```
# Class: B.E. A
# Batch: A1
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# Roll No.: 4101005
# LP-V (DL) lab-7
```

```
import tensorflow as tf
from tensorflow.keras.datasets import fashion_mnist
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Conv2D, MaxPooling2D, Flatten, Dense
from tensorflow.keras.utils import to_categorical
```

```
# Load dataset
(X_train, y_train), (X_test, y_test) = fashion_mnist.load_data()
```

```
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-labels-idx1-ubyte.gz
29515/29515 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/train-images-idx3-ubyte.gz
26421880/26421880 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-labels-idx1-ubyte.gz
5148/5148 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/t10k-images-idx3-ubyte.gz
4422102/4422102 ━━━━━━━━━━━━━━━━━━━━ 0s 0us/step
```

```
# Preprocess 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, 10)
y_test = to_categorical(y_test, 10)
```

```
# Define CNN model
model = Sequential([
    Conv2D(32, (3,3), activation='relu', input_shape=(28,28,1)),
    MaxPooling2D((2,2)),
    Conv2D(64, (3,3), activation='relu'),
    MaxPooling2D((2,2)),
    Flatten(),
    Dense(128, activation='relu'),
    Dense(10, activation='softmax')
```

```
])
```

```
/usr/local/lib/python3.11/dist-packages/keras/src/layers/convolutional/base_conv.py:107: UserWarning: Do not pass an `input_shape`/`input_dim`
  super().__init__(activity_regularizer=activity_regularizer, **kwargs)
```

```
# Compile model
model.compile(optimizer='adam', loss='categorical_crossentropy', metrics=['accuracy'])


# Train model
model.fit(X_train, y_train, epochs=5, batch_size=64, validation_data=(X_test, y_test))
```

```
Epoch 1/5
938/938 ━━━━━━━━━━━━━━━━━━━━ 53s 55ms/step - accuracy: 0.7565 - loss: 0.6838 - val_accuracy: 0.8604 - val_loss: 0.3961
Epoch 2/5
938/938 ━━━━━━━━━━━━━━━━━━━━ 81s 54ms/step - accuracy: 0.8774 - loss: 0.3367 - val_accuracy: 0.8804 - val_loss: 0.3358
Epoch 3/5
938/938 ━━━━━━━━━━━━━━━━━━━━ 80s 52ms/step - accuracy: 0.8953 - loss: 0.2854 - val_accuracy: 0.8928 - val_loss: 0.2949
Epoch 4/5
938/938 ━━━━━━━━━━━━━━━━━━━━ 50s 54ms/step - accuracy: 0.9062 - loss: 0.2515 - val_accuracy: 0.8952 - val_loss: 0.2870
Epoch 5/5
938/938 ━━━━━━━━━━━━━━━━━━━━ 82s 54ms/step - accuracy: 0.9170 - loss: 0.2266 - val_accuracy: 0.9039 - val_loss: 0.2670
<keras.src.callbacks.history.History at 0x7fd146935990>
```

```
# Evaluate model
test_loss, test_acc = model.evaluate(X_test, y_test)
print(f"Test Accuracy: {test_acc}")
```

```
313/313 ━━━━━━━━━━━━━━━━━━━━ 3s 8ms/step - accuracy: 0.9049 - loss: 0.2739
Test Accuracy: 0.9039000272750854
```