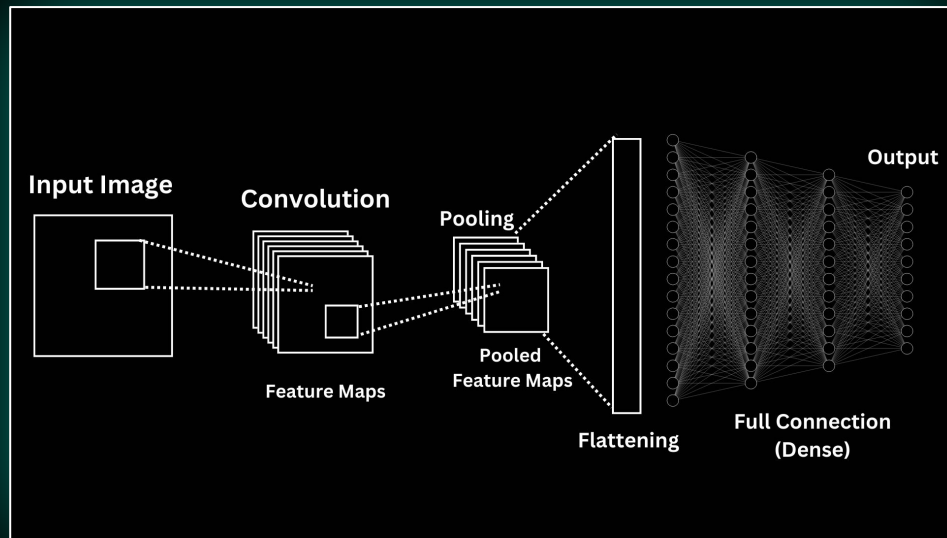


Number Image Classification

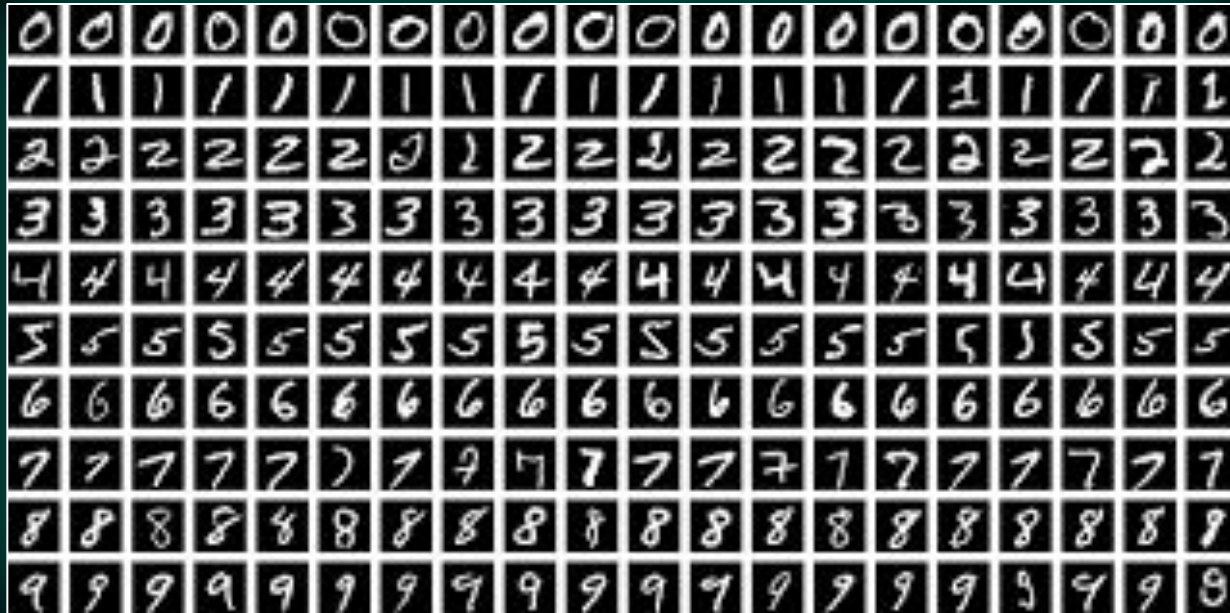
Using

Convolutional Neural Networks

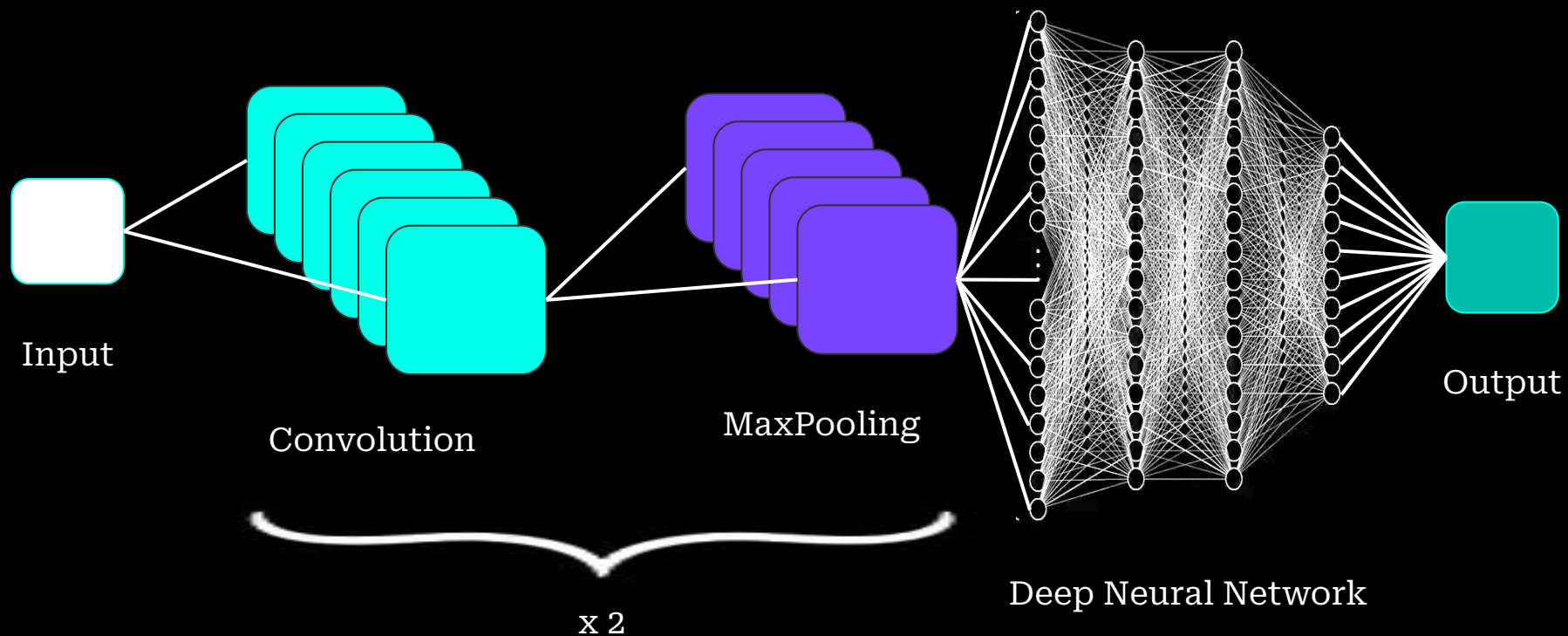


Dataset

Mnist dataset of Hand-written numbers from Tensorflow were used.



CNN Model



Model

```
cnn = models.Sequential([  
  
    # CNN  
    layers.Conv1D(filters=128, kernel_size=(3), activation='relu', input_shape=(28,28)),  
    layers.MaxPooling1D((2)),  
  
    layers.Conv1D(filters=64, kernel_size=(3), activation='relu', input_shape=(28,28)),  
    layers.MaxPooling1D((2)),  
  
    # Dense Layers  
    layers.Flatten(),  
    layers.Dense(32, activation='relu'),  
    layers.Dense(10, activation='softmax')  
])
```

