* Part of Speech Tagging (POS)

→ Use for machines to understand Syntactical meaning of sentence.
→ Use in chatbots, and advanced NLP for preprocessing

POS:

POS tagging is a task of labelling each word in a sentence with its appropriate part of Speech.

In traditional grammar, part of speech or part-of-speech is a category of words that have similar grammatical properties

e.g

Why	not	tell	Someone	?
adverb	adverb	verb	noun	punctuation mark, sentence closer.

→ **Applications**

[POS Tagging is Preprocessing Step]

1. Named Entity Recognition
2. Question Answering System
3. Word Sense disambiguation → [Same word with different meaning]
4. chatbots.

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* Spacy library is used for POS Tagging
  1) Course Grained POS (POS_)
  2) Fine Grained POS (tag_)

Word Sense disambiguation
e.g I left the room.
To the left of the room.

* How POS Tagging Works?

[Hidden Markov Models]

S (N) (V) (N) E .
Nitish love Campus x

S (M) (N) (V) (N) E
Can Nitish google Campus x

S (M) (N) (V) (N) E
Will ABC google Campus x

S (N) (V) (N) E
ABC loves Will

S (N) (V) (N) E
Will loves Google

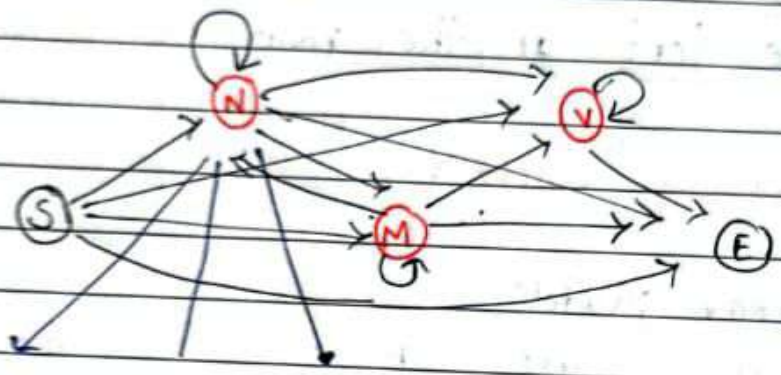
S → start
E → End
N → Noun
M → Model
Verb → V

Emission Probablity

	Noun	Model	Verb
Nitish	2/10	0	0
loves	0	0	3/5
Campus x	3/10	0	0
google	1/10	0	2/5
will	2/10	1/2	0
ABC	2/10	0	0
Can	0	1/2	0

Transition Probablity

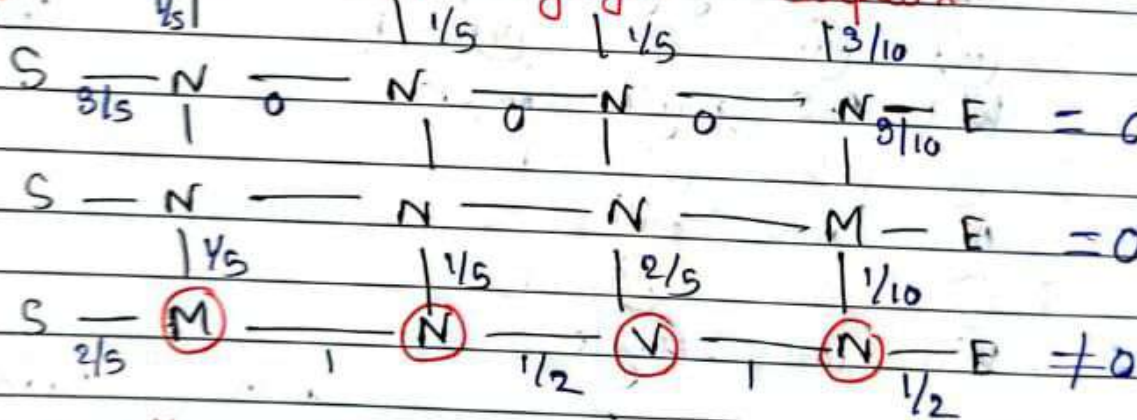
	N	M	V	E
S	3/5	2/5	0	0
N	0	0	5/10	5/10
M	2/2	0	0	0
V	5/5	0	0	0



→ Hidden Markov Model

Nitish loves CampusX . Will ABC Car

eg. Will Will . . google CampusX . .



