20MCA241– DATA SCIENCE LAB

Lab Report Submitted By

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In Partial fulfillment for the Award of the Degree of

MASTER OF COMPUTER APPLICATIONS (2 Year)
(MCA)
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

AMAL JYOTHI COLLEGE OF ENGINEERING KANJIRAPPALLY

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2022-2023

DEPARTMENT OF COMPUTER APPLICATIONS

AMAL JYOTHI COLLEGE OF ENGINEERING

KANJIRAPPALLY

CERTIFICATE

This is to certify that the Lab report, **“20MCA241 DATA SCIENCE LAB”** is the bonafide work of **SREELAKSHMI R (AJC21MCA-2101)** in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications under APJ Abdul Kalam Technological University during the year 2022-23.

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Course Code	Course Name	Syllabus Year	L-T-P-C
20MCA241	Data Science Lab	2020	0-1-3-2

VISION

To promote an academic and research environment conducive for innovation centric technical education.

MISSION

MS1 - Provide foundations and advanced technical education in both theoretical and applied Computer Applications in-line with Industry demands.

MS2 - Create highly skilled computer professionals capable of designing and innovating real life solutions.

MS3 - Sustain an academic environment conducive to research and teaching focused to generate upskilled professionals with ethical values.

MS4 - Promote entrepreneurial initiatives and innovations capable of bridging and contributing with sustainable, socially relevant technology solutions.

COURSE OUTCOME

CO	Outcome	Target
CO1	Use different python packages to perform numerical calculations, statistical computations and data visualization	60
CO2	Use different packages and frameworks to implement regression and classification algorithms.	60
CO3	Use different packages and frameworks to implement text classification using SVM and clustering using k-means	60
CO4	Implement convolutional neural network algorithm using Keras framework.	60
CO5	Implement programs for web data mining and natural language processing using NLTK	60

COURSE END SURVEY

CO	Survey Question	Answer Format
CO1	To what extend you are able to use different python packages to perform numerical calculations, statistical computations and data visualization?	Excellent/Very Good/Good Satisfactory/Needs improvement
CO2	To what extend you are able to use different packages and frameworks to implement regression and classification algorithms?	Excellent/Very Good/Good Satisfactory/Needs improvement

CO3	To what extend you are able to use different packages and frameworks to implement text classification using SVM and clustering using K-means?	Excellent/Very Good/Good Satisfactory/Needs improvement
CO4	To what extend you are able to implement convolutional neural network algorithm using Keras framework?	Excellent/Very Good/Good Satisfactory/Needs improvement
CO5	To what extend you are able to implement programs for web data mining and natural language processing using NLTK?	Excellent/Very Good/Good Satisfactory/Needs improvement

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Experiment No.: 1

Aim

Create a student table with columns Roll.no, Name, age, marks using pandas and do the following a. select the top 2 rows

b. filter data based on some condition with mark&gt;80

c. filter in names first name start with &#39; N&#39; then remaining.

CO1

Use different python packages to perform numerical calculations, statistical computations and data visualization

Program and Output

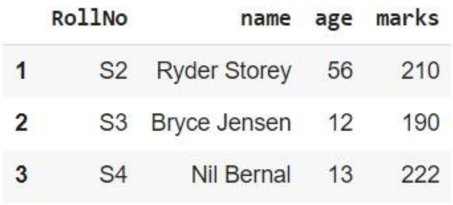
```
import pandas as pd
s1 = pd.DataFrame({ 'RollNo': ['S1', 'S2', 'S3', 'S4', 'S5'],
     name': ['Nirmal Fenton', 'Ryder Storey', 'Bryce Jensen', 'Nil Bernal', 'Kwame Morin'],  'age’:
[23,56,12,13,14], 'marks': [20, 210, 190, 222, 30]}) print(s1. head (2))
```

Output

```
                    RollNo     name              age    marks
0              S1         Nirmal Fenton    23     20
1              S2         Ryder Storey     56    210
```

```
s1[s1['marks']>80]
```

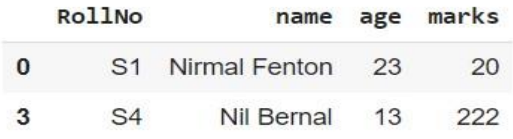
Output



	RollNo	name	age	marks
1	S2	Ryder Storey	56	210
2	S3	Bryce Jensen	12	190
3	S4	Nil Bernal	13	222

```
s1[s1['name'].str.startswith('N')]
```

Output



	RollNo	name	age	marks
0	S1	Nirmal Fenton	23	20
3	S4	Nil Bernal	13	222

Result

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No. : 2

Aim

Numpy array creation and basic operations, Initialization, array indexing.