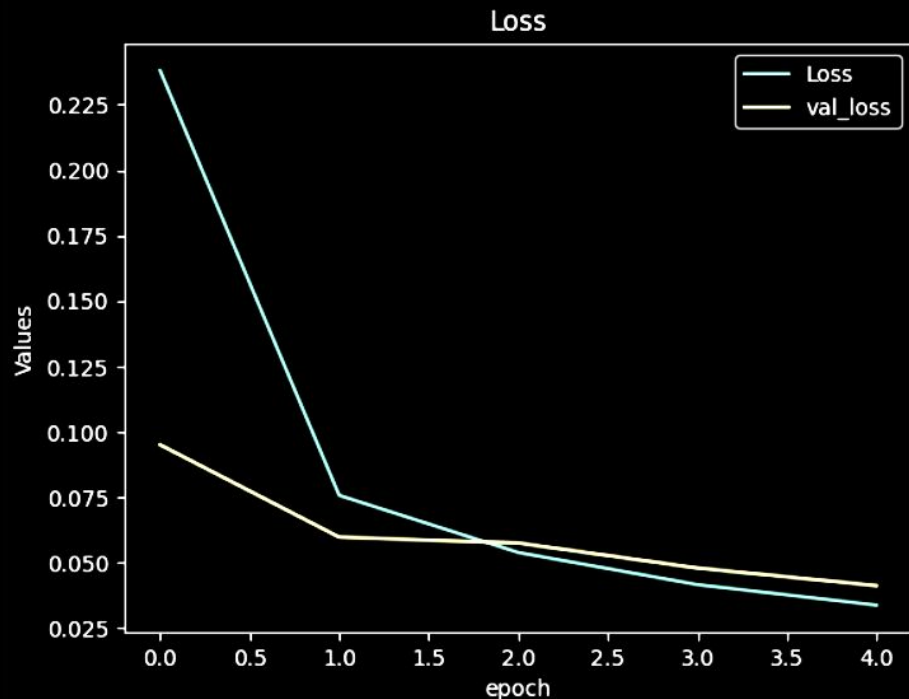
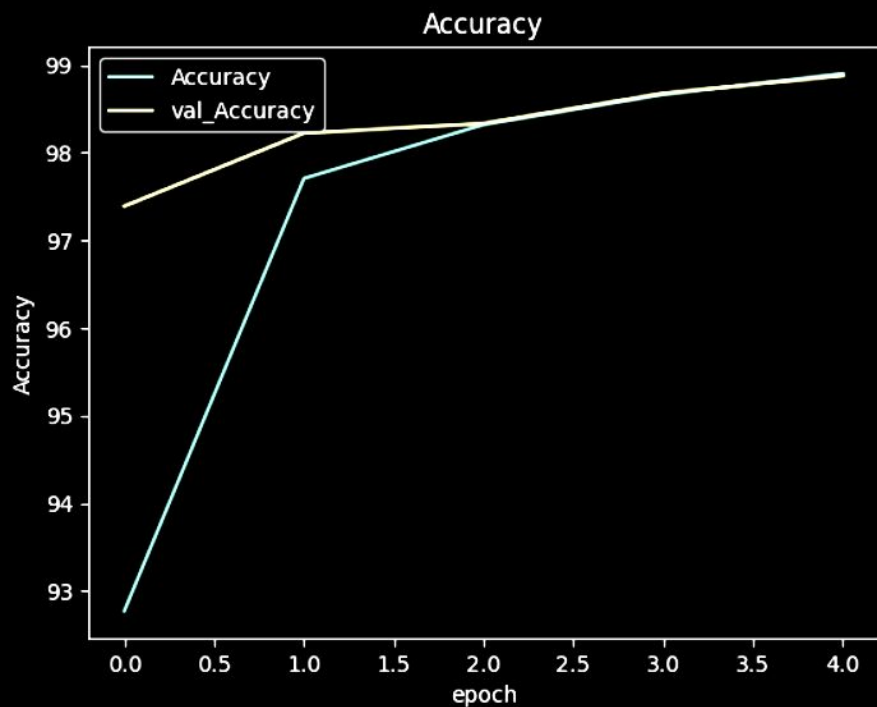
Model

```
cnn = models.Sequential([  
  
    # CNN  
    layers.Conv1D(filters=128, kernel_size=(3), activation='relu', input_shape=(28,28)),  
    layers.MaxPooling1D((2)),  
  
    layers.Conv1D(filters=64, kernel_size=(3), activation='relu', input_shape=(28,28)),  
    layers.MaxPooling1D((2)),  
  
    # Dense Layers  
    layers.Flatten(),  
    layers.Dense(32, activation='relu'),  
    layers.Dense(10, activation='softmax')  
])
```

```
cnn.compile(optimizer='adam',  
            loss='sparse_categorical_crossentropy',  
            metrics=['Accuracy'])
```

