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SUBJECT: Natural Language Processing

COURSE & SEM: BS(SE) – 5th

Question No. 1:

Briefly explain NLP? Write the name of 2 Applications of NLP with example? Write the name of 2 Challenges of NLP with example?

ANSWER

NLP

Natural Language Processing, usually shortened as NLP, is a branch of artificial intelligence that deals with the interaction between computers and humans using the natural language. The ultimate objective of NLP is to read, decipher, understand, and make sense of the human languages in a manner that is valuable. NLP is used as a method of personal development through promoting skills, such as self-reflection, confidence, and communication. Practitioners have applied NLP commercially to achieve work-orientated goals, such as improved productivity or job progression.

Applications Of NLP

Sentiment Analysis

Sentiment analysis (also known as opinion mining or emotion AI) is an interesting type of data mining that measures the inclination of people's opinions. The task of this analysis is to identify subjective information in the text. For example, this can be a movie review or an emotional state caused by this movie.

Question Answering

Question answering (QA) is concerned with building systems that automatically answer questions posed by humans in a natural language. Sounds complicated? Well then here are the real examples of Question-Answering applications: Siri, OK Google, chat boxes and virtual assistants. I know that I have already mentioned these apps. But here is the point — all of them have a few NLP-applications or functions — to understand speech is only half of the path and another one naturally is to give a response.

Challenges

- Ambiguity in Speech(speech recognition)
Example: “youth in Asia” vs. “euthanasia”

- Humor and Ambiguity (jokes rely on the ambiguity of language)
Example: She criticized my apartment, so I knocked her flat

b) Define Phonology and Morphology with the help of example?

ASNWER

Phonology

Phonology is defined as the study of sound patterns and their meanings, both within and across languages

Example

Phonology is the study of different sounds and the way they come together to form speech and words - such as the comparison of the sounds of the two "p" sounds in "pop-up."

Morphology

Morphology is the study of morphemes; a morpheme is defined as "the smallest unit of meaning in a language." All words, since they have meaning, have at least 1 morpheme, but a word can have several morphemes

Example

The word "cat" has just one morpheme but the word "cats" has 2, as the -s denotes plurality.

Question No. 2:

a) What do you mean by regular expressions?

ANSWER

Regular Expressions

A regular expression (or "regex") is a search pattern used for matching one or more characters within a string. It can match specific characters, wildcards, and ranges of characters. Regular expressions were originally used by Unix utilities, such as vi and grep. However, they are now supported by many code editing applications and word processors on multiple platforms. Regular expressions can also be used in most major programming languages.

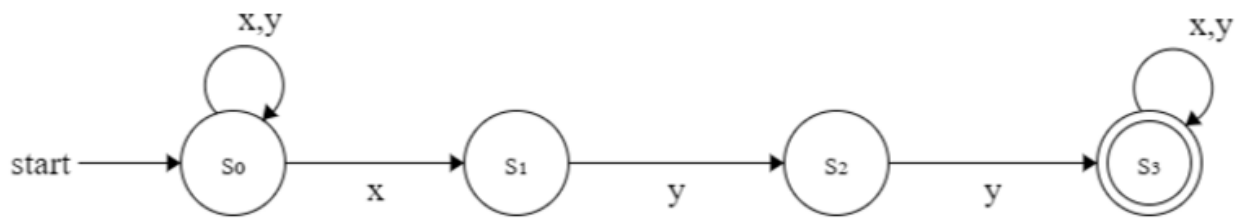
b) Specify the text strings using the below regular expressions:

1. `/[a-fAF0-9]`
a. Given string: **a89** opx **cfff**
2. `/[abc]`
a. Given string **abc ac acb a0b a2b a42c** A878
3. `a(b|c)`
a. Given string **abc** aa **acbaob**
4. `/abc*`
a. Given string **ab abc abcc** **babc abc abcc** **babc**
5. `/abc+`
a. Given string ab **abc abcc** **babc**
abc abcc **babc**
6. `/[^a-z A-Z]`
a. Given string Price of cat **\$1**
7. `/[^a-z A-Z 0-9]`
a. Given string: a89 opx cfff **\$1!**
8. `/a(bc)`
a. Given string: ab **abc** ac acb a0b a2b a42c A87d
9. `/a[bc]`
a. Given string **abc** **ac acb** a0ba2b
10. `a|b|c`
a. Given string: **ab abc ac acb a0b a2b a42c** A87d

Question No. 3:

Design an NFA over an alphabet $\Sigma=\{x,y\}$ such that every string accepted must have a substring --xyy-- ? identify its tuples and also convert it into DFA.