CO1

Use different python packages to perform numerical calculations,statistical computations and data visualization

Program and Output

```
import pandas as pd import numpy as
np
print(pd.Series(np.array([1,2,3,4,5,6,7]), index=['a','b','c','d','e','f','g']))
```

Output

```
a    1
b    2
c    3
d    4
e    5
f    6
g    7
dtype: int64 print(pd.Series(np.array([1,2,3,4,5,6,7]),
index=['a','b','c','d','e','f','g'])*2)
```

Output

```
a     2
b     4
c     6
d     8
e    10
f    12
g    14
dtype: int64
print(pd.Series(np.array([1,2,3,4,5,6,7]), index=['a','b','c','d','e','f','g'])**2)
```

Output

```
a     1
b     4
c     9
d    16
e    25
f    36
g    49
dtype: int64
```

Result

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No. : 3

Aim

Plot a graph by matplotlib library

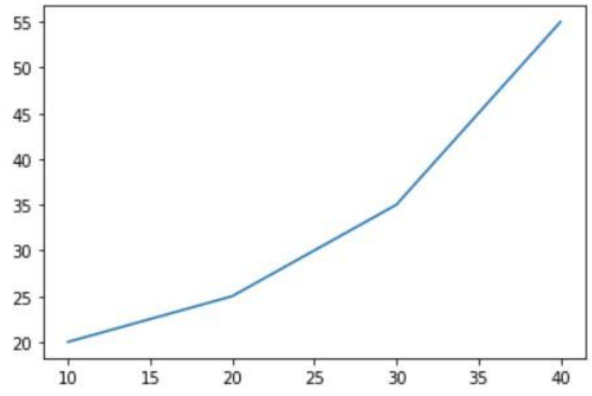
CO1

Use different python packages to perform numerical calculations, statistical computations and data visualization

Program and Output

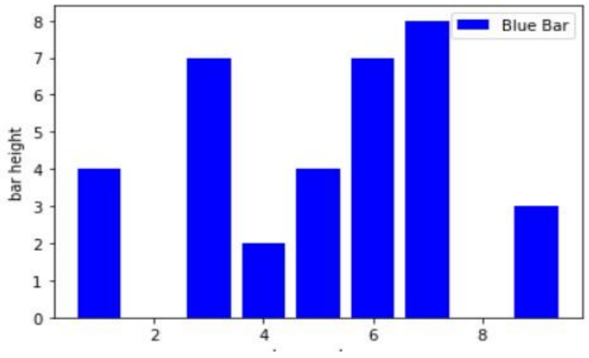
```
import matplotlib.pyplot as plt
# initializing the data x = [10,
20, 30, 40] y = [20, 25, 35, 55]
# plotting the data plt.plot(x, y)
plt.show()
```

Output



```
import matplotlib.pyplot as plt
x1 = [1, 3, 4, 5, 6, 7, 9] y1 = [4, 7, 2, 4, 7, 8, 3]
plt.bar(x1, y1, label="Blue Bar", color='b') plt.plot()
plt.show()
```

