

# CNN model using mnist Dataset

```
In [1]: import tensorflow as tf
```

```
In [2]: from keras.models import Sequential
from keras.layers import Flatten,Dense,Dropout,Activation
from keras.optimizers import Adam
```

```
In [5]: mnist=tf.keras.datasets.mnist
(x_train,y_train),(x_test,y_test)=mnist.load_data()
(x_train,x_test)=(x_train/255.0,x_test/255.0)
```

```
In [8]: model=tf.keras.models.Sequential([
    tf.keras.layers.Flatten(input_shape=(28,28)),
    tf.keras.layers.Dense(512,activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(10,activation='softmax')
])
```

```
In [9]: model.compile(optimizer='SGD', loss='sparse_categorical_crossentropy', metrics=['accuracy'])
```

```
In [10]: tf_callbacks=tf.keras.callbacks.TensorBoard(log_dir='logs/fit',histogram_freq=1)
```

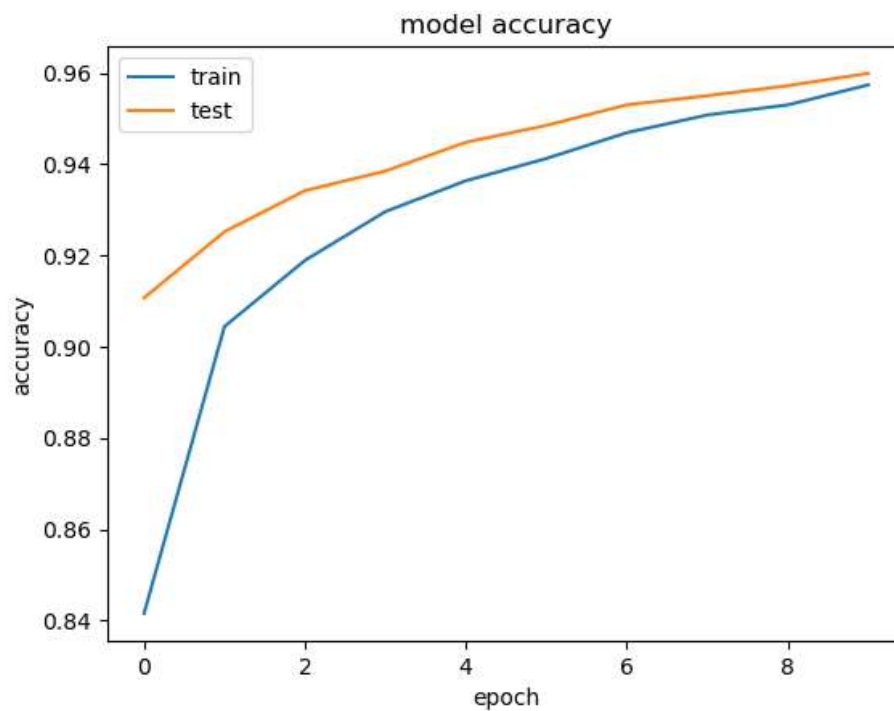
```
In [11]: history=model.fit(x_train,y_train,validation_data=(x_test,y_test),epochs=10,callbacks=tf_callbacks)
```

```
Epoch 1/10
1875/1875 [=====] - 26s 13ms/step - loss: 0.6246 - accuracy: 0.8415 - val
_loss: 0.3379 - val_accuracy: 0.9107
Epoch 2/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.3397 - accuracy: 0.9044 - val
_loss: 0.2761 - val_accuracy: 0.9252
Epoch 3/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.2874 - accuracy: 0.9189 - val
_loss: 0.2399 - val_accuracy: 0.9342
Epoch 4/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.2519 - accuracy: 0.9296 - val
_loss: 0.2167 - val_accuracy: 0.9385
Epoch 5/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.2272 - accuracy: 0.9364 - val
_loss: 0.1962 - val_accuracy: 0.9448
Epoch 6/10
1875/1875 [=====] - 25s 13ms/step - loss: 0.2075 - accuracy: 0.9413 - val
_loss: 0.1810 - val_accuracy: 0.9485
Epoch 7/10
1875/1875 [=====] - 25s 13ms/step - loss: 0.1897 - accuracy: 0.9469 - val
_loss: 0.1683 - val_accuracy: 0.9530
Epoch 8/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.1778 - accuracy: 0.9508 - val
_loss: 0.1582 - val_accuracy: 0.9550
Epoch 9/10
1875/1875 [=====] - 25s 13ms/step - loss: 0.1657 - accuracy: 0.9530 - val
_loss: 0.1492 - val_accuracy: 0.9572
Epoch 10/10
1875/1875 [=====] - 24s 13ms/step - loss: 0.1552 - accuracy: 0.9574 - val
_loss: 0.1406 - val_accuracy: 0.9599
```

```
In [12]: %reload_ext tensorboard
```

```
In [13]: tensorboard --logdir logs/fit
```

```
In [14]: import matplotlib.pyplot as plt
plt.plot(history.history['accuracy'])
plt.plot(history.history['val_accuracy'])
plt.title('model accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'test'], loc='upper left')
plt.show()
```



```
In [15]: plt.plot(history.history['loss'])
plt.plot(history.history['val_loss'])
plt.title('model accuracy')
plt.ylabel('accuracy')
plt.xlabel('epoch')
plt.legend(['train', 'test'],loc='upper left')
plt.show()
```

