Name : Keith Fernandes Roll No. : 25

St. Francis Institute of Technology, Mumbai-400 103
Department Of Information Technology

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Class: BE-ITA/B, Semester: VII
Subject: Data Science Lab

Experiment – 2

1. **Aim:** To implement a Cognitive Computing Application

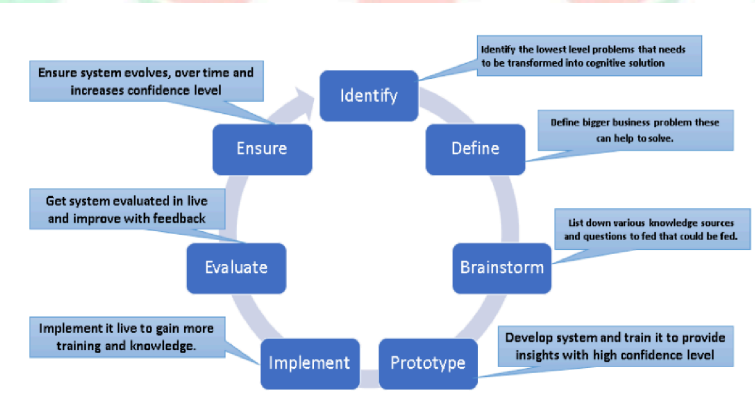
2. **Objectives:** Students should be able to design a solution for problem using Cognitive Computing.

3. **Prerequisite:** Python basics

4. **Requirements:** PC, Python 3.9, Windows 10/ MacOS/ Linux, IDLE IDE

5. **Pre-Experiment Exercise:**
   Theory:
   - The Cognitive is the mental action to learning and acquiring through thought, experience and the senses.
   - Cognitive computing is computerized model that simulates human thought process in complex situations where the answer may be ambiguous and uncertain.
   - Cognitive computing systems can recognize, understand, analyze, memorize and take out best possible result as or near about the human brain.
   - The basic idea behind this type of computing is that to develop the computer system(include hardware and software) who interacts with human like humans.
   - To accomplish this, cognitive computing makes use of AI and underlying technologies.
   - If you look at cognitive computing as an analog to the human brain, you need to analyze in context all types of data, from structured data in databases to unstructured data in text, images, voice, sensors, and video.

Design Principles of Cognitive Computing:



Phases in NLP:

Phonological Analysis:
- It is applied if input is speech.

Morphological Analysis
- Deals with understanding distinct words according to their morphemes.
- Eg: Unhappiness: broken down into three morphemes (prefix, stem, suffix).
- Stem is considered as free morpheme and prefix and suffix are considered are

bound morphemes.

Lexical Analysis:

- Lexicon of a language means the collection of words and phrases in the language.
- Lexical analysis is dividing the whole chunk of text into paragraphs, sentences and words.
- Lexicon normalization is often needed in Lexical analysis.
- The most common lexicon normalization are:
    - Stemming: it is a rudimentary rule based process of stripping the suffixes. From word.
    - Lemmatization: organized procedure of obtaining the root form of the word by using dictionary and morphological analysis.

Syntactic Analysis:

- Deals with analyzing the words of a sentence so as to uncover the grammatical structure of the sentence.
- Eg: “Colorless green idea”
- Checked for dependency grammar and parts of speech tags .

Semantic Analysis:

- Determines possible meaning of the sentence by focusing on the interactions among word level meanings in the sentence.

Discourse Integration:

- Focuses on the properties of the text as a whole that convey meaning by making connections between component sentences.

Pragmatic Analysis:

- Explains how extra meaning is read into texts without actually being encoded in them.
- It helps user to discover intended effect by applying set of rules that characterize cooperative dialogues.

6. Laboratory Exercise

A. Procedure

i. Use google colab for programming.
ii. Import nltk package.
iii. Demonstrate all phases of NLP on a given text.
iv. Add relevant comments in your programs and execute the code. Test it for various cases.

7. Post-Experiments Exercise:

A. Extended Theory:

a. Explain design Principles of Cognitive Computing.

B. Post Lab Program:

a. Select a application of your choice in domain like health care, banking, finance and implement

C. Conclusion:

1. Write what was performed in the program (s) .
2. What is the significance of program and what Objective is achieved?

D. References:

[1]Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive Computing and Big Data Analytics”, Wiley India, 2015

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Screenshots:
Tokenization Text:

```
[ ] import nltk
    from nltk.tokenize import sent_tokenize, word_tokenize
    example_text = "I want to be a certified artificial intelligence professional"
    print('sentence-->', sent_tokenize(example_text))
    print('word-->' ,word_tokenize(example_text))
    for i in word_tokenize(example_text):
      print(i)
```

```
sentence--> ['I want to be a certified artificial intelligence professional']
word--> ['I', 'want', 'to', 'be', 'a', 'certified', 'artificial', 'intelligence', 'professional']
I
want
to
be
a
certified
artificial
intelligence
professional
```

Normalization - Stemming and Lemmatization

```
[ ] #### Stemming
```

```
[ ] from nltk.stem import PorterStemmer
    #from nltk.tokenize import word_tokenize
    ps = PorterStemmer()
    #example_words = ["python","pythoner","pythoning","pythoned","pythonic"]
    example_words = "Indices"
    print(ps.stem(example_words))
    #for w in example_words:
      #print(ps.stem(w))
```

```
indic
```

```
[ ] #### Lemmatization
```

```
#nltk.download('wordnet')
from nltk.stem import WordNetLemmatizer
lemmatizer = WordNetLemmatizer()
print("rocks when lemmatized :",   lemmatizer.lemmatize("rocks"))
print("corpora when lemmatized :", lemmatizer.lemmatize("corpora"))

#ps = PorterStemmer()
#print("rocks when Stemmed :", ps.stem("rocks"))
#print("corpora when Stemmed :", ps.stem("corpora"))

# a denotes adjective in "pos"
print("better :", lemmatizer.lemmatize("better", pos ="a"))
```

```
rocks when lemmatized : rock
corpora when lemmatized : corpus
better : good
```