Output

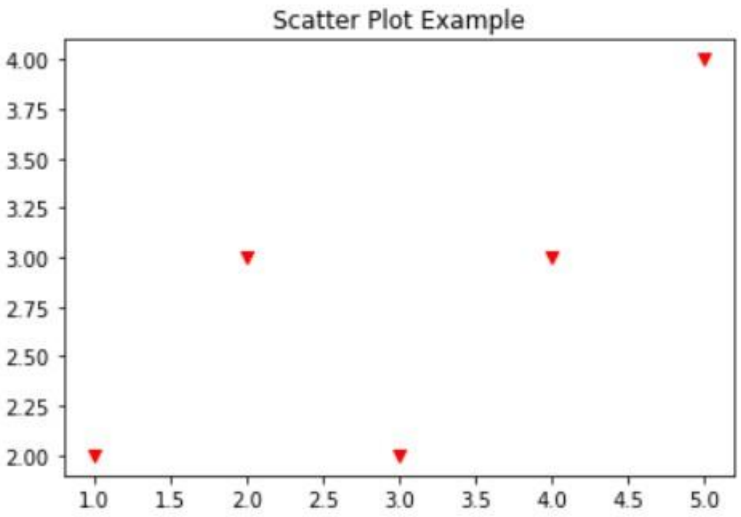


```
import matplotlib.pyplot as plt

x2 = [1, 2, 3, 4, 5] y2 = [2, 3, 2, 3, 4]

plt.scatter(x2, y2, marker='v', color='r')
plt.title('Scatter Plot Example') plt.show()
```

Output



Result

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No. : 4

Aim

Perform all matrix operation using python (using numpy)

CO1

Use different python packages to perform numerical calculations, statistical computations and data visualization

Program and Output

```
import numpy as np
a  = np.array([1, 2, 3])   # Create a rank 1 array
print("type: " ,type(a))            # Prints "<class 'numpy.ndarray'>"
print("shape: " ,a.shape)            # Prints "(3,)" print(a[0], a[1],
a[2])   # Prints "1 2 3"
a[0] = 5                  # Change an element of the array print(a)
# Prints "[5, 2, 3]"
b          = np.array([[1,2,3],[4,5,6]])    # Create a rank 2 array print("\n shape of
b:",b.shape)                    # Prints "(2, 3)" print(b[0, 0], b[0, 1], b[1, 0])   # Prints
"1 2 4" a = np.zeros((3,3))   # Create an array of all zeros print("All zeros
matrix:\n  " ,a)              # Prints "[[ 0.  0.] b = np.ones((1,2))    # Create an array of
all ones
print("\nAll ones matrix:\n  " ,b)              # Prints "[[ 1.  1.]]"
d = np.eye(2)         # Create a 2x2 identity matrix print("\n
identity matrix: \n",d)              # Prints "[[ 1.  0.]
e = np.random.random((2,2))  # Create an array filled with random values
print("\n random matrix: \n",e)
```

Output

```
type:  <class 'numpy.ndarray'>
1 2 3 [5
2 3]
 shape of b: (2, 3)
1 2 4
All zeros matrix:
   [[0. 0. 0.]
 [0. 0. 0.]
 [0. 0. 0.]]
All ones matrix:
   [[1. 1.]]
identity matrix:
 [[1. 0.]
[0.        1.]]
random matrix:
 [[0.50738093 0.49587583]
 [0.85821263 0.69582347]]
```

Result

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No. : 5

Aim

Program to Perform SVD (Singular Value Decomposition) in Python

CO1

Use different python packages to perform numerical calculations, statistical computations and data visualization

Program and Output

```
from numpy import array from
scipy.linalg import svd
# define a matrix
A = array([[1, 2], [3, 4], [5, 6]]) print("A: \n", A)
# SVD
U, s, VT = svd(A)
print("\nU: \n", U)
print("\ns: \n", s)
print("\nV^T: \n", VT)
```

Output

```
A:
 [[1 2]
 [3 4]
 [5 6]]

U:
 [[-0.2298477   0.88346102  0.40824829]
[-0.52474482  0.24078249 -0.81649658]
 [-0.81964194 -0.40189603  0.40824829]]
 s:
 [9.52551809 0.51430058]

V^T:
 [[-0.61962948 -0.78489445]
[-0.78489445  0.61962948]]
```

Result

The program was executed and the result was successfully obtained. Thus CO1 was obtained.

Experiment No. : 6

Aim

Program to implement k-NN classification using any standard dataset available
in the public domain and find the accuracy of the algorithm.

CO2

Use different packages and frameworks to implement regression and classification algorithms.