NFA



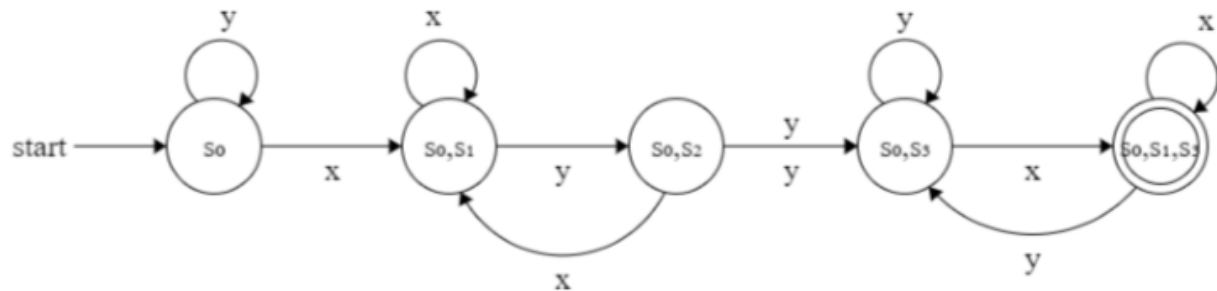
FSA Transition Table

S	X	Y
s0	s0 , s1	s0
s1	Null	s2
s2	Null	s3
s3	s1	s3

DFSA Transition Table

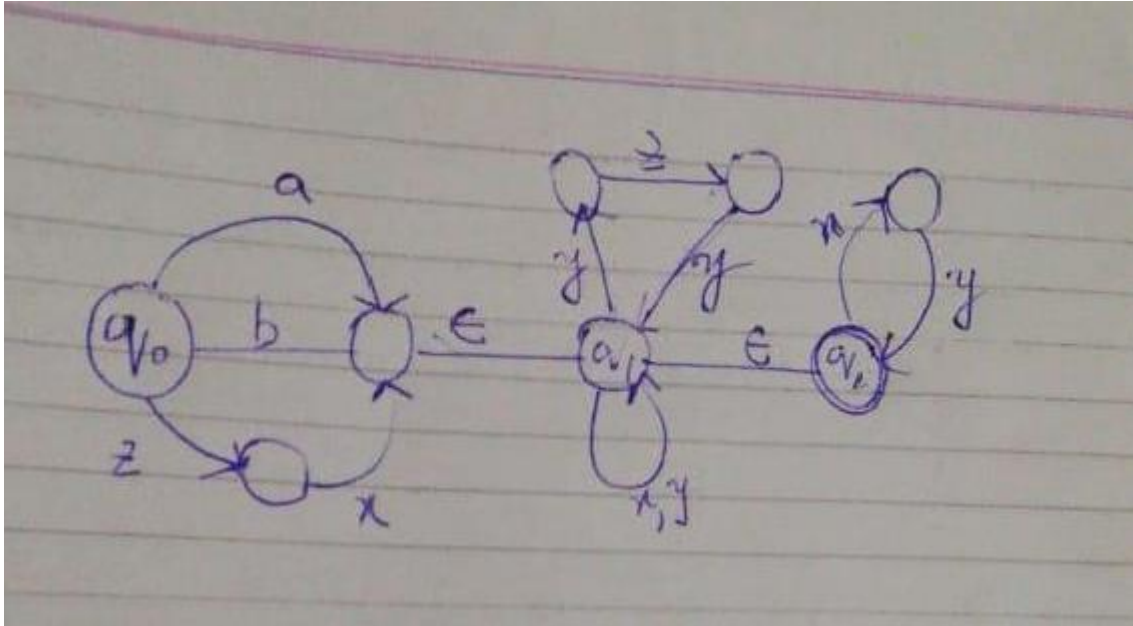
Q	X	Y
→ s0	{s0 , s1}	s0
{s0,s1}	{s0,s1}	{s0,s2}
{s0,s2}	{s0,s1}	{s0,s3}
{s0,s3}	{s0,s1,s3}	{s0,s3}
{s0,s1,s3}	{s0,s1,s3}	{s0,s3}

DFA



Question No. 4:

a) Design an NFA for the regular expression : $(x+y+zx)$
 $((yxy)^*+(x+y)^*)(xy)^*$



Question No. 5:

Find the Maximum Likelihood Estimation of the below according to the given corpus using conditional probability:

<s> The green eyes </s> <s> The green jungle </s>
<s> The green jungle </s> <s> The green eyes </s>
<s> The green park </s> <s> The green eyes </s>

- i. $P(\text{jungle} | \text{The green}) = \frac{P(\text{The green jungle})}{P(\text{The green})} = \frac{2}{6} = 0.333$
- ii. $P(\text{eyes} | \text{The green}) = \frac{P(\text{The green eyes})}{P(\text{The green})} = \frac{3}{6} = 0.5$
- iii. $P(\text{park} | \text{The green}) = \frac{P(\text{The green park})}{P(\text{The green})} = \frac{1}{6} = 0.17$
- iv. $P(\text{sea} | \text{The green}) = \frac{P(\text{The green park})}{P(\text{The green})} = \frac{0}{6} = 0$

$$P(S) = \frac{2 + 3 + 1 + 0}{6} = 0$$

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