A PROJECT REPORT
ON
BOSS: The Personal Voice Assistant

Submitted as term project in MACHINE LEARNING

of

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Degree In

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ABSTRACT

In Today’s era there is huge Advancement in the Technical field which is increasing day by day. In early days there were only computer systems where we were able to perform only few tasks, but today new technologies like machine learning, artificial intelligence, deep learning, and few some others have made computer systems so advance that we can perform any type of task with them. The main goal of Artificial intelligence (AI) is the realization of natural dialogue between humans and machines. There are many IT companies have used the dialogue systems technology to establish various kinds of Virtual Personal Assistants (VPAs) based on their applications and areas for increasing interaction between human and machine, such as Microsoft’s Cortana, Apple’s Siri, Amazon Alexa, Google Assistant. We have created our own virtual personal assistant BOSS which is cable to perform basic day to day task just one voice command and mainly perform basic data analysis task of Machine Learning like Decision Tree, PCA, Regression Analysis, KNN,etc. which is basically useful to do machine learning task in one go and less time consuming. We use python as a programming language because it has a major library which is used to execute commands. By using python installer packages our personal virtual assistant recognize the user voice and process on it. It has been designed to provide a user-friendly interface for carrying out a variety of tasks by employing certain well-defined commands. Users can interact with the assistant either through voice commands or using keyboard input.

Keywords: Voice Assistant, A.I., BOSS, Python, Machine Learning

CONTENT

INTRODUCTION

An intelligent virtual assistant (IVA) or intelligent personal assistant (IPA) is a software agent that can perform tasks or services for an individual based on commands or questions. Some virtual assistants can interpret human speech and respond via synthesized voices. Users can ask their assistants questions, control home automation devices and media playback via voice, and manage other basic tasks such as email, to-do lists, and calendars with verbal commands. Basically, virtual assistant is an application program that understands natural language and voice commands to complete tasks for the users. Virtual assistant is used to perform a typical task like showing datetime, managing emails, open apps, etc. on your command. Nowadays virtual assistant is very useful to human. It makes human life easier like operate PC's or laptop on only voice command. Virtual assistant is a less time consuming. By using virtual assistant, we save our time and contribute in other works. Virtual assistants are task oriented. It has ability to understand and perform requests. It is a software that understands verbal and written commands and completes task assigned by clients. Virtual assistants can interpret human speech and respond via synthesized voices. There are several voice assistants in market like Siri for apple TV remote, Google Assistant for pixel XL smartphones, Alexa as a smart speaker which is developed by using Raspberry Pi, Microsoft Cortona for windows 10.

We have created a personal voice assistant BOSS with the help of Neural Network, artificial Intelligence, Machine Learning, Deep Learning and NLP. Also, we have use python as a programming language, because python offers a good major library. For this program input is taken as voice command and the voice assistant process our command and gives output voice and text in terminal. This process is the combination of several different technologies like voice recognition, voice analysis and language processing. BOSS use Natural Processing language to match user text or voice input to executable commands. When a user gives a command to personal virtual assistant to perform a task, the natural language is converted the audio signals into digital signals.

MOTIVATION

We are all aware about Cortana, Siri, Google Assistant and many other virtual assistants which are designed to aid the tasks of users in Windows, Android and iOS platforms. But to our surprise, there’s no such virtual assistant available for machine learning basic task like Decision Tree: decision tree classifier & random tree classifier; Principal Component analysis (PCA), Regression: linear regression, sum square error, R-squared, etc.

This project aims at developing a personal assistant for solving basic machine learning task of dataset provided here we have used iris dataset mainly. The main purpose of the BOSS is to perform the tasks of the user at certain commands, provided in either of the ways, speech or text. It will ease most of the work of the user as a complete task can be done on a single command. BOSS draws its inspiration from Virtual assistants like Cortana for Windows and Siri for iOS. Users can interact with the assistant easily.

