Assignment 1

Title : Implementation of Basic Python Librabries

Aim:
1. To understand & apply the analytical concept of python
2. To study basic Python Libraries used for machine learning & data science.

Software Requirement
1. Ubuntu 14.04/14.10
2. Python 3.9
3. Anaconda spides/Jupiter Notebook.

Theory:
Python libraries for Machine learning
Machine learning, as the name suggests, is the science of programming, as computer kinds of data.
A more general definition given by Arthur Samuel is - "Machine learning is the field of study that gives computer the ability to learn without being explicitly programmed.". They are typically used to solve various types of life problems. In the older days, people used to perform Machine learning tasks by manually. Coding all the algorithms & mathematical & statistical formula. This made the process time consuming, tedious & inefficient. But in the modern days, it is become very much easy & efficient compared to the older days by various python libraries, Frameworks & modules. Today, Python is one of the most popular programming languages for this task & it has replaced many languages in the industry, one of the reasons is its vast collection of libraries. Python libraries that used in Machine learning are:

- Numpy
- Matplotlib
- Scikit-learn
- Tensor flow
- PyTorch.
- Pandas
- Scipy
- Theano
- Keras

Numpy:
Numpy is a very popular Python library for large multi-dimensional array & matrix processing, with the help of a large collection of high-level mathematical function. It is very useful for fundamental scientific computations in Machine learning. It is particularly useful for linear algebra, Fourier transform & random number capabilities. High-end libraries like Tensorflow use Numpy internally for manipulation of Tensors.

Pandas:
Pandas is a popular Python library for data analysis. It is not directly related to Machine learning. As we know that the data set must be prepared before training. In this case, Pandas comes handy as it was developed specifically for data extraction & preparation. It provides high-level data structures & wide variety tools for data analysis. It provides many inbuilt methods for grouping, combining & filtering data.

Matplotlib:
Matplotlib is very popular Python library for data visualization like Python, it is not directly related to Machine learning. It particularly comes in handy when a programmer wants to visualize the pattern in the data. It is a 2D plotting library used for creating 2D graphs & plots. A module named pyplot makes it easy for programmers for plotting as it provides features to control line styles, font properties, formating axes, etc. It provides various kinds of graphs & plots for data visualization, viz., histogram, error charts, bar charts, etc.

Scikit-learn:
Scikit-learn is one of the most popular ML libraries for classical ML algorithms. It is built on top of two basic Python library, viz., Numpy & SciPy. Scikit-learn supports most of the supervised and unsupervised learning algorithms Scikit-learn can

also be used for data-Mining & data-analysis, which makes it a great tool who is starting out with ML.

Theano:
We all known that Machine learning is basically mathematics & statistics. Theano is basically a popular python library that is used to define, evalute & optimize mathematical expressions involving multi-dimensional arrays in an efficient manner. It is achieved by optimizing the utilization of CPU and GPU. It is extensively used for unit-testing & self-verification to detect & diagnose different types of errors. Theano is a very powerfull library that has been used in large-scale computationally intensive scientific projects for a long time but is simple & approchable enough to be used by individuals for their own projects.

Tensor Flow:
Tensorflow is a very popular open-source library for high performance numerical computation developed by the google Brain team in Google. As the name suggests, Tensorflow is a Framework that involves defining & running computations involving tensors. It can train & run deep neural networks that can be used to develop several AI application. Tensorflow is wickly used in the field of deep learning reasearch & application.

Keras:
Keras is a very popular Machine learning library for Python. It is a high-level neural networks API capable of running on top of Tensiorflow, CNTK or Theano. It can run seamlessly on both CPU & GPU. Keras makes it really for ML beginners to built & design a Neural Network. One of the best things about Keras is that it allows for easy & fast prototypings.

Scipy:

Scipy is a very popular library among ML enthusiasts as it contains different modules for optimization, linear algebra, integration & statistics. There is a difference betⁿ the scipy library & the scipy stacks. The scipy is one of the core packages that makes up the scipy stacks. Scipy is very useful for image manipulation.

Conclusion:

This Practical we learned different types of python ML Libraries.

NumPy

In [1]:
```
# Python program using NumPy
# for some basic mathematical
# operations

import numpy as np

# Creating two arrays of rank 2
x =np.array([[1, 2], [3, 4]])
y =np.array([[5, 6], [7, 8]])

# Creating two arrays of rank 1
v =np.array([9, 10])
w =np.array([11, 12])

# Inner product of vectors
print(np.dot(v, w), "\n")

# Matrix and Vector product
print(np.dot(x, v), "\n")

# Matrix and matrix product
print(np.dot(x, y))
```

```
219

[29 67]

[[19 22]
 [43 50]]
```

Pandas

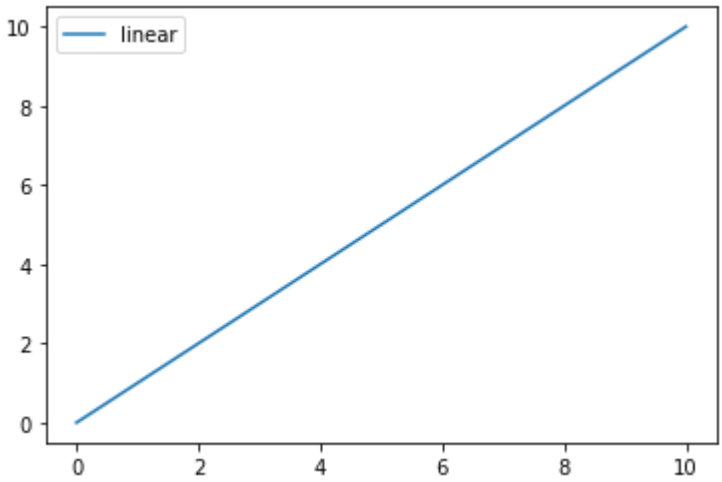
In [2]:
```
# Python program using Pandas for
# arranging a given set of data
# Into a table
# importing pandas as pd

import pandas as pd

data ={"country": ["Brazil", "Russia", "India", "China", "South Africa"],
       "capital": ["Brasilia", "Moscow", "New Dehli", "Beijing", "Pretoria"],
       "area": [8.516, 17.10, 3.286, 9.597, 1.221],
       "population": [200.4, 143.5, 1252, 1357, 52.98] }

data_table =pd.DataFrame(data)
print(data_table)
```

```
        country    capital    area  population
0        Brazil   Brasilia   8.516      200.40
1        Russia     Moscow  17.100      143.50
2         India  New Dehli   3.286     1252.00
3         China    Beijing   9.597     1357.00
4  South Africa   Pretoria   1.221       52.98
```

Matplotlib

In [3]:
```
#  Python program using Matplotlib
# for forming a linear plot
```

```
# importing the necessary packages and modules

import matplotlib.pyplot as plt
import numpy as np

# Prepare the data
x =np.linspace(0, 10, 100)

# Plot the data
plt.plot(x, x, label ='linear')

# Add a legend
plt.legend()

# Show the plot
plt.show()
```



In [ ]: