Assignment No.1

Title: Study of Deep learning Packages: Tensorflow, Keras, Theano and PyTorch.

Document the distinct features and functionality of the packages.

Aim: Study and installation of following Deep learning Packages:

    i. Tensor Flow

    ii. Keras

    iii. Theno

    iv. PyTorch

Theory:

Installation of Tensorflow On Ubntu:

1. Install the Python Development Environment:

You need to download Python, the PIP package, and a virtual environment. If these packages are already installed, you can skip this step. You can download and install what is needed by visiting the following links:

https://www.python.org/

https://pip.pypa.io/en/stable/installing/

https://docs.python.org/3/library/venv.html

To install these packages, run the following commands in the terminal:

sudo apt update

sudo apt install python3-dev python3-pip python3-venv

2. Create a Virtual Environment:

Navigate to the directory where you want to store your Python 3.0 virtual environment. It can be in your home directory, or any other directory where your user can read and write permissions.

mkdir tensorflow_files

cd tensorflow_files

Now, you are inside the directory. Run the following command to create a virtual environment:

python3 -m venv virtualenv

The command above creates a directory named virtualenv. It contains a copy of the Python binary, the PIP package manager, the standard Python library, and other supporting files.

3. Activate the Virtual Environment:

source virtualenv/bin/activate

Once the environment is activated, the virtual environment' s bin directory will be added to the beginning of the $PATH variable. Your shell' s prompt will alter, and it will show the name of the virtual environment you are currently using, i.e. virtualenv.

4. Update PIP:

pip install --upgrade pip

5. Install TensorFlow:

The virtual environment is activated, and it' s up and running. Now, it' s time to install the TensorFlow package.

pip install -- upgrade TensorFlow

Installation of Keras on Ubntu :

Prerequisite : Python version 3.5 or above.

Step 1: Install and Update Python3 and Pip

Skip this step if you already have Python3 and Pip on your machine**.**

sudo apt install python3 python3.pip

sudo pip3 install – – upgrade pip

Step 2: Upgrade Setuptools

pip3 install – – upgrade setuptools

Step 3: Install TensorFlow

pip3 install tensorflow

Verify the installation was successful by checking the software package information:

pip3 show tensorflow

Step 4: Install Keras

pip3 install keras

Verify the installation by displaying the package information:

pip3 show keras

[https://phoenixnap.com/kb/how-to-install-keras-on-linux]

Installation of Theano on Ubuntu:

Step 1: First of all, we will install Python3 on our Linux Machine. Use the following command in the terminal to install Python3.

sudo apt-get install python3

Step 2: Now, install the pip module

sudo apt install python3-pip

Step 3: Now, install the Theano

Verifying Theano package Installation on Linux using PIP

python3 -m pip show theano

Installation of PyTorch

First, check if you are using python' s latest version or not.Because PyGame requires python 3.7 or a higher version

python3 – version

pip3 – version

pip3 install torch==1.8.1+cpu torchvision==0.9.1+cpu torchaudio==0.8.1 -f

https://download.pytorch.org/whl/torch_stable.html

[Ref : https://www.geeksforgeeks.org/install-pytorch-on-linux/]

Python Libraries and functions required

1. Tensorflow, keras

numpy : NumPy is a Python library used for working with arrays. It also has functions for working in domain of linear algebra, fourier transform, and matrices. NumPy stands for Numerical Python. To import numpy use

import numpy as np

pandas: pandas is a fast, powerful, flexible and easy to use open source data analysis and manipulation tool, built on top of the Python programming language. To import pandas use

import pandas as pd

sklearn : Scikit-learn (Sklearn) is the most useful and robust library for machine learning in Python. It provides a selection of efficient tools for machine learning and statistical modeling including classification, regression, clustering and dimensionality reduction via a consistence interface in Python. This library, which is largely written in Python, is built upon NumPy, SciPy and Matplotlib. For importing train_test_ split use

from sklearn.model_selection import train_test_split

2. For Theaon Requirements:

Python3

Python3-pip

NumPy

SciPy

BLAS

Sample Code with comments

1. Tensorflow Test program:

```
import tensorflow as tf

print(tf.__version__)

2.1.0

print(tf.reduce_sum(tf.random.normal([1000, 1000])))

tf.Tensor(-505.04108, shape=(), dtype=float32)
```

2. Keras Test Program:

```
from tensorflow import keras
from keras import datasets
#
# Load MNIST data
#
(train_images, train_labels), (test_images, test_labels) = datasets.mnist.load_data()
#
# Check the dataset loaded
#
train_images.shape, test_images.shape
```

3. Theano test program

```
# Python program showing
# addition of two scalars
# Addition of two scalars
import numpy
import theano.tensor as T
from theano import function
```

```
# Declaring two variables
x = T.dscalar('x')
y = T.dscalar('y')
# Summing up the two numbers
z = x + y
# Converting it to a callable object
# so that it takes matrix as parameters
f = function([x, y], z)
f(5, 7)
```

4. Test program for PyTorch

```
## The usual imports
import torch
import torch.nn as nn
## print out the pytorch version used
print(torch._version_)
```

Conclusion:

Tensorflow, PyTorch, Keras and Theano all these packages are installed and ready for Deep learning applications . As per application domain and dataset we can choose the appropriate package and build required type of Neural Network.

Output of Code:

Note: Run the code and attach your output of the code here.

Questions:

1) What is Deep learning ?

2) What are various packages in python for supporting Machine Learning libraries and which are mainly used for Deep Learning ?

3) Compare Tensorflow / Keras/Theno and PyTorch on following points(make a table) :

i. Available Functionality

ii. GUI status

iii. Versions.

iv. Features

5

v. Compatibility with other environments.

vi. Specific Application domains.

4) Enlist the Models Datasets and pretrained models, Libraaries and Extensions , Tools related to Tensorflow also discuss any two casestudies like (PayPal, Intel, Etc.) related to Tensor Flow. [Ref:https://www.tensorflow.org/about]

5) Explain the Keras Ecosystem.(kerastuner,kerasNLP,kerasCV,Autokeras and Modeloptimization.). Also explain following concepts related to keras :

 1. Developing sequential Model

2. Training and validation using the inbuilt functions

3. Parameter Optimization. [Ref: https://keras.io/]

6) Explain simple Theano program.

7) Explain PyTorch Tensors . And also explain Uber' s Pyro, Tesala
    Autopilot.[https://pytorch.org/]