WORKDONE

Working of BOSS Voice assistant

Our voice assistant the BOSS is simple and easy to use. In our voice assistant we added neural network, Machine learning, Artificial intelligence, Data Science ,etc .We added the base of this voice assistant with the help of natural language processing and neural network . In case of neural network, we have use natural language processing tool NLTK. We tried to give some emotions and chats also using json. We made different script for different functions like Speak , Neural Network, Training , BOSS, Intent, Listen, K-Nearest neighbor ,Decision tree , etc. So now we see every script in detail: -

1.SPEAK:

We made this script to make our BOSS to speak .We use pyttsx3 library,pyttsx3 is a text -to-speech conversion library in python were pyttsx3 supports two voices first is female and the second is male here then we the speak function in it then we call sapi5 which is Microsoft speaking API .After that get the voice then set the voice for male or female voice then we set the speed of voice. Now our voice assistant can speak.

2.LISTEN:

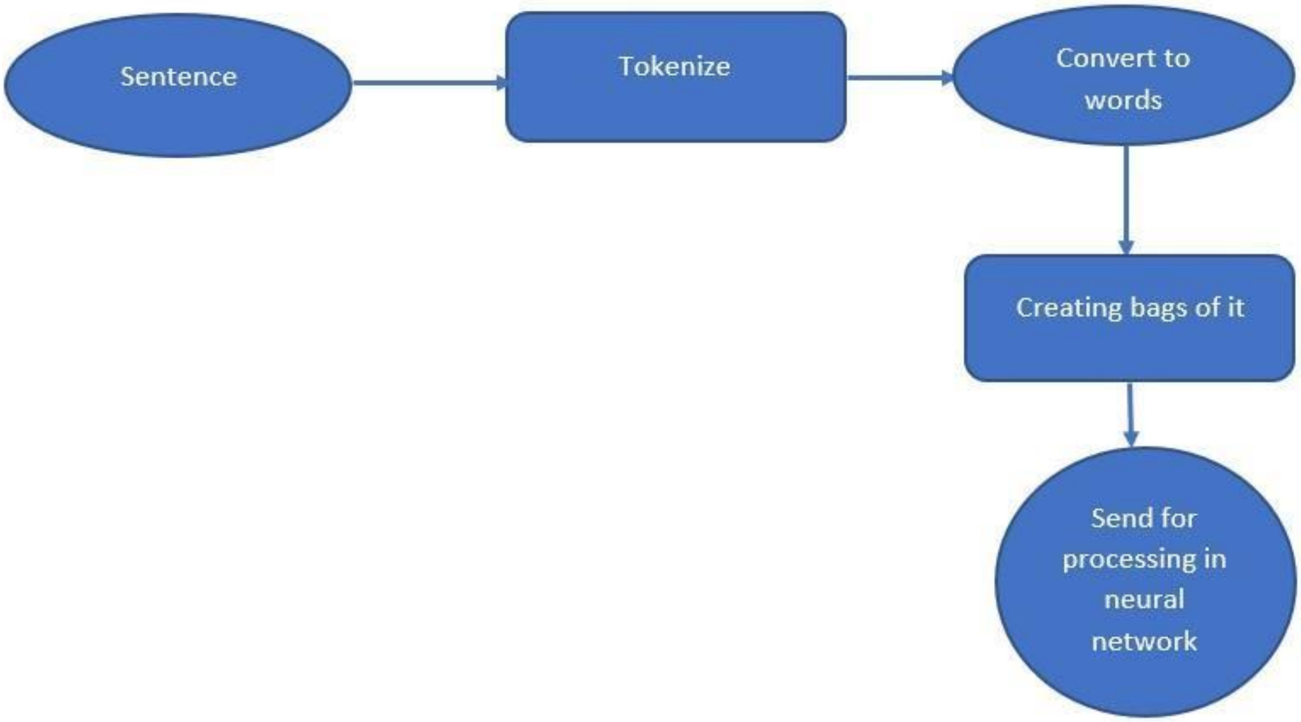
We made this script to listen means taking input from outside we define listen function in it. With the help of speech recognition, it listen. Speech recognition is a library which is used to automatic speech recognition it translates spoken words into text using closed captions to enable a person with hearing loss to understand what others are saying. It allows computers to understand human language.

3.Brain:

Brain is the central part of the system. So here we created brain of BOSS with the help of neural network using Pytorch. Pytorch is python library, it is an open source machine learning framework it is used for creating deep neural network .In it first we create class of neural network which takes 3 input which are named as input size ,hidden size and num classes and relocate them to give the output.

