Assignment 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.Theano

iv.PyTorch

Theory:

What is Deep Learning?

Deep learning can be considered as a subset of machine learning. It is a field that is based on learning and improving on its own by examining computer algorithms. While machine learning uses simpler concepts, deep learning works with artificial neural networks, which are designed to imitate how humans think and learn. Until recently, neural networks were limited by computing power and thus were limited in complexity. However, advancements in Big Data analytics have permitted larger, sophisticated neural networks, allowing computers to observe, learn, and react to complex situations faster than humans. Deep learning has aided image classification, language translation, speech recognition. It can be used to solve any pattern recognition problem and without human intervention. Artificial neural networks, comprising many layers, drive deep learning.

Deep Neural Networks (DNNs) are such types of networks where each layer can perform complex operations such as representation and abstraction that make sense of images, sound, and text. Considered the fastest-growing field in machine learning, deep learning represents a truly disruptive digital technology, and it is being used by increasingly more companies to create new business models.

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

Python libraries that are used in Machine Learning are:

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

Steps/ Algorithm:

Installation of Tensorflow on Ubuntu:

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 Ubuntu :

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]

[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

Packages	Features
TensorFlow	• TensorFlow is by far one of the most popular deep learning frameworks. It is developed by Google Brain and supports languages like Python, C++ and R. TensorFlow uses dataflow graphs to process data. • TensorFlow allows developers to create dataflow graphs—structures that describe how data moves through a graph, or a series of processing nodes. Each node in the graph represents a mathematical operation, and each connection or edge between nodes is a multidimensional data array, or tensor.
Keras	• Keras is a high-level, deep learning API developed by Google for implementing neural networks. It is written in Python and is used to make the implementation of neural networks easy. It also supports multiple backend neural network computation. • The features of Keras are as follows: Simple, extensible, and constant API. It supports backends and different platforms. Due to its Customizable framework, it can work on both GPU and CPU
Theano	• Theano is a foundation library mainly used for deep learning research and development and directly to create deep learning models or by convenient libraries such as Keras. It supports both convolutional networks and recurrent networks, as well as combinations of the two. • Theano is a low-level Python library that is used to target deep learning tasks that are related to defining, optimizing, and evaluating mathematical expressions
PyTorch	• **PyTorch is** a fully featured framework for building deep learning models, which is a type of machine learning that's commonly used in applications like image recognition and language processing**.** • Tensor Computation (similar to NumPy) with strong GPU (Graphical Processing Unit) acceleration support. • Automatic Differentiation for creating and training deep neural networks.