Vidyavardhini's College of Engineering and Technology

Department of Artificial Intelligence & Data Science

AY: 2024-25

Class:	BE-AI/DS	Semester:	VII
Course Code:		Course Name:	Natural Language processing

Name of Student:	Mokshad sankhe
Roll No. :	67
Assignment No.:	3
Title of Assignment:	
Date of Submission:	
Date of Correction:	

Evaluation

Performance Indicator	Max. Marks	Marks Obtained
Demonstrated knowledge	5	
Legibility	3	
Completeness and timely submission	2	
Total	10	

Performance Indicator	Exceed Expectations (EE)	Meet Expectations (ME)	Below Expectations (BE)
Demonstrated Knowledge	5	3-4	1-2
Legibility	3	2	1
Completeness and Timely submission	2	1	0

Checked by

Name of Faculty :

Signature :

Date :

NLP Assignment 3

Q) We want to predict the weather (sunny or Rainy) based on whether someone is carrying an umbrella or not. Let S: sunny, R: Rainy, U: person carrying umbrella, N: Person not carrying umbrella. Suppose the observed sequence is U, U, N. Determine the most likely sequence of weather conditions that lead to this sequence of observations.

→ Initializing the probabilities for the first observation based on probabilities & the emission probabilities

$t=1$

observation $O_1 = U$ (umbrella)

$$v_1(S) = P(S) \times P(U|S)$$
$$= 0.6 \times 0.1 = 0.06$$
$$v_1(R) = P(R) \times P(U|R)$$
$$= 0.4 \times 0.8 = 0.32$$

computing the probabilities for the subsequent observations using the transition & emission probabilities

Observation $O_2 = U$

$$v_2(S) = \max(v_1(S) \times P(S \to S), v_1(R) \times P(R \to S) \times P(U|S))$$
$$= \max(0.06 \times 0.7, 0.32 \times 0.4) \times 0.1$$
$$= 0.0128$$

For state $S_2 = R$

$$v_2(R) = \max(v_1(S) \times P(S \to R), v_1(R) \times P(R \to R)) \times P(U|R)$$
$$= \max(0.06 \times 0.3, 0.32 \times 0.6) \times 0.8$$
$$= \max(0.018, 0.198) \times 0.8$$
$$= 0.1536$$

observation $O_3 = N$

For state $S_3 = S$

$v_3(S) = \max(v_2(S) \times P(S \to S), v_2(R) \times P(R \to S)) \times P(N|S)$

$= \max(0.0128 \times 0.7, 0.1536 \times 0.4) \times 0.9$

$= \max(0.00898, 0.06144) \times 0.9$

$= 0.055296$

For state $S_3 = R$

$v_3(R) = \max(v_2(S) \times P(S \to R), v_2(R) \times P(R \to R)) \times P(N|R)$

$= \max(0.0128 \times 0.3, 0.1536 \times 0.6) \times 0.2$

$= \max(0.00384, 0.09216) \times 0.2$

$= 0.018432$

The backtracking to determining the most likely sequence of state.

on the day 3, $S_3 = S$ since $v_3(S) > v_3(R)$

on the day 2, $S_2 = R$ since $v_2(S) < v_2(R)$

on the day 1, $S_1 = R$ since $v_1(R) > v_1(S)$

Thus the most likely sequence of weather condition that led to observed sequence U, U, N is Rainy, Rainy, Sunny.

Q3) Consider the sentence given below:
"Although frequently disregarded the intricately interwined ramifications of such decisions demand meticulous consideration."
Solve using Penn treebank parts of speech tags.

→

Although /IN (preposition)
frequently / RB (adverb)
disregarded / VBN (verb, past participate)
, / , (comma)
the / DT (determiner)
intricately / RB (adverb)
interwined / VBN (verb, past participate)
ramification / NNS (Noun)
of /IN (preposition)
such / JJ (adjective)
decisions / NNS (plural, noun)
demand / VB (verb)
meticulous / JJ (adjective)
consideration / NN (Noun, singular)
. / . (Period, sentence-final punctuation)