4.Neural Network:

Now we are creating neural network. Using natural language processing we built its consciousness. whatever we say goes inside it as sentence and with the help of NLTK it is tokenize similar thing happen for word and create a bag of words of token and this bag goes to neural network. We use NumPy library here. NumPy is used for working with arrays.



5.**Intent:**

Intent script we created in which we put the emotions of the voice assistant.We created basics of emotions and their replies such that greeting,health,identity,time ,date,wikipedia ,etc.In it we created a tag first then the pattern of input and then the responses means reply for it.We are just creating a dictionary of emotions.

6.Train:

Now the actual work start now we start training our voice assistant .we use numpy and torch library and then importing some part of other file like we are importing neural network from brain ,bags of word's ,tokenize from neural network.After that we call the intent json file. Now we start training of data . After that we make a new class of chat-dataset then calculate loss function and created a file which is work faster.

7.BOSS:

We created a BOSS script in this script we use json,torch and random library files then we call neural network from brain .After that we call the intent json file then we are defining input size ,hidden size, output size ,all words , model state and tag.Then we start making Boss .first we import listen ,speak and task .After that defining main function in which we are calling google for execution,time ,date and day also.

8.Task:

Now we created task script then we import date and time library.Then we start defining non-input executable functions and input executable functions.Noninput executable function mean it doesn't need any input for execution but input executable function needs.

Now we created task script then we import date and time library.Then we start defining non-input executable functions and input executable functions.Noninput executable function mean it doesn't need any input for execution but input executable function needs. Our Boss is able to find eculidean distance ,confusion matrix ,train and test and split the dataset ,correlation matrix,mdimensional feature vector.

Machine Learning algorithms are the programs that can learn the hidden patterns from the data, predict the output, and improve the performance from experiences on their own. Different algorithms can be used in machine learning for different tasks, such as simple linear regression that can be used for prediction problems like stock market prediction ,and many more.We created a new script in which we are defining the Regression ,Principal component analysis, Decision tree and solving them using different formula.We use IRIS dataset for implementing all the above mentioned machine learning algorithms . Some machine learning task explain in brief :

PCA : The Principal Component Analysis is a popular unsupervised learning technique for reducing the dimensionality of data. It increases interpretability yet, at the same time, it minimizes information loss. It helps to find the most significant features in a dataset and makes the data easy for plotting in 2D and 3D. PCA helps in finding a sequence of linear combinations of variables.

Decision Tree : Decision Tree is a Supervised learning technique that can be used for both classification and Regression problems, but mostly it is preferred for solving Classification problems. It is a tree-structured classifier, where internal nodes represent the features of a dataset, branches represent the decision rules and each leaf node represents the outcome.

Regression: It is a technique for investigating the relationship between independent variables or features and a dependent variable or outcome. It's used as a method for predictive modelling in machine learning, in which an algorithm is used to predict continuous outcomes.

LITERATURE REVIEW

In the current scenario there are more than hundreds of voice assistant developed by different people. Using voice assistant has now a days made our life easier here in this project we have tried and implemented basic machine learning tasks to make programming easier for the machine learning people. All the tasks are stored in the assistant whenever use ask for the result it performs the task within itself by using neural network, deep leaning, artificial intelligence, machine learning libraries and display the result.

Basically, this project is eased to use and very helpful. Along with that we have used only python libraries and for neural networks we have used natural language tool kit. We have mostly used different libraries to do our work.

Apart from machine learning task our program also does basic task like google search, Wikipedia, day-date-time, etc. this project is helpful for all old also as they can only say about basic thing what they want from BOSS and BOSS will function according to request and works finely and accurately with just one command.

PROPOSED METHOD

We are using BOSS to perform Machine learning basic tasks like PCA, Decision Tree, regression, Knn and many more. BOSS supports uploading a CSV dataset. Supports data description, data cleaning and data visualisation. And it is mainly used to perform and get output of classification models of machine learning that is, Logistic regression, K Neighbours Classifier, Decision Tree Classifier. It also support finding Euclidean distance, confusion matrix, train-test splits, k fold cross validation, feature engineering methods like calculating mean and variance, covariance, correlation matrix, m- dimensional feature vector.