Program and Output

```
from sklearn.neighbors
import KNeighborsClassifier from
sklearn.model_selection
import train_test_split from sklearn.metrics
import accuracy_score
import pandas as pd
from sklearn.datasets import load_iris data
load_iris()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['target'] = data.target
X_train, X_test, Y_train, Y_test = train_test_split(df[data.feature_names], df['target'], random_state=42,
test_size=0.1)
clf = KNeighborsClassifier(n_neighbors = 5)
clf.fit(X_train, Y_train) y_pred=clf.predict(X_test)
# Comparing actual response values (y_test) with predicted response values (y_pred)
from sklearn import metrics
print ("KNN model accuracy (in %):", metrics.accuracy_score(Y_test, y_pred)*100)
```

Output

```
KNN model accuracy (in %): 100.0
```

Result

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No. : 7

Aim

Program to implement Naive Bayes Algorithm using any standard dataset available in the public domain and find the accuracy of the algorithm

CO2

Use different packages and frameworks to implement regression and classification algorithms.

Program and Output

```
from sklearn.datasets import load_iris
iris = load_iris()
X = iris.data
 y = iris.target
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
from sklearn.naive_bayes import GaussianNB gnb = GaussianNB()
gnb.fit(X_train, y_train) y_pred = gnb.predict(X_test)
from sklearn import metrics
print("Gaussian Naive Bayes model accuracy(in %):", metrics.accuracy_score(y_test, y_pred)*100)
```

Output

```
Gaussian Naive Bayes model accuracy(in %): 100.0
```

Result

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No. : 8

Aim

Program to implement linear and multiple regression techniques using any standard dataset available in the public domain and evaluate its performance.

CO2

Use different packages and frameworks to implement regression and classification algorithms.

Program and Output

```
import numpy as np
from sklearn.linear_model
import LinearRegression
x = [[0, 1], [5, 1], [15, 2], [25, 5], [35, 11], [45, 15], [55, 34], [60, 35]]
y = [4, 5, 20, 14, 32, 22, 38, 43] x, y = np.array(x), np.array(y) model
LinearRegression().fit(x, y) r_sq = model.score(x, y)
print(f"coefficient of determination: {r_sq}") print(f"intercept:
{model.intercept_}") print(f"coefficients: {model.coef_}") y_pred =
model.predict(x)
print(f"predicted response:\n{y_pred}")
```

Output

```
coefficient of determination: 0.8615939258756775
intercept: 5.52257927519819
coefficients: [0.44706965 0.25502548]

predicted response:
[ 5.77760476 8.012953   12.73867497 17.9744479 23.97529728 29.4660957
 38.78227633 41.27265006]
```

Result

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No. : 9

Aim

Program to implement decision trees using any standard dataset available in the public domain and find the accuracy of the algorithm.

CO3

Use different packages and frameworks to implement regression and classification algorithms.

Program and Output

```
import matplotlib.pyplot as plt
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection
import train_test_split from sklearn.metrics
import accuracy_score import pandas as pd
from sklearn.datasets import load_iris
data = load_iris()
df = pd.DataFrame(data.data, columns=data.feature_names)
df['target']= data.target
X_train, X_test, Y_train, Y_test = train_test_split(df[data.feature_names], df['target'], random_state=42,t
est_size=0.1) clf = DecisionTreeClassifier() clf.fit(X_train, Y_train) y_pred=clf.predict(X_test) from
sklearn import metrics
print("Decision tree model accuracy(in %):", metrics.accuracy_score(Y_test, y_pred)*100)
```

Output

```
Decision tree model accuracy(in %): 100.0
```

Result

The program was executed and the result was successfully obtained. Thus CO2 was obtained.