→ Algorithm will try different number of Combinations of Parts of Speech to find the maximum non zero probablity

→ Combination with maximum probablity is Consider as Correct Combination for POS Tagging

→ Since the above Sentence only has 3 Parts of Speech it hav $3^4 = 81$ Combinations to find Correst Combination of POS Tagging which is exponential.

→ Hence Viterbi Optimization Algo is used.

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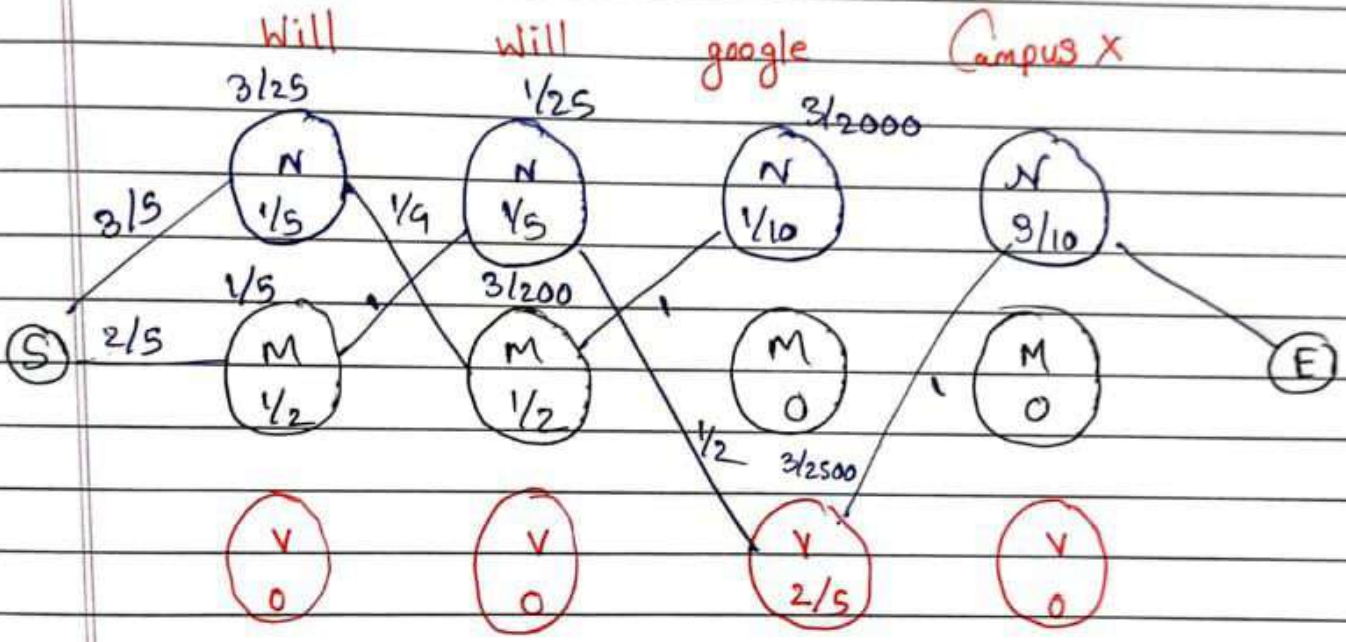
→ Optimization Technique → Vàrterbi Algo

Transition Probablity

	N	M	V	E
S	3/5	2/5	0	0
N	1/4	1/4	5/10	5/10
M	2/2	0	0	0
V	5/5	0	0	0



$\frac{3}{5} \times \frac{1}{5} = \frac{3}{25}$ $\frac{2}{5} \times \frac{1}{2} = \frac{2 \times 1}{10\ 5}$ $\frac{3}{200} \times \frac{1}{10} = \frac{3}{2000}$

$\frac{1}{5} \times \frac{1}{5} = \frac{1}{25}$ $\frac{3}{25} \times \frac{1}{4} \times \frac{1}{2} = \frac{3}{200}$ $\frac{1}{25} \times \frac{1}{2} \times \frac{2}{5} = \frac{3}{2500}$

* Virterbi Op' Algorithm is just an Optimization
* On each node chooses and select the best path on basis of maximum probablity.
* Transition probablity is used for finding best path between two nodes on basis of maximum probablity
* Transition probablity with Zero is not considered as it may cause overall product of probablity to zero.