HOW BOSS WORK:

i. Run the BOSS program.

ii. Once the system is switched on, then must wait for input from the user. In this stage, the system will be trying to listen for various user inputs.

iii. The received audio input is converted to text so that it can be processed further.

iv. The input is analysed further so that the system can decide if it's a query/question or a command to perform some task.

v. If the input is classified as a question/query, then an appropriate response is generated. If the input is classified as a command to perform a task, then the command is executed to perform the requested task.

vi. Convert the response(text) into audio that can be presented as the output.

vii. Once the requested task is performed the output is displayed to the user and accordingly sometime given as output voice.

viii. When exit is received as input from the user the BOSS stops running.

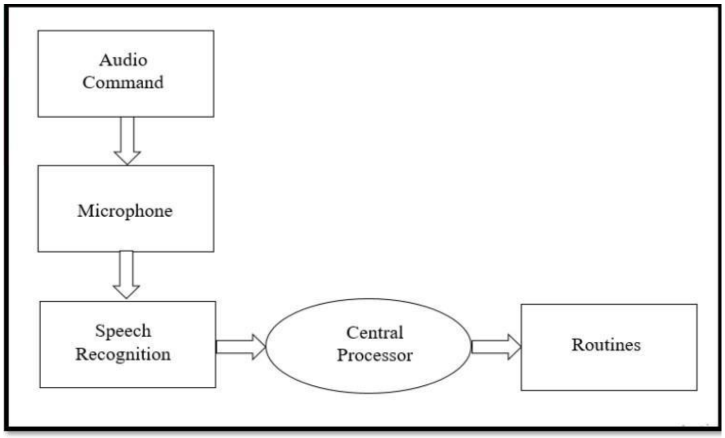
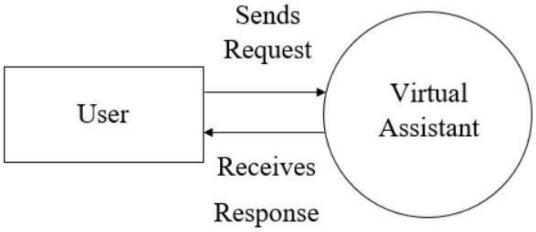
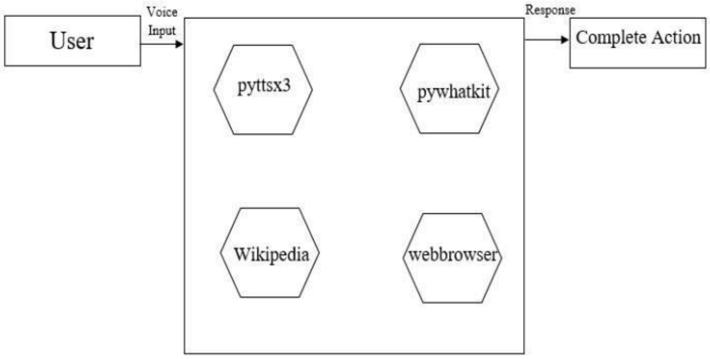


fig. processing in existing system

WORKING IN BOSS

Working:





Basic libraries used in ML:

- Numpy
- Scipy
- Scikit-learn.
- Theano
- TensorFlow
- Keras
- PyTorch
- Pandas
- Matplotlib

EXPERIMENTAL SET-UP

SOFTWARE used to construct BOSS is VSCODE: Visual Studio Code is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extensions for other languages and runtimes (such as C++, C#, Java, Python, PHP, Go, .NET).

The python files we have created includes the construction of BOSS. Each file performs basic duty which a voice assistant need to do like speak , learn, take command, etc. Basically in the beginning we have created a base for BOSS with the help of neural network and natural language processing by using nltk. Then emotions, feelings and chat are included with the help of json file. For speech engine we have used pyttsx3.

