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Title: **Assignment 1: Study of Deep learning Packages: Tensorflow, Keras, Theano and PyTorch. Document the distinct features and functionality of the packages.**

```
In [ ]: import numpy as np
```

## 1. Tensorflow

```
In [1]: import tensorflow as tf
```

```
In [2]: print(tf.__version__)
```

2.9.2

## 2. Keras

```
In [3]: from keras import datasets
# Load MNIST datasets from keras
(train_images, train_labels), (test_images, test_labels) = datasets.mnist.load_data()
```

Downloading data from <https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz> (<https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz>)

11490434/11490434 [=====] - 0s 0us/step

```
In [4]: train_images.shape
```

Out[4]: (60000, 28, 28)

```
In [5]: test_images.shape
```

Out[5]: (10000, 28, 28)

## 3. Theano

```
In [6]: !pip install Theano
```

```
Looking in indexes: https://pypi.org/simple, (https://pypi.org/simple,) http
s://us-python.pkg.dev/colab-wheels/public/simple/ (https://us-python.pkg.dev/co
lab-wheels/public/simple/)
Collecting Theano
  Downloading Theano-1.0.5.tar.gz (2.8 MB)
    |████████████████████████████████████████| 2.8 MB 5.1 MB/s
Requirement already satisfied: numpy>=1.9.1 in /usr/local/lib/python3.7/dist-pa
ckages (from Theano) (1.21.6)
Requirement already satisfied: scipy>=0.14 in /usr/local/lib/python3.7/dist-pac
kages (from Theano) (1.7.3)
Requirement already satisfied: six>=1.9.0 in /usr/local/lib/python3.7/dist-pack
ages (from Theano) (1.15.0)
Building wheels for collected packages: Theano
  Building wheel for Theano (setup.py) ... done
  Created wheel for Theano: filename=Theano-1.0.5-py3-none-any.whl size=2668111
sha256=4fcf8567a04ffbbc8687bec651425846dacba37939e919162cb9380cdf9dd5e8
  Stored in directory: /root/.cache/pip/wheels/26/68/6f/745330367ce7822fe0cd863
712858151f5723a0a5e322cc144
Successfully built Theano
Installing collected packages: Theano
Successfully installed Theano-1.0.5
```

```
In [7]: import theano.tensor as T
        from theano import function
```

```
In [8]: # Declaring 2 variables
        x = T.dscalar('x')
        y = T.dscalar('y')
```

```
In [10]: # Summing up the 2 numbers
         z = x + y
```

```
In [12]: # Converting it to a callable object so that it takes matrix as parameters
         f = function([x, y], z)
```

```
In [13]: f(5, 7)
```

```
Out[13]: array(12.)
```

#### 4. PyTorch

```
In [14]: !pip3 install torch torchvision torchaudio --extra-index-url https://download.pyt
```

```
Looking in indexes: https://pypi.org/simple, (https://pypi.org/simple,) http
s://us-python.pkg.dev/colab-wheels/public/simple/, (https://us-python.pkg.dev/c
olab-wheels/public/simple/,) https://download.pytorch.org/whl/cu115 (https://do
wnload.pytorch.org/whl/cu115)
Requirement already satisfied: torch in /usr/local/lib/python3.7/dist-packages
(1.12.1+cu113)
Requirement already satisfied: torchvision in /usr/local/lib/python3.7/dist-pac
kages (0.13.1+cu113)
Requirement already satisfied: torchaudio in /usr/local/lib/python3.7/dist-pack
ages (0.12.1+cu113)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/di
st-packages (from torch) (4.1.1)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/local/lib/python3.
7/dist-packages (from torchvision) (7.1.2)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages
(from torchvision) (1.21.6)
Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packag
es (from torchvision) (2.23.0)
Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in /usr/
local/lib/python3.7/dist-packages (from requests->torchvision) (1.24.3)
Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/di
st-packages (from requests->torchvision) (3.0.4)
Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-pa
ckages (from requests->torchvision) (2.10)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/d
ist-packages (from requests->torchvision) (2022.9.24)
```

```
In [15]: import torch
import torch.nn as nn
```

```
In [17]: print(torch.__version__)

1.12.1+cu113
```

```
In [18]: torch.cuda.is_available()
```

```
Out[18]: False
```