game/ noun

EOS/eos They/pronoun asked/verb for/preposition his/pronoun Opinion/noun

EOS/eos she/pronoun accepts/verb him/pronoun

EOS/eos she/pronoun asked/verb the/determiner rules/noun of/preposition Game/noun

EOS/eos

<u>emission probabilities matrix1</u>

	he	accepts	the	cricket	as	game	they	asked	for	his	opinion	she	him	rule	of
														S	
Verb	0	0.5	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Noun	0	0	0	0.25	0	0.25	0	0	0	0	0.25	0	0	0.25	0
Pronoun	0.2	0	0	0		0	0.2	0	0	0.2	0	0.2	0.2	0	0
Determiner	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Preposition	0	0	0	0	0.33	0	0	0	0.33	0	0	0	0	0	0.33

transition probabilities matrix1

	eos	noun	verb	Preposition	Determiner	pronoun
eos	0	0	0	0	0	4/6
noun	3/5	0	0	2/3	0	0
verb	0	0	0	1/3	1	1/6
Preposition	0	2/5	0	0	0	1/6
Determiner	0	2/5	0	0	0	0
pronoun	1/5	1/5	1	0	0	0

Q4. Find HMM probabilities for the following corpus.

They/pronoun cut/verb the/determiner paper/noun

EOS/eos He/pronoun asked/verb for/preposition his/pronoun cut/noun

EOS/eos Put/verb the/determiner paper/noun in/preposition the/determiner cut/noun EOS/eos

emission probabilities matrix

	they	cut	the	paper	for	his	in	put	asked
noun	0	0.66	0	0.33	0	0	0	0	0
verb	0	0.33	0	0	0	0	0	0.33	0.33
preposition	0	0	0	0	0.5	0	0.5	0	0
determiner	0	0	1	0	0	0	0	0	0
pronoun	0.5	0	0	0	0	0.5	0	0	0

count (cut,noun)= 2 count (cut)= 3 p(cut|noun)=2/3=0.667

transition probabilities matrix

	eos	noun	verb	Preposition	Determiner	pronoun
eos	0		1/3	0	0	2/3
noun	3/4	0	0	1/2	0	0
verb	0	0	0	1/2	2/3	0
Preposition	0	0	0	0	1/3	1/3
Determiner	0	3/4	0	0	0	0
pronoun	0	1/4	2/3	0	0	0