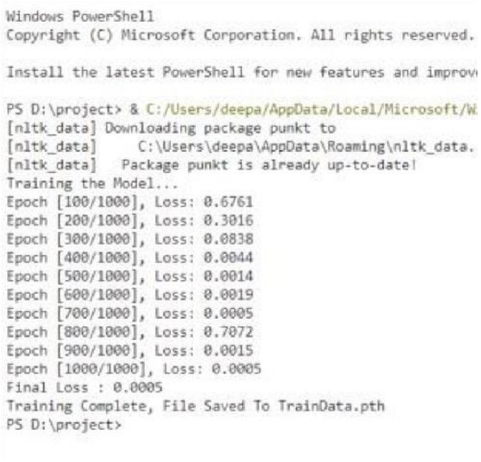
Neural network for assistant Neural networks comprises of layers/modules that perform operations on data. The torch.nn namespace provides all the building blocks you need to build your own neural network and define our neural network. Then create the neurons through which data and computations flow. The input comes from the raw data set We use NumPy to build a single neuron. NLTK is a toolkit built for working with NLP in Python. It provides us with various text processing libraries with a lot of test datasets. A neural network is a series of algorithms that endeavours to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates.

Dataset Here we are creating a .json file which contains tags, patterns, responses and they are supplied to the neural network to train the model. And then all the data which is trained will be stored in a. pth dataset file, . pth is a data file for machine learning in PyTorch. The reason why we used a json file is because it is a data inter change format and uses human readable text to store and transmit data objects consisting of attribute value pairs and arrays. It basically has two data structures :- object and array. Object stores a set of name value pairs and array is a list of values. The dataset has been created by us depending on the tasks that has to be carried out.

We are generating the probability where we train the model what to respond like if we are communicating with the assistant the assistant should be able to categorize the conversation under the specific tag using the probability.

In the task we have combined all the work of machine learning and BOSS is generating the output when the command is given by going to task and solving all functionality.

RESULT AND ANALYSIS



```
Windows PowerShell
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Install the latest PowerShell for new features and improv

PS D:\project> & C:/Users/deepa/AppData/Local/Microsoft/W
[nltk_data] Downloading package punkt to
[nltk_data]     C:\Users\deepa\AppData\Roaming\nltk_data.
[nltk_data]   Package punkt is already up-to-date!
Training the Model...
Epoch [100/1000], Loss: 0.6761
Epoch [200/1000], Loss: 0.3016
Epoch [300/1000], Loss: 0.0838
Epoch [400/1000], Loss: 0.0044
Epoch [500/1000], Loss: 0.0014
Epoch [600/1000], Loss: 0.0019
Epoch [700/1000], Loss: 0.0005
Epoch [800/1000], Loss: 0.7072
Epoch [900/1000], Loss: 0.0015
Epoch [1000/1000], Loss: 0.0005
Final Loss : 0.0005
Training Complete, File Saved To TrainData.pth
PS D:\project>
```
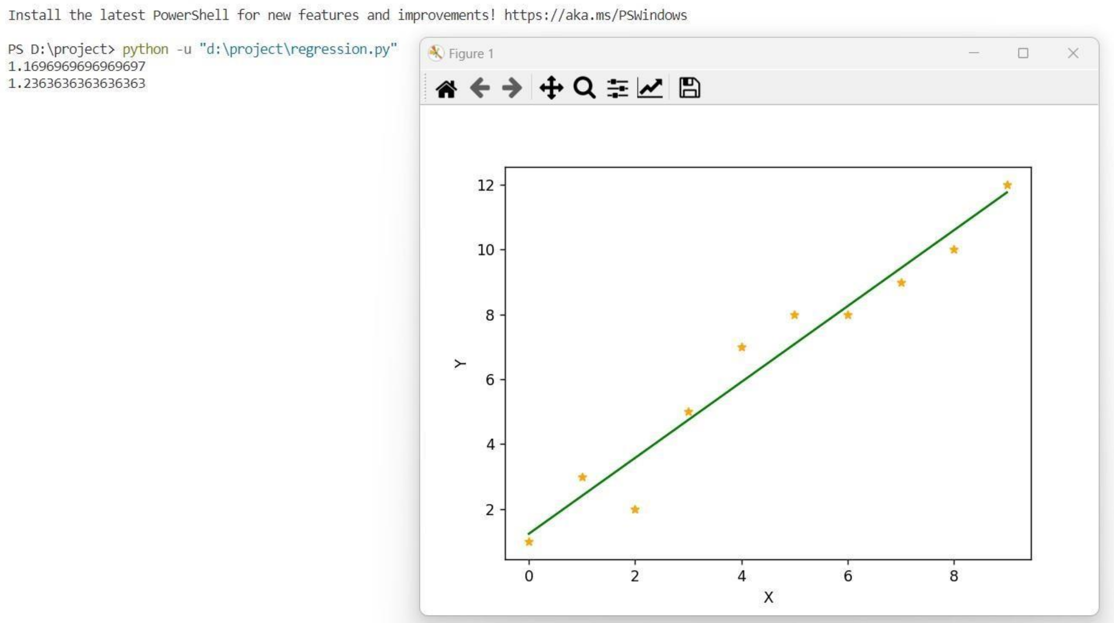
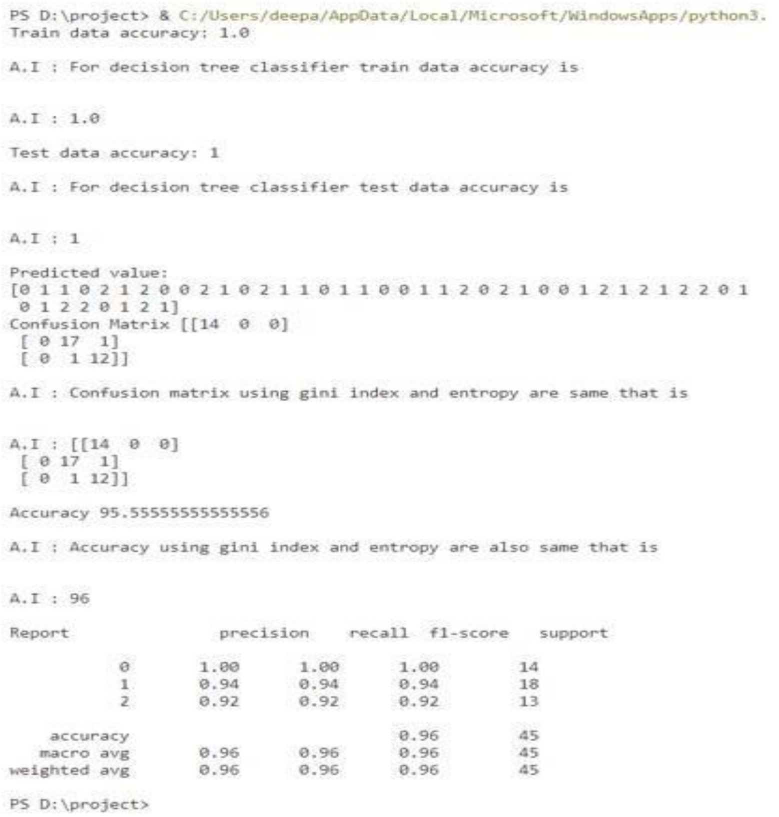