Experiment No. : 10

Aim

Program to implement k- means clustering technique using any standard dataset available in the public domain

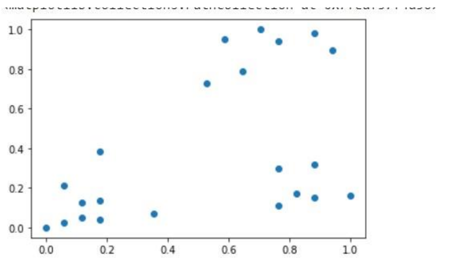
CO3

Use different packages and frameworks to implement text classification using SVM and clustering using k-means

Program and Output

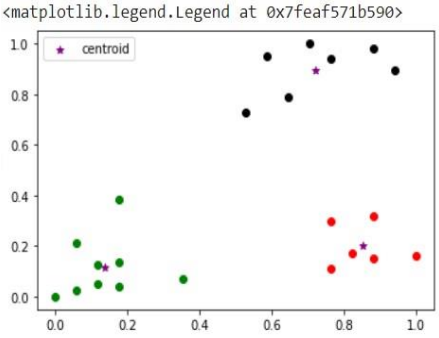
```
from sklearn.cluster import KMeans
import pandas as pd from
matplotlib import pyplot as plt
 df = pd.read_csv("income.csv")
plt.scatter(df.Age,df['Income($)'])
```

Output



```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['Age','Income($)']])
df['cluster']=y_predicted df1 = df[df.cluster==0]
df2 = df[df.cluster==1] df3 = df[df.cluster==2]
plt.scatter(df1.Age,df1['Income($)'],color='green') plt.scatter(df2.Age,df2['Income($)'],color='red')
plt.scatter(df3.Age,df3['Income($)'],color='black')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker='*',label='centroid')
plt.legend()
```

Output



```
<matplotlib.legend.Legend at 0x7feaf571b590>
```

Result

The program was executed and the result was successfully obtained. Thus CO3 was obtained.

Experiment No. :11

Aim

Implementation of CNN using keras network

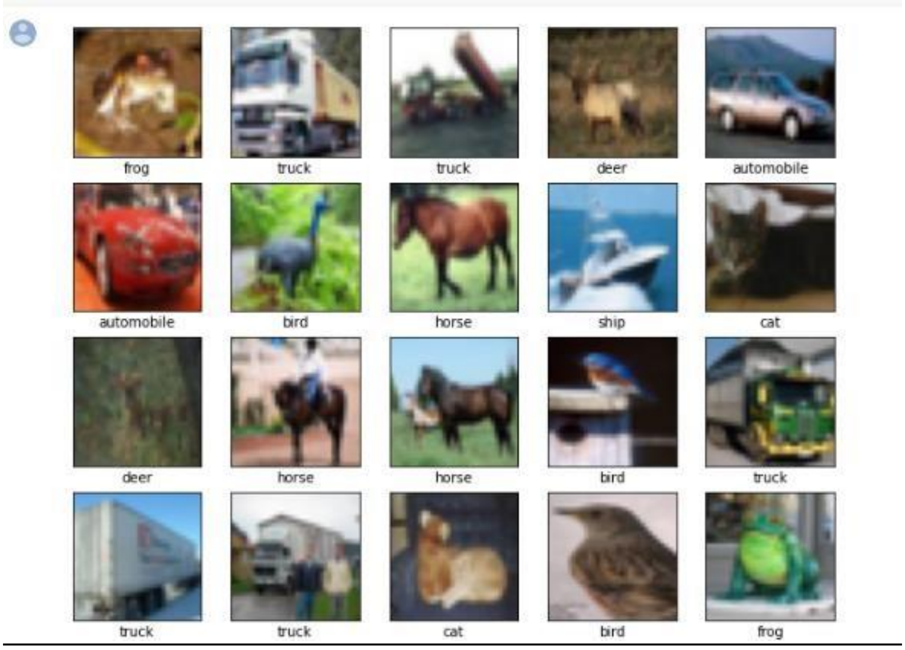
CO4

Implement convolutional neural network algorithm using Keras framework.

Program and Output

```
import tensorflow as tf
from tensorflow.keras import datasets, layers, models import
matplotlib.pyplot as plt
(train_images, train_labels), (test_images, test_labels) = datasets.cifar10.load_data() train_images,
test_images = train_images / 255.0, test_images / 255.0
class_names = ['airplane', 'automobile', 'bird', 'cat', 'deer', ‘dog', 'frog', 'horse', 'ship', 'truck']
plt.figure(figsize=(10,10))
for i in range(25):     plt.subplot(5,5,i+1)
plt.xticks([])     plt.yticks([])
 plt.grid(False)     plt.imshow(train_images[i])
    plt.xlabel(class_names[train_labels[i][0]]) plt.show()
```

Output



```
model = models.Sequential()
model.add(layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)))
model.add(layers.MaxPooling2D((2, 2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu')) model.add(layers.MaxPooling2D((2,
2)))
model.add(layers.Conv2D(64, (3, 3), activation='relu')) model.summary()
 model.add(layers.Flatten()) model.add(layers.Dense(64,
 activation='relu')) model.add(layers.Dense(10))
model.summary()
```

Output

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 30, 30, 32)        896
max_pooling2d (MaxPooling2D  (None, 15, 15, 32)        0
 )
 conv2d_1 (Conv2D)           (None, 13, 13, 64)        18496
max_pooling2d_1 (MaxPooling  (None, 6, 6, 64)          0
 2D)
 conv2d_2 (Conv2D)           (None, 4, 4, 64)          36928
 flatten (Flatten)           (None, 1024)              0
dense (Dense)                (None, 64)                65600
 dense_1 (Dense)             (None, 10)                650
=================================================================
Total params: 122,570
Trainable params: 122,570
          Non-trainable params: 0
```

```
model.compile(optimizer='adam',
loss=tf.keras.losses.SparseCategoricalCrossentropy(from_logits=True), metrics=['accuracy'])
history = model.fit(train_images, train_labels, epochs=5,
validation_data=(test_images, test_labels))
```

Output

```
Epoch 1/5
1563/1563 [==============================] - 16s 5ms/step - loss: 1.5253 - accuracy: 0.4442 -
val_loss: 1.2627 - val_accuracy: 0.5531 Epoch 2/5
1563/1563 [==============================] - 8s 5ms/step - loss: 1.1625 - accuracy: 0.5867 -
val_loss: 1.1056 - val_accuracy: 0.6121 Epoch 3/5
1563/1563 [==============================] - 8s 5ms/step - loss: 1.0065 - accuracy: 0.6467 -
val_loss: 0.9735 - val_accuracy: 0.6567
```

```
Epoch 4/5
1563/1563 [==============================] - 7s 5ms/step - loss: 0.9101 - accuracy: 0.6816 -
val_loss: 0.9356 - val_accuracy: 0.6720
Epoch 5/5
1563/1563 [==============================] - 7s 5ms/step - loss: 0.8382 - accuracy:
0.7062 - val_loss: 0.9111 - val_accuracy: 0.6862
```

```
test_loss, test_acc = model.evaluate(test_images,  test_labels, verbose=2) print(test_acc)
```

Output

```
0.6862000226974487
```

Result

The program was executed and the result was successfully obtained. Thus CO4 was obtained.

Experiment No. : 12

Aim

Program to implement scrap of any website

CO5

Implement programs for web data mining and natural language processing using NLTK

Program and Output

```
import requests from bs4
import BeautifulSoup
URL = "http://www.ajce.in"
r = requests.get(URL)
soup = BeautifulSoup(r.content, 'html5lib')
print(soup.prettify())
```

Output

```
<!DOCTYPE html>
<html lang="en">
 <head>
  <meta charset="utf-8"/>
  <title>
   Amal Jyothi College of Engineering | B Tech honours, B Tech honours degree in ktu, FIRST
ENGINEERING COLLEGE in Kerala to secure NAAC A grade. Engineering Admissions Kerala, KTU,
Kerala Engineering Admissions, admissions in engineering, APJ Abdul Kalam Technological University,
dual degree mca kerala, integrated MCA kerala, Kerala Technological University, Fiber optics training in
kerala, Fiber optics training in kottayam, research promoting institution,institution for
innovation,technolgy business incubator,IELTS training,GATE coaching,in-house internship,placement
training,clean campus,beautiful campus, institution well connected by road,catholic institution, ANFOT,
Fiber Training,best infrastructure engineering college kerala, MCA Colleges in Kerala, MCA in
Engineering College Kerala, MCA LE College Kerala,Best MCA Course in Kerala, MCA Kerala, KTU
MCA, Best College in KTU, Best College under KTU,Best MCA College under KTU,Best MCA College
in KTU, highest intake engineering college kerala, top self financing engineering college in kerala,
engineering, ece admissions, MCA 2 year, dual jyothi engineering college, amaljyothi college of
engineering, ajce, jyothi college of engineering, jyothi college, B Tech in &amp; Construction
Management, M Tech in Machine Design, M Tech in Power Electronics &amp;
Power Systems, M Tech in Nano Technology, nanotechnology, nano science &amp; technology kerala,
  </title>
  <meta content="width=device-width, initial-scale=1" name="viewport"/>
<script type="text/javascript">
   <!--
                    if (screen.width <= 699) {
                    document.location = "https://m.ajce.in";
```

