JYOTHY INSTITUTE OF TECHNOLOGY

Affiliated to VTU, Belagavi

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Accredited by NBA, New Delhi

ASSIGNMENT 2

Course Code	18CS71
Course Name	Artificial Intelligence and Machine Learning

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Semester	7
Academic Year	2021-2022

Signature of student Signature of Instructor

Assignment No. 2 (CO 6)

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Program	Computer Science and Engineering

1.What is Stemming? Design and develop a program to demonstrate the working of stemming.

Stemming is the process of producing morphological variants of a root/base word.

Stemming programs are commonly referred to as stemming algorithms or stemmers. A stemming algorithm reduces the words.

"chocolates", "chocolatey", "choco" to the root word, "chocolate" and "retrieval", "retrieved", "retrieves" reduce to the stem "retrieve"

Stemming is an important part of the pipelining process in Natural language processing. The input to the stemmer is tokenized words.

Some more example of stemming for root word "like" include:

->"likes"

->"liked"

->"likely"

->"liking"

PROGRAM:

```
import nltk

from nltk.stem import PorterStemmer

from nltk.tokenize import sent_tokenize,word_tokenize
```

```
ps=PorterStemmer()

tokens=['consult','consulting','consulatation','consultative','consu
ltant']


for w in tokens:

    print(w+'-->'+ps.stem(w))
```

OUTPUT:

2. What is Lemmatization? Design and develop a program to demonstrate the working of Lemmatization.

Lemmatization is the process of grouping together the different inflected forms of a word so they can be analyzed as a single item.

Lemmatization is similar to stemming but it brings context to the words.

So it links words with similar meanings to one word.

Text preprocessing includes both Stemming as well as Lemmatization

PROGRAM:

```
from nltk.stem import WordNetLemmatizer

from nltk.tokenize import sent_tokenize,word_tokenize
```

```
lemmatizer=WordNetLemmatizer()

input="been had done languages cities mice"

input=word_tokenize(input)

for word in input:

    print(lemmatizer.lemmatize(word))
```

OUTPUT:

3. What is Bag of Words? Design and develop a program to demonstrate the concept of Bag of Words.

The bag-of-words model is a way of representing text data when modeling text with machine learning algorithms.

The approach is very simple and flexible, and can be used in a myriad of ways for extracting features from documents.

A bag-of-words is a representation of text that describes the occurrence of words within a document. It involves two things:

1)A vocabulary of known words.

2)A measure of the presence of known words.

PROGRAM:

```
import nltk

import re
```

```
import numpy as np

import heapq



text = "With the scale and scope we utilize on the internet,
defining ownership of content is very difficult. Diagrams and
sketches from research papers depict a lot of information about the
work done by the author. The flow of working and logic is easily
explained visually, rather than in text. Many engineering and
technology problems are solved with the help of diagrams and tables.
Due to vast widespread use of the internet worldwide plagiarism is
seen everywhere. There are a few plagiarism checking systems for
text, but plagiarism for images has not been explored much. Images
such as tables of rows and columns, on comparison would say there is
copyright infringement even if the data in it is completely
different. Verifying and prevention of infringement is not something
that has been attempted."

dataset = nltk.sent_tokenize(text)

for i in range(len(dataset)):

      dataset[i] = dataset[i].lower()

      dataset[i] = re.sub(r'\W', ' ', dataset[i])

      dataset[i] = re.sub(r'\s+', ' ', dataset[i])

word2count = {}

for data in dataset:

    words = nltk.word_tokenize(data)

    for word in words:

        if word not in word2count.keys():

            word2count[word] = 1

        else:

            word2count[word] += 1


freq_words = heapq.nlargest(50, word2count, key=word2count.get)
```

```
X = []
for data in dataset:
    vector = []
    for word in freq_words:
        if word in nltk.word_tokenize(data):
            vector.append(1)
        else:
            vector.append(0)
    X.append(vector)
X = np.asarray(X)
```

OUTPUT:

4. What is TF-IDF? Design and develop a program to demonstrate the concept of TF-IDF.

TF-IDF (term frequency-inverse document frequency) is a statistical measure that evaluates how relevant a word is to a document in a collection of documents.

This is done by multiplying two metrics: how many times a word appears in a document, and the inverse document frequency of the word across a set of documents.

The term frequency of a word in a document. There are several ways of calculating this frequency, with the simplest being a raw count of instances a word appears in a document. Then, there are ways to adjust the frequency, by length of a document, or by the raw frequency of the most frequent word in a document.

TF(t) = (Number of times term t appears in a document) / (Total number of terms in the document).

The inverse document frequency of the word across a set of documents. This means, how common or rare a word is in the entire document set. The closer it is to 0, the more common a word is. This metric can be calculated by taking the total number of documents, dividing it by the number of documents that contain a word, and calculating the logarithm.

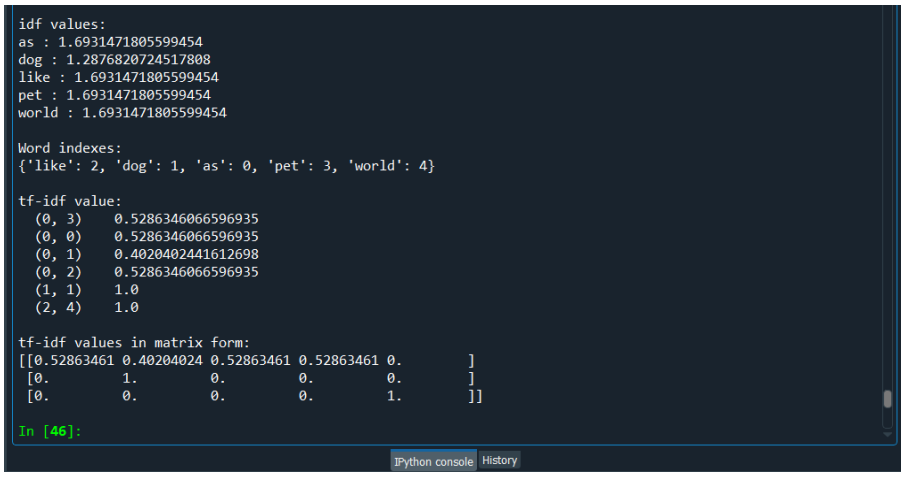
IDF(t) = log_e(Total number of documents / Number of documents with term t in it).

PROGRAM:

```
from sklearn.feature_extraction.text import TfidfVectorizer

d0 = 'I like dog as a pet'

d1 = 'Dog'

d2 = 'world'

string = [d0, d1, d2]

tfidf = TfidfVectorizer()


result = tfidf.fit_transform(string)



print('\nidf values:')
```

```
for ele1, ele2 in zip(tfidf.get_feature_names(), tfidf.idf_):
      print(ele1, ':', ele2)


print('\nWord indexes:')
print(tfidf.vocabulary_)


print('\ntf-idf value:')
print(result)


print('\ntf-idf values in matrix form:')
print(result.toarray())
```

OUTPUT:



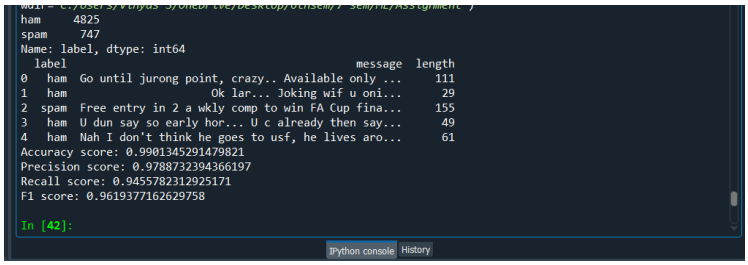
5. Design and develop a program to predict whether a given message is a spam or a ham

PROGRAM:

```
import nltk

from nltk.corpus import stopwords


from sklearn.feature_extraction.text import CountVectorizer

from sklearn.naive_bayes import MultinomialNB

from sklearn.model_selection import train_test_split

from sklearn.metrics import accuracy_score, precision_score,
recall_score, f1_score

import matplotlib.pyplot as plt

import pandas as pd

import string

import seaborn as sns


df = pd.read_csv("smsspamcollection/SMSSpamCollection", sep="\t",
names=["label","message"])

df.head(2)


df = df.rename(columns={"v1":"label", "v2":"message"})

print(df.label.value_counts())


df['length'] = df['message'].apply(len)

print(df.head())


df['length'].plot(bins=50, kind='hist')

df.hist(column='length', by='label', bins=50,figsize=(10,4))

df.loc[:,'label'] = df.label.map({'ham':0, 'spam':1})


X_train, X_test, y_train, y_test = train_test_split(df['message'],
```

```
df['label'],test_size=0.20,
                                                    random_state=1)


count_vector = CountVectorizer()


training_data = count_vector.fit_transform(X_train)


testing_data = count_vector.transform(X_test)


naive_bayes = MultinomialNB()

naive_bayes.fit(training_data,y_train)


predictions = naive_bayes.predict(testing_data)

print('Accuracy score: {}'.format(accuracy_score(y_test,
predictions)))

print('Precision score: {}'.format(precision_score(y_test,
predictions)))

print('Recall score: {}'.format(recall_score(y_test, predictions)))

print('F1 score: {}'.format(f1_score(y_test, predictions)))
```

OUTPUT:



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