```
#2 Installing Keras, Tensorflow and PyTorch
!pip install tensorflow keras torch torchvision
```

```
Requirement already satisfied: tensorflow in /usr/local/lib/python3.11/dist-packages (2.18.0)
Requirement already satisfied: keras in /usr/local/lib/python3.11/dist-packages (3.8.0)
Requirement already satisfied: torch in /usr/local/lib/python3.11/dist-packages (2.5.1+cu124)
Requirement already satisfied: torchvision in /usr/local/lib/python3.11/dist-packages (0.20.1+cu124)
Requirement already satisfied: absl-py>=1.0.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.4.0)
Requirement already satisfied: astunparse>=1.6.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=24.3.25 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (25.1.24)
Requirement already satisfied: gast!=0.5.0,!=0.5.1,!=0.5.2,>=0.2.1 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (
Requirement already satisfied: google-pasta>=0.1.1 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (0.2.0)
Requirement already satisfied: libclang>=13.0.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (18.1.1)
Requirement already satisfied: opt-einsum>=2.3.2 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (3.4.0)
Requirement already satisfied: packaging in /usr/local/lib/python3.11/dist-packages (from tensorflow) (24.2)
Requirement already satisfied: protobuf!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<6.0.0dev,>=3.20.3 in /usr/local/lib
Requirement already satisfied: requests<3,>=2.21.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (2.32.3)
Requirement already satisfied: setuptools in /usr/local/lib/python3.11/dist-packages (from tensorflow) (75.1.0)
Requirement already satisfied: six>=1.12.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.17.0)
Requirement already satisfied: termcolor>=1.1.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (2.5.0)
Requirement already satisfied: typing-extensions>=3.6.6 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (4.12.2)
Requirement already satisfied: wrapt>=1.11.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.17.2)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.70.0)
Requirement already satisfied: tensorboard<2.19,>=2.18 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (2.18.0)
Requirement already satisfied: numpy<2.1.0,>=1.26.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (1.26.4)
Requirement already satisfied: h5py>=3.11.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (3.12.1)
Requirement already satisfied: ml-dtypes<0.5.0,>=0.4.0 in /usr/local/lib/python3.11/dist-packages (from tensorflow) (0.4.1)
Requirement already satisfied: tensorflow-io-gcs-filesystem>=0.23.1 in /usr/local/lib/python3.11/dist-packages (from tensorflow)
Requirement already satisfied: rich in /usr/local/lib/python3.11/dist-packages (from keras) (13.9.4)
Requirement already satisfied: namex in /usr/local/lib/python3.11/dist-packages (from keras) (0.0.8)
Requirement already satisfied: optree in /usr/local/lib/python3.11/dist-packages (from keras) (0.14.0)
Requirement already satisfied: filelock in /usr/local/lib/python3.11/dist-packages (from torch) (3.17.0)
Requirement already satisfied: networkx in /usr/local/lib/python3.11/dist-packages (from torch) (3.4.2)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.11/dist-packages (from torch) (3.1.5)
Requirement already satisfied: fsspec in /usr/local/lib/python3.11/dist-packages (from torch) (2024.10.0)
Collecting nvidia-cuda-nvrtc-cu12==12.4.127 (from torch)
  Downloading nvidia_cuda_nvrtc_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cuda-runtime-cu12==12.4.127 (from torch)
  Downloading nvidia_cuda_runtime_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cuda-cupti-cu12==12.4.127 (from torch)
  Downloading nvidia_cuda_cupti_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cudnn-cu12==9.1.0.70 (from torch)
  Downloading nvidia_cudnn_cu12-9.1.0.70-py3-none-manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cublas-cu12==12.4.5.8 (from torch)
  Downloading nvidia_cublas_cu12-12.4.5.8-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cufft-cu12==11.2.1.3 (from torch)
  Downloading nvidia_cufft_cu12-11.2.1.3-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-curand-cu12==10.3.5.147 (from torch)
  Downloading nvidia_curand_cu12-10.3.5.147-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Collecting nvidia-cusolver-cu12==11.6.1.9 (from torch)
  Downloading nvidia_cusolver_cu12-11.6.1.9-py3-none-manylinux2014_x86_64.whl.metadata (1.6 kB)
Collecting nvidia-cusparse-cu12==12.3.1.170 (from torch)
  Downloading nvidia_cusparse_cu12-12.3.1.170-py3-none-manylinux2014_x86_64.whl.metadata (1.6 kB)
Requirement already satisfied: nvidia-nccl-cu12==2.21.5 in /usr/local/lib/python3.11/dist-packages (from torch) (2.21.5)
Requirement already satisfied: nvidia-nvtx-cu12==12.4.127 in /usr/local/lib/python3.11/dist-packages (from torch) (12.4.127)
Collecting nvidia-nvjitlink-cu12==12.4.127 (from torch)
  Downloading nvidia_nvjitlink_cu12-12.4.127-py3-none-manylinux2014_x86_64.whl.metadata (1.5 kB)
Requirement already satisfied: triton==3.1.0 in /usr/local/lib/python3.11/dist-packages (from torch) (3.1.0)
Requirement already satisfied: sympy==1.13.1 in /usr/local/lib/python3.11/dist-packages (from torch) (1.13.1)
Requirement already satisfied: mpmath<1.4,>=1.1.0 in /usr/local/lib/python3.11/dist-packages (from sympy==1.13.1->torch) (1.3.0)
```

```
#3 CNNs on Computer Vision
import tensorflow as tf
from tensorflow.keras import layers, models
from tensorflow.keras.datasets import cifar10

# Load dataset
(X_train, y_train), (X_test, y_test) = cifar10.load_data()
X_train, X_test = X_train / 255.0, X_test / 255.0

# Build a simple CNN model
model = models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(32, 32, 3)),
    layers.MaxPooling2D((2, 2)),
    layers.Flatten(),
    layers.Dense(64, activation='relu'),
    layers.Dense(10, activation='softmax')
])

model.compile(optimizer='adam', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
history = model.fit(X_train, y_train, epochs=2, validation_data=(X_test, y_test))

print("Final Training Accuracy:", history.history['accuracy'][-1])
```

```
Downloading data from https://www.cs.toronto.edu/~kriz/cifar-10-python.tar.gz
170498071/170498071 ━━━━━━━━━━━━━━━━━━━━ 6s 0us/step
/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`/`
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
Epoch 1/2
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 46s 28ms/step - accuracy: 0.3879 - loss: 1.6941 - val_accuracy: 0.5577 - val_loss: 1.2669
Epoch 2/2
1563/1563 ━━━━━━━━━━━━━━━━━━━━ 84s 30ms/step - accuracy: 0.5670 - loss: 1.2372 - val_accuracy: 0.5655 - val_loss: 1.2597
Final Training Accuracy: 0.5706800222396851
```

```
#4 CNN on MNIST
from tensorflow.keras.datasets import mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Conv2D, Flatten, MaxPooling2D
from tensorflow.keras.utils import to_categorical

# Load MNIST dataset
(X_train, y_train), (X_test, y_test) = mnist.load_data()
X_train = X_train.reshape(-1, 28, 28, 1) / 255.0
X_test = X_test.reshape(-1, 28, 28, 1) / 255.0
y_train = to_categorical(y_train)
y_test = to_categorical(y_test)

# Build the CNN model
model = Sequential([
    Conv2D(32, kernel_size=(3, 3), activation='relu', input_shape=(28, 28, 1)),
    MaxPooling2D(pool_size=(2, 2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dense(10, activation='softmax')
])

model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])
history = model.fit(X_train, y_train, epochs=2, validation_data=(X_test, y_test))

print("Test Accuracy:", history.history['val_accuracy'][-1])
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
11490434/11490434 ━━━━━━━━━━━━━━━━━━━━ 1s 0us/step
Epoch 1/2
1875/1875 ━━━━━━━━━━━━━━━━━━━━ 50s 25ms/step - accuracy: 0.9075 - loss: 0.3115 - val_accuracy: 0.9791 - val_loss: 0.0688
Epoch 2/2
1875/1875 ━━━━━━━━━━━━━━━━━━━━ 46s 24ms/step - accuracy: 0.9841 - loss: 0.0509 - val_accuracy: 0.9847 - val_loss: 0.0474
Test Accuracy: 0.9847000241279602
```

```
#5 Deep Learning for NLP LSTM
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, LSTM, Dense
import numpy as np

# Sample text data
texts = ["I love programming", "Machine learning is amazing", "Deep learning is powerful"]
labels = np.array([1, 1, 1], dtype='float32')  # Ensure labels are numpy array

# Tokenization
tokenizer = Tokenizer(num_words=1000)
tokenizer.fit_on_texts(texts)
sequences = tokenizer.texts_to_sequences(texts)
padded_sequences = pad_sequences(sequences, maxlen=5)

# Model definition
model = Sequential([
    Embedding(input_dim=1000, output_dim=64),
    LSTM(32),
    Dense(1, activation='sigmoid')
])

model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])

# Training the model
history = model.fit(padded_sequences, labels, epochs=5, verbose=1)

print("Final Accuracy:", history.history['accuracy'][-1])
```

```
Epoch 1/5
1/1 ━━━━━━━━━━━━━━━━━━━━ 3s 3s/step - accuracy: 0.3333 - loss: 0.6958
Epoch 2/5
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 63ms/step - accuracy: 1.0000 - loss: 0.6872
Epoch 3/5
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 55ms/step - accuracy: 1.0000 - loss: 0.6786
Epoch 4/5
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 61ms/step - accuracy: 1.0000 - loss: 0.6700
Epoch 5/5
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 54ms/step - accuracy: 1.0000 - loss: 0.6613
Final Accuracy: 1.0
```

```
#6 Sentiment Analysis LSTM
from tensorflow.keras.datasets import imdb
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Embedding, LSTM, Dense

# Load dataset
(X_train, y_train), (X_test, y_test) = imdb.load_data(num_words=10000)
X_train = pad_sequences(X_train, maxlen=100)
X_test = pad_sequences(X_test, maxlen=100)

# Build the model
model = Sequential([
    Embedding(10000, 128),
    LSTM(64),
    Dense(1, activation='sigmoid')
])

model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accuracy'])
history = model.fit(X_train, y_train, epochs=2, validation_data=(X_test, y_test))

print("Validation Accuracy:", history.history['val_accuracy'][-1])
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/imdb.npz
17464789/17464789 ━━━━━━━━━━━━━━━━━━━━ 1s 0us/step
Epoch 1/2
782/782 ━━━━━━━━━━━━━━━━━━━━ 91s 112ms/step - accuracy: 0.7544 - loss: 0.4828 - val_accuracy: 0.8518 - val_loss: 0.3364
Epoch 2/2
782/782 ━━━━━━━━━━━━━━━━━━━━ 139s 108ms/step - accuracy: 0.9017 - loss: 0.2526 - val_accuracy: 0.8580 - val_loss: 0.3457
Validation Accuracy: 0.8579599857330322
```

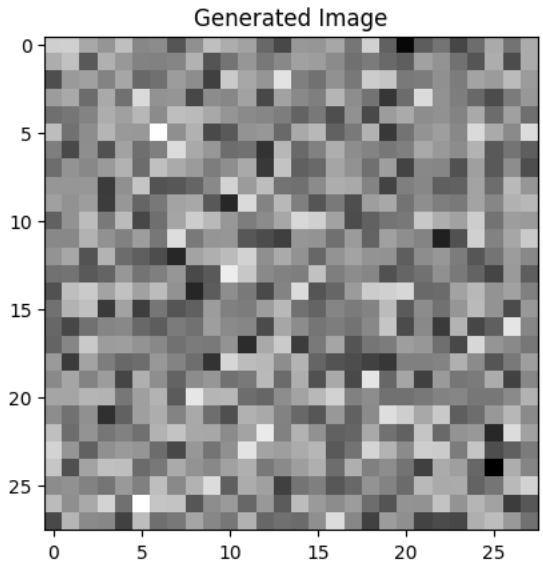
```
#7 Autoencoders on real-world data
from tensorflow.keras.models import Model
from tensorflow.keras.layers import Input, Dense
import numpy as np

# Define input data
data = np.random.random((1000, 20))

# Autoencoder architecture
input_layer = Input(shape=(20,))
encoded = Dense(10, activation='relu')(input_layer)
decoded = Dense(20, activation='sigmoid')(encoded)
autoencoder = Model(input_layer, decoded)

autoencoder.compile(optimizer='adam', loss='mse')
history = autoencoder.fit(data, data, epochs=5)

print("Final Training Loss:", history.history['loss'][-1])
```

```
Epoch 1/5
32/32 ━━━━━━━━━━━━━━━━━━━━ 2s 5ms/step - loss: 0.0859
Epoch 2/5
32/32 ━━━━━━━━━━━━━━━━━━━━ 0s 5ms/step - loss: 0.0828
Epoch 3/5
32/32 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - loss: 0.0809
Epoch 4/5
32/32 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - loss: 0.0800
Epoch 5/5
32/32 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - loss: 0.0800
Final Training Loss: 0.07879046350717545
```

```
#8 GANs for Image Gen
import tensorflow as tf
from tensorflow.keras.layers import Dense, Reshape, Flatten
from tensorflow.keras.models import Sequential
import numpy as np
import matplotlib.pyplot as plt

# Generate random noise
def generate_latent_points(latent_dim, n_samples):
    return np.random.randn(latent_dim * n_samples).reshape(n_samples, latent_dim)
```

```
# Define generator
generator = Sequential([
    Dense(128, activation='relu', input_dim=100),
    Dense(784, activation='sigmoid'),
    Reshape((28, 28))
])

# Generate sample images
latent_points = generate_latent_points(100, 1)
generated_images = generator.predict(latent_points)

plt.imshow(generated_images[0], cmap='gray')
plt.title("Generated Image")
plt.show()
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 78ms/step
/usr/local/lib/python3.11/dist-packages/keras/src/layers/core/dense.py:87: UserWarning: Do not pass an `input_shape`/`input_dim` arg
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```



Start coding or generate with AI.