Showing final loss of our model BOSS and Epoch



```
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS D:\project> python -u "d:\project\regression.py"
1.1696969696969697
1.2363636363636363
```

Linear Regression result showing betaO and beta1 value with graph



```
PS D:\project> & C:/Users/deepa/AppData/Local/Microsoft/WindowsApps/python3.
Train data accuracy: 1.0

A.I : For decision tree classifier train data accuracy is


A.I : 1.0

Test data accuracy: 1

A.I : For decision tree classifier test data accuracy is


A.I : 1

Predicted value:
[0 1 1 0 2 1 2 0 0 2 1 0 2 1 1 0 1 1 0 0 1 1 2 0 2 1 0 0 1 2 1 2 1 2 2 0 1
 0 1 2 2 0 1 2 1]
Confusion Matrix [[14  0  0]
 [ 0 17  1]
 [ 0  1 12]]

A.I : Confusion matrix using gini index and entropy are same that is


A.I : [[14  0  0]
 [ 0 17  1]
 [ 0  1 12]]

Accuracy 95.55555555555556

A.I : Accuracy using gini index and entropy are also same that is


A.I : 96

Report                precision    recall  f1-score   support

           0       1.00      1.00      1.00        14
           1       0.94      0.94      0.94        18
           2       0.92      0.92      0.92        13

    accuracy                           0.96        45
   macro avg       0.96      0.96      0.96        45
weighted avg       0.96      0.96      0.96        45

PS D:\project>
```

Showing result of decision tree and BOSS is giving output voice for accuracy of test and train data with confusion matrix