```
                        }
  </script>
  <!--[if lte IE 8]><script src="assets/js/ie/html5shiv.js"></script><![endif]-->
  <link href="assets/css/main.css" rel="stylesheet"/>
  <!--Bootstrap Stylesheet [ REQUIRED ]-->
  <link href="css/bootstrap.css" rel="stylesheet"/>
  <!--Nifty Stylesheet [ REQUIRED ]-->
  <link href="css/nifty.css" rel="stylesheet"/>
  <!--Animate.css [ OPTIONAL ]-->
  <link href="css/animate.min.css" rel="stylesheet"/>
  <link href="ajce.ico" rel="icon" type="image/ico"/>
  <!--[if lte IE 8]><link rel="stylesheet" href="assets/css/ie8.css" /><![endif]-->
  <!--[if lte IE 9]><link rel="stylesheet" href="assets/css/ie9.css" /><![endif]-->
<link href="../ajce.ico" rel="icon" type="image/ico"/>
  <style>
   .alert-title a{
            border-bottom:0px;
    }
  </style>
 </head>
 <!--TIPS-->
 <!--You may remove all ID or Class names which contain "demo-", they are only used for
demonstration. -->
 <body>
<script>
   setTimeout(function(){
           window.location.href = 'https://ajce.in/home/index.html';
}, 10000);
  </script>
  <div class="effect aside-float aside-bright mainnav-lg" id="container">
</div>
  <div id="wrapper">
   <div id="bg">
   </div>
   <div id="overlay">
   </div>
   <div id="main">
    <!-- Header -->
    <header id="header">
     <img alt="" height="100" src="300x300png.png" style="vertical-align:middle" width="100"/>
```

Result

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment No. : 13

Aim

Program for Natural Language Processing which performs ngrams(Using inbuilt functions)

CO5

Implement programs for web data mining and natural language processing using NLTK

Program and Output

```
import nltk
from nltk.util import ngrams
text = "this is a very good book to study";
Ngrams = ngrams(sequence=nltk.wordpunct_tokenize(text), n=3)
for grams in Ngrams:  print(grams)
```

Output

```
('this', 'is', 'a')
('is', 'a', 'very')
('a', 'very', 'good')
('very', 'good', 'book')
('good', 'book', 'to')
('book', 'to', 'study')
```

Result

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment No. : 14

Aim

Program for Natural Language Processing which perform parts of speech
tagging.

CO5

Implement programs for web data mining and natural language processing using NLTK

Program and Output

```
import nltk
from nltk.tag import DefaultTagger
exptagger = DefaultTagger('NN')
exptagger.tag_sents([['Hi', ','], ['How', 'are', 'you', '?']])
```

Output

```
 [[('Hi', 'NN'), (',', 'NN')], [('How', 'NN'), ('are', 'NN'), ('you', 'NN'), ('?', 'NN')]]
```

```
import nltk
from nltk.tag import untag
untag([('Tutorials', 'NN'), ('Point', 'NN')])
```

Output

```
 ['Tutorials', 'Point']
```

```
sentence = """At eight o'clock on Thursday morning
Arthur didn't feel very good.""" tokens =
nltk.word_tokenize(sentence) tagged =
nltk.pos_tag(tokens)
print(tagged)
```

Output