Training

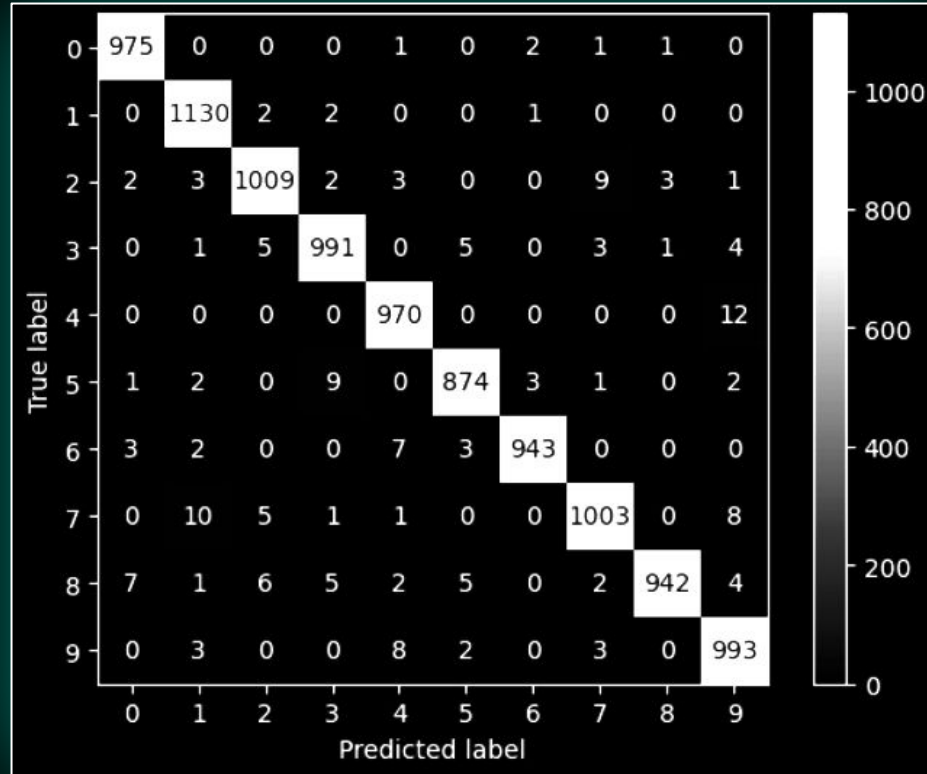
```
history = cnn.fit(X_train, y_train, validation_split=0.15, epochs=5)
```



Results

Classification report:				
	precision	recall	f1-score	support
0	0.99	0.99	0.99	980
1	0.98	1.00	0.99	1135
2	0.98	0.98	0.98	1032
3	0.98	0.98	0.98	1010
4	0.98	0.99	0.98	982
5	0.98	0.98	0.98	892
6	0.99	0.98	0.99	958
7	0.98	0.98	0.98	1028
8	0.99	0.97	0.98	974
9	0.97	0.98	0.98	1009
accuracy			0.98	10000
macro avg	0.98	0.98	0.98	10000
weighted avg	0.98	0.98	0.98	10000

Confusion Matrix



Hardware & Software Details

- Ryzen 9 5900HX
 - 24GB RAM
 - NVIDIA RTX 3060
 - TensorFlow GPU (CUDA & CUDNN)
 - Jupyter Notebook (Miniconda - Python 3)
-

GitHub



https://github.com/Codeynamics/DeepNeuralNetworks/blob/main/MNIST_CNN.ipynb