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Roll: 407B028

LP-IV (Deep Learning)

Practical 1

Aim: To Study of Deep learning Packages: Tensorflow, Keras, Theano and PyTorch. Document the distinct features and functionality of the packages.

```
In [13]: import numpy as np
```

```
In [14]: !pip install tensorflow  
import tensorflow as tf #Tensorflow
```

Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: tensorflow in /home/sapatevaibhav/.local/lib/python3.10/site-packages (2.14.0)
Requirement already satisfied: absl-py>=1.0.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (2.0.0)
Requirement already satisfied: astunparse>=1.6.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=23.5.26 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (23.5.26)
Requirement already satisfied: gast!=0.5.0,!0.5.1,!0.5.2,>=0.2.1 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (0.5.4)
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Requirement already satisfied: opt-einsum>=2.3.2 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (3.3.0)
Requirement already satisfied: packaging in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (23.2)
Requirement already satisfied: protobuf!=4.21.0,!4.21.1,!4.21.2,!4.21.3,!4.21.4,!4.21.5,<5.0.0dev,>=3.20.3 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (4.24.4)
Requirement already satisfied: setuptools in /usr/lib/python3/dist-packages (from tensorflow) (59.6.0)
Requirement already satisfied: six>=1.12.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (1.16.0)
Requirement already satisfied: termcolor>=1.1.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (2.3.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (4.12.2)
Requirement already satisfied: wrapt<1.15,>=1.11.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (1.14.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorflow) (0.34.0)
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Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorboard<2.15,>=2.14->tensorflow) (0.7.1)

Requirement already satisfied: werkzeug>=1.0.1 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from tensorboard<2.15,>=2.14->tensorflow) (3.0.2)

Requirement already satisfied: cachetools<6.0,>=2.0.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from google-auth<3,>=1.6.3->tensorboard<2.15,>=2.14->tensorflow) (5.3.1)

Requirement already satisfied: pyasn1-modules>=0.2.1 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from google-auth<3,>=1.6.3->tensorboard<2.15,>=2.14->tensorflow) (0.3.0)

Requirement already satisfied: rsa<5,>=3.1.4 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from google-auth<3,>=1.6.3->tensorboard<2.15,>=2.14->tensorflow) (4.9)

Requirement already satisfied: requests-oauthlib>=0.7.0 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from google-auth-oauthlib<1.1,>=0.5->tensorboard<2.15,>=2.14->tensorflow) (1.3.1)

Requirement already satisfied: charset-normalizer<4,>=2 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from requests<3,>=2.21.0->tensorboard<2.15,>=2.14->tensorflow) (3.2.0)

Requirement already satisfied: idna<4,>=2.5 in /usr/lib/python3/dist-packages (from requests<3,>=2.21.0->tensorboard<2.15,>=2.14->tensorflow) (3.3)

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Requirement already satisfied: certifi>=2017.4.17 in /usr/lib/python3/dist-packages (from requests<3,>=2.21.0->tensorboard<2.15,>=2.14->tensorflow) (2020.6.20)

Requirement already satisfied: MarkupSafe>=2.1.1 in /home/sapatevaibhav/.local/lib/python3.10/site-packages (from werkzeug>=1.0.1->tensorboard<2.15,>=2.14->tensorflow) (2.1.5)

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Requirement already satisfied: oauthlib>=3.0.0 in /usr/lib/python3/dist-packages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<1.1,>=0.5->tensorboard<2.15,>=2.14->tensorflow) (3.2.0)

In [15]: `print(tf.__version__)`

2.14.0

In [16]: `#Keras
from keras import datasets
Load MNIST datasets from keras
(train_images, train_labels), (test_images, test_labels) = datasets.mnist.load_data()`

In [17]: `test_images.shape`

Out[17]: (10000, 28, 28)

In [18]: `#4. PyTorch
!pip3 install torch torchvision torchaudio --extra-index-url https://download.py`

```

Defaulting to user installation because normal site-packages is not writeable
Looking in indexes: https://pypi.org/simple, https://download.pytorch.org/whl/cu1
15
Requirement already satisfied: torch in /home/sapatevaibhav/.local/lib/python3.1
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Requirement already satisfied: torchvision in /home/sapatevaibhav/.local/lib/pyth
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Requirement already satisfied: nvidia-cuda-nvrtc-cu12==12.1.105 in /home/sapateva
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ibhav/.local/lib/python3.10/site-packages (from torch) (11.4.5.107)
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l/lib/python3.10/site-packages (from nvidia-cusolver-cu12==11.4.5.107->torch) (1
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Requirement already satisfied: numpy in /home/sapatevaibhav/.local/lib/python3.1
0/site-packages (from torchvision) (1.24.0)
Requirement already satisfied: pillow!=8.3.*,>=5.3.0 in /usr/lib/python3/dist-pac
kages (from torchvision) (9.0.1)
Requirement already satisfied: MarkupSafe>=2.0 in /home/sapatevaibhav/.local/lib/
python3.10/site-packages (from Jinja2->torch) (2.1.5)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /home/sapatevaibhav/.local/l
ib/python3.10/site-packages (from sympy->torch) (1.3.0)

```

```
In [19]: pip install --upgrade pip
```

Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: pip in /home/sapatevaibhav/.local/lib/python3.10/site-packages (24.2)
Note: you may need to restart the kernel to use updated packages.

```
In [20]: import torch
import torch.nn as nn
```

```
In [21]: print(torch.__version__)

2.4.1+cu121
```

```
In [22]: torch.cuda.is_available()
```

```
Out[22]: False
```

Feature	TensorFlow	Keras	Theano	PyTorch
Interface	C++, Python, CUDA	Python	Python	Python
Architecture	Complex static graphs	Simple high-level API	Static graphs	Dynamic graphs
Performance	High performance	Depends on backend	High performance	Competitive
Learning Curve	Steep	Easy	Moderate	Gentle
Community Support	Extensive	Growing	Limited	Increasing
Use Case Suitability	Large datasets	Small datasets	Academic research	Research and prototyping