```
 ['At', 'eight', "o'clock", 'on', 'Thursday', 'morning', 'Arthur', 'did', "n't", 'feel', 'very', 'good', '.']
[('At', 'IN'), ('eight', 'CD'), ("o'clock", 'NN'), ('on', 'IN'), ('Thursday',
'NNP'), ('morning', 'NN'), ('Arthur', 'NNP'), ('did', 'VBD'), ("n't", 'RB'),
('feel', 'VB'), ('very', 'RB'), ('good', 'JJ'), ('.', '.')]
```

```
text ="learn php from guru99 and make study easy".split()
print("After Split:",text) tokens_tag = nltk.pos_tag(text)
print("After Token:",tokens_tag)
```

Output

```
After Split: ['learn', 'php', 'from', 'guru99', 'and', 'make', 'study', 'easy']
After Token: [('learn', 'JJ'), ('php', 'NN'), ('from', 'IN'), ('guru99', 'NN'), ('and',
'CC'), ('make', 'VB'), ('study', 'NN'), ('easy', 'JJ')]
```

Result

The program was executed and the result was successfully obtained. Thus CO5 was obtained.

Experiment No. :15

Aim

Data preprocessing with NLTK

1. Counting Tags
2. Bigrams
3. Trigrams
4. Stop Words
5. Stemming

CO5

Implement programs for web data mining and natural language processing using NLTK.

Program and Output

```
!pip install -q wordcloud
import wordcloud
import nltk
nltk.download('stopwords')
nltk.download('averaged_perceptron_tagger')
import pandas as pd import unicodedata
import numpy as np import string
```

1. from collections import Counter import nltk

```
text = "Guru99 is one of the best sites to learn WEB, SAP, Ethical Hacking and much more online."
lower_case = text.lower()
tokens = nltk.word_tokenize(lower_case)
tags = nltk.pos_tag(tokens)
counts = Counter( tag for word,  tag in tags) print(counts)
```

Output

```
Counter({'NN': 5, ',': 2, 'VBZ': 1, 'CD': 1, 'IN': 1, 'DT': 1, 'JJS': 1, 'NNS': 1, 'TO': 1, 'VB': 1, 'JJ': 1,
'CC': 1, 'RB': 1, 'JJR': 1, '.': 1})
```

2. import nltk text = "Guru99 is a totally new kind of learning experience." Tokens = nltk.word_tokenize(text) output = list(nltk.bigrams(Tokens)) print(output)

Output

```
[('Guru99', 'is', 'a'), ('is', 'a', 'totally'), ('a', 'totally', 'new'), ('totally', 'new', 'kind'), ('new', 'kind', 'of'),
('kind', 'of', 'learning'), ('of', 'learning', 'experience'), ('learning', 'experience', '.')]
```

3. import nltk text = "Guru99 is a totally new kind of learning
experience." Tokens = nltk.word_tokenize(text)
output = list(nltk.trigrams(Tokens)) print(output)

Output

```
 [('Guru99', 'is', 'a'), ('is', 'a', 'totally'), ('a', 'totally', 'new'), ('totally', 'new', 'kind'), ('new', 'kind',
'of'),
('kind', 'of', 'learning'), ('of', 'learning', 'experience'), ('learning', 'experience', '.')]
```

```
4.from nltk.corpus import stopwords
 print(stopwords.words('english'))
 en_stopwords = stopwords.words('english')
 def remove_stopwords(text):
    result = []  for token in text:
 if token not in en_stopwords:
 result.append(token)
       return result
 text = "this is the only solution of that question".split()  remove_stopwords(text)
```

Output

```
 ['solution', 'question']
```

```
5. from nltk.stem import PorterStemmer from nltk.tokenize import
 word_tokenize ps = PorterStemmer() sentence = "Programmers
 program with programming languages" words =
 word_tokenize(sentence) for w in words:
    print(w, " : ", ps.stem(w))
```

Output

```
Programmers  :  programm
program  :  program
with  :  with
programming  :  program
languages  :  languag
```

Result

The program was executed and the result was successfully obtained. Thus CO5 was obtained.