=================================================================== **Exp No 4 CNN Multiclass Classifier  
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Aim…**

To build and evaluate a CNN model for multiclass classification

**Code…**

**import tensorflow as tf**

**from tensorflow.keras.datasets import mnist**

**from tensorflow.keras.models import Sequential**

**from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense**

**# Load and preprocess the MNIST dataset**

**(X\_train, y\_train), (X\_test, y\_test) = mnist.load\_data()**

**X\_train = X\_train.reshape(-1, 28, 28, 1).astype("float32") / 255.0**

**X\_test = X\_test.reshape(-1, 28, 28, 1).astype("float32") / 255.0**

**# Define the CNN model**

**model = Sequential([**

**Conv2D(32, (3, 3), activation='relu', input\_shape=(28, 28, 1)),**

**MaxPooling2D((2, 2)),**

**Flatten(),**

**Dense(128, activation='relu'),**

**Dense(10, activation='softmax') # 10 output classes for digits 0-9**

**])**

**# Compile the model**

**model.compile(optimizer='adam',**

**loss='sparse\_categorical\_crossentropy',**

**metrics=['accuracy'])**

**# Train the model**

**model.fit(X\_train, y\_train, epochs=5, validation\_data=(X\_test, y\_test))**

Output…

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

**11490434/11490434** ━━━━━━━━━━━━━━━━━━━━ **0s** 0us/step

/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base\_conv.py:107: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(activity\_regularizer=activity\_regularizer, \*\*kwargs)

Epoch 1/5

**1875/1875** ━━━━━━━━━━━━━━━━━━━━ **39s** 20ms/step - accuracy: 0.9119 - loss: 0.2969 - val\_accuracy: 0.9747 - val\_loss: 0.0775

Epoch 2/5

**1875/1875** ━━━━━━━━━━━━━━━━━━━━ **38s** 20ms/step - accuracy: 0.9838 - loss: 0.0534 - val\_accuracy: 0.9823 - val\_loss: 0.0479

Epoch 3/5

**1875/1875** ━━━━━━━━━━━━━━━━━━━━ **41s** 22ms/step - accuracy: 0.9906 - loss: 0.0315 - val\_accuracy: 0.9849 - val\_loss: 0.0437

Epoch 4/5

**1875/1875** ━━━━━━━━━━━━━━━━━━━━ **83s** 23ms/step - accuracy: 0.9940 - loss: 0.0184 - val\_accuracy: 0.9834 - val\_loss: 0.0556

Epoch 5/5

**1875/1875** ━━━━━━━━━━━━━━━━━━━━ **80s** 21ms/step - accuracy: 0.9960 - loss: 0.0129 - val\_accuracy: 0.9876 - val\_loss: 0.0419

<keras.src.callbacks.history.History at 0x7a2925ed4210>