Parts of Speech Tagging:

```
example_text = "The training is going great and the day is very fine.The code is working and all are happy about it"
#nltk.download('averaged_perceptron_tagger') # this has to run first time
token = nltk.word_tokenize(example_text)
nltk.pos_tag(token)  # error
#nltk.download('tagsets')  # this has to run first time

# We can get more details about any POS tag using help funciton of NLTK as follows.
nltk.help.upenn_tagset("PRP$")
nltk.help.upenn_tagset("JJ$")
nltk.help.upenn_tagset("VBG")
```

```
PRP$: pronoun, possessive
    her his mine my our ours their thy your
JJ: adjective or numeral, ordinal
    third ill-mannered pre-war regrettable oiled calamitous first separable
    ectoplasmic battery-powered participatory fourth still-to-be-named
    multilingual multi-disciplinary ...
VBG: verb, present participle or gerund
    telegraphing stirring focusing angering judging stalling lactating
    hankerin' alleging veering capping approaching traveling besieging
    encrypting interrupting erasing wincing ...
```

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bigrams/trigrams/ngrams

```
word_data = 'I want to be a certified artificial intelligence professional'
nltk_tokens = nltk.word_tokenize(word_data)
#print(list(nltk.bigrams(nltk_tokens)))
#nltk_tokens = nltk.word_tokenize(example_text)
print('Bigram-->',list(nltk.bigrams(nltk_tokens)))
print('--------------------------------------------------------')
print('Trigram-->',list(nltk.trigrams(nltk_tokens)))
print('--------------------------------------------------------')
print('5-gram-->',list(nltk.ngrams(nltk_tokens,5)))
```

```
Bigram--> [('I', 'want'), ('want', 'to'), ('to', 'be'), ('be', 'a'), ('a', 'certified'), ('certified'
--------------------------------------------------------
Trigram--> [('I', 'want', 'to'), ('want', 'to', 'be'), ('to', 'be', 'a'), ('be', 'a', 'certified'), (
--------------------------------------------------------
5-gram--> [('I', 'want', 'to', 'be', 'a'), ('want', 'to', 'be', 'a', 'certified'), ('to', 'be', 'a',
```

Printing all combinations:

```
import nltk
from nltk.util import ngrams
def word_grams(words, min=1, max=5):
    s = []
    for n in range(min, max):
        for ngram in ngrams(words, n):
            s.append(' '.join(str(i) for i in ngram))
    return s
print(word_grams(nltk_tokens))
```

```
['I', 'want', 'to', 'be', 'a', 'certified', 'artificial', 'intelligence', 'professional',
```

Removing stop word:

```
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize

#example_text = "This is an example showing off stop word filtration."
example_text = 'Manoj want to be a certified artificial intelligence professional'
stop_words = set(stopwords.words("english"))
print("List of the Stop words=",stop_words)
print("------------------------------------------------------------")

words = word_tokenize(example_text)

filtered_sentence = []

for w in words:
  if w not in stop_words:
    filtered_sentence.append(w)

print("Words after stopword removal--",filtered_sentence)
```

```
List of the Stop words= {'into', "didn't", 'd', 'be', 'he', 'the', 'doing', "i'll", 'for', 'wasn', "doesn't",
------------------------------------------------------------
Words after stopword removal-- ['Manoj', 'want', 'certified', 'artificial', 'intelligence', 'professional']
```

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```
[ ] new_text = "It is very important to be pythonic while you are pythoning with python.Python name is derived from the pythons"
    words=word_tokenize(new_text)
    for w in words:
      print(ps.stem(w))
```

```
It
is
veri
import
to
be
python
while
you
are
python
with
python.python
name
is
deriv
from
the
python
```

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```

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    multilingual multi-disciplinary ...
VBG: verb, present participle or gerund
    telegraphing stirring focusing angering judging stalling lactating
    hankerin' alleging veering capping approaching traveling besieging
    encrypting interrupting erasing wincing ...
```

Named Entity Recognition using Spacy

```
import spacy
#from spacy import displacy
from collections import Counter
import en_core_web_sm # en_core_web_md and en_core_web_lg
import pprint
# Run in console  python -m spacy download en_core_web_sm / en_core_web_md / en_core_web_lg
nlp = en_core_web_sm.load()
doc = nlp(u'European authorities fined Google a record $5.1 billion on Wednesday for abusing its power in the mobile phone market and ordered the company to alter its practices')
print([(X.text, X.label_) for X in doc.ents])
print([(X, X.ent_iob_, X.ent_type_) for X in doc])

sentences = [x for x in doc.ents]
print(sentences)
```

```
[('European', 'NORP'), ('Google', 'ORG'), ('$5.1 billion', 'MONEY'), ('Wednesday', 'DATE')]
[(European, 'B', 'NORP'), (authorities, 'O', ''), (fined, 'O', ''), (Google, 'B', 'ORG'), (a, 'O', ''), (record, 'O', ''), ($, 'B', 'MONEY'), (5.1, 'I', 'MONEY'), (billion, 'I', '
[European, Google, $5.1 billion, Wednesday]
```