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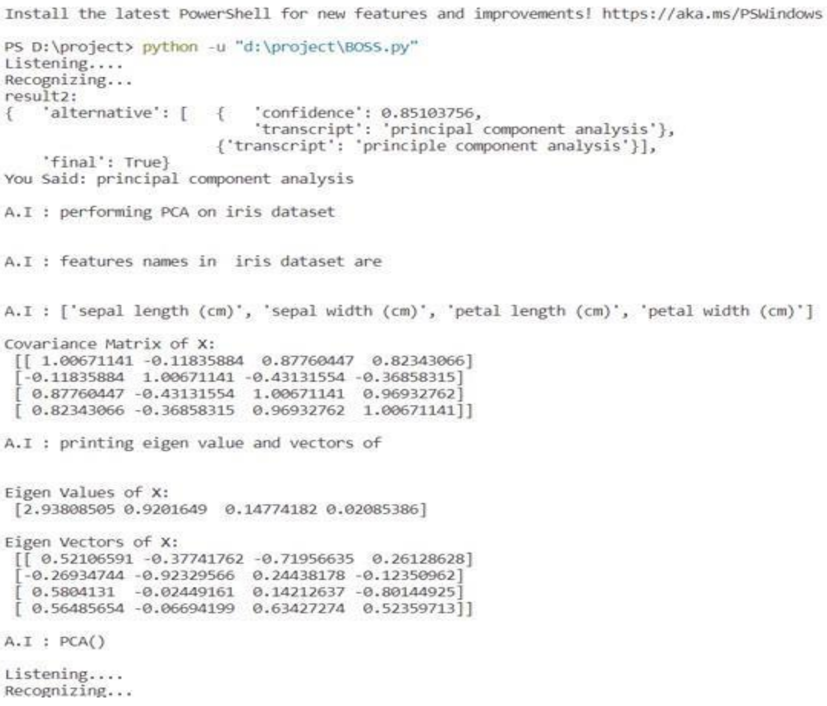

```
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS D:\project> python -u "d:\project\BOSS.py"
Listening....
Recognizing...
result2:
{   'alternative': [   {   'confidence': 0.85103756,
                           'transcript': 'principal component analysis'},
                       {'transcript': 'principle component analysis'}],
    'final': True}
You Said: principal component analysis

A.I : performing PCA on iris dataset


A.I : features names in  iris dataset are


A.I : ['sepal length (cm)', 'sepal width (cm)', 'petal length (cm)', 'petal width (cm)']

Covariance Matrix of X:
 [[ 1.00671141 -0.11835884  0.87760447  0.82343066]
 [-0.11835884  1.00671141 -0.43131554 -0.36858315]
 [ 0.87760447 -0.43131554  1.00671141  0.96932762]
 [ 0.82343066 -0.36858315  0.96932762  1.00671141]]

A.I : printing eigen value and vectors of


Eigen Values of X:
 [2.93808505 0.9201649  0.14774182 0.02085386]

Eigen Vectors of X:
 [[ 0.52106591 -0.37741762 -0.71956635  0.26128628]
 [-0.26934744 -0.92329566  0.24438178 -0.12350962]
 [ 0.5804131  -0.02449161  0.14212637 -0.80144925]
 [ 0.56485654 -0.06694199  0.63427274  0.52359713]]

A.I : PCA()

Listening....
Recognizing...
```

Showing result of PCA of iris dataset along with eigen value and eigen vectors

CONCLUSION

BOSS is a less time consuming. BOSS is a software that understands verbal or written commands and complete task assigned by client. BOSS use natural language processing (NLP) to match user voice or text input with executable commands. With the help of virtual assistant, you able to run your machine-like laptop or PC's on your own command. It is the fast process; therefore, it saves time. Virtual assistant is working for you at set times, so always available to you and able to adapt to changing needs quickly. Virtual assistant will be available to you and, should their workload enable, help others too, such as family and colleagues.

Virtual assistant makes life easier to humans. BOSS have the flexibility to contract for just the services user need. As like Alexa, Cortona, Siri, Google assistant we also make virtual assistant using python for all windows versions. We use Artificial Intelligence, Machine learning, neural network , natural language processing , deep learning and performed maximum task of machine learning classifier. We can say that BOSS is effective way to manage time, reliable and available to use anytime. Here our data is also saved. BOSS is modular in nature so that addition of new features is possible without disturbing current system functionalities.
