

Project Development PhaseSprint-2

Date	05 November 2022
Team ID	PNT2022TMID39478
Project Name	A Novel Method for Handwritten Digit Recognition System

The screenshot displays a Google Colab notebook interface. The browser address bar shows the URL: `colab.research.google.com/drive/1huptOJ_rj6lyv4wertUbqSxVhbj9n5X#scrollTo=SKoe5bj3eEv`. The notebook title is "Handwritten Digit Recognition.ipynb".

Files Panel: Shows a directory structure with folders like `data`, `drive`, `models`, and `sample_data`. The `data` folder contains files `0.png`, `1.png`, `2.png`, and `3.png`. The `models` folder contains `mnistCNN.h5`.

Code Cells:

- Creating the Model:** Contains code to create a sequential model with three convolutional layers and a dense output layer.

```
#create model
model=Sequential()
#adding model Layer
model.add(Conv2D (64, (3, 3), input_shape=(28, 28, 1), activation='relu'))
model.add(Conv2D (32, (3, 3), activation='relu'))
model.add(Conv2D (32, (3, 3), activation='relu'))
#flatten the dimension of the image
model.add(Flatten())
#output Layer with 10 neurons
model.add(Dense(number_of_classes, activation='softmax'))
```
- Compiling the Model:** Contains code to compile the model with categorical crossentropy loss and Adam optimizer.

```
[11] #compile model
model.compile(loss='categorical_crossentropy', optimizer="Adam", metrics=['accuracy'])
```
- Fitting the Model:** Contains code to fit the model on training data.

```
[12] #fit the model
model.fit(x_train,y_train, validation_data=(X_test,y_test),epochs=5,batch_size=32)
```

Execution Status: The fitting process completed successfully in 1 second at 1:08 PM.

System Tray: Shows the date as 05-11-2022, time as 13:55, and weather as 31°C Cloudy.

Handwritten Digit Recognition.ipynb

File Edit View Insert Runtime Tools Help All changes saved

Files

data

0.png

1.png

2.png

3.png

drive

models

mnistCNN.h5

sample_data

Fitting the Model

```
[12] #fit the model
model.fit(x_train,y_train, validation_data=(X_test,y_test),epochs=5,batch_size=32)

Epoch 1/5
1875/1875 [=====] - 227s 121ms/step - loss: 0.2526 - accuracy: 0.9527 - val_loss: 0.0826 - val_accuracy: 0.9759
Epoch 2/5
1875/1875 [=====] - 208s 111ms/step - loss: 0.0645 - accuracy: 0.9809 - val_loss: 0.0733 - val_accuracy: 0.9788
Epoch 3/5
1875/1875 [=====] - 208s 111ms/step - loss: 0.0470 - accuracy: 0.9849 - val_loss: 0.0722 - val_accuracy: 0.9788
Epoch 4/5
1875/1875 [=====] - 204s 109ms/step - loss: 0.0374 - accuracy: 0.9878 - val_loss: 0.1071 - val_accuracy: 0.9773
Epoch 5/5
1875/1875 [=====] - 210s 112ms/step - loss: 0.0270 - accuracy: 0.9913 - val_loss: 0.0944 - val_accuracy: 0.9792
<keras.callbacks.History at 0x7f75dd9dcf10>

Observing the Metrics

[13] # final evaluation of the model
metrics = model.evaluate(X_test, y_test, verbose=0)
print("Metrics(Test loss & Test Accuracy): ")
print(metrics)

Metrics(Test loss & Test Accuracy):
[0.09444485604763031, 0.979200005531311]
```

1s completed at 1:08 PM

Handwritten_Dig...ipynb

Handwritten_Dig...ipynb

Show all

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colab.research.google.com/drive/1huptOJ_r16ly4wertUbqSxVhba9n5X#scrollTo=t3WKvA1r4SOy

Handwritten Digit Recognition.ipynb

Comment Share

Files

data

0.png

1.png

2.png

3.png

drive

models

mnistCNN.h5

sample_data

Predicting the Output

```
[14] prediction=model.predict(x_train[:4])
print(prediction)

1/1 [=====] - 0s 139ms/step
[[2.5547447e-10 9.1011010e-17 2.1545315e-16 4.4356509e-07 7.8045992e-16
 9.9999952e-01 2.6448076e-08 1.4538972e-12 7.4182804e-12 2.4652363e-12]
[9.9999952e-01 1.1720869e-16 4.9511823e-07 1.8508145e-17 9.0131385e-13
 1.3760980e-14 3.2749848e-11 2.5558004e-15 7.8689971e-15 1.2754901e-13]
[1.8911607e-23 1.4676257e-10 9.6136315e-13 1.1502954e-13 9.9999928e-01
 3.9170007e-13 1.5371555e-17 1.2054613e-11 4.9376969e-10 7.3709936e-07]
[4.5282798e-14 1.0000000e+00 3.2090297e-10 7.4234428e-14 1.2362800e-11
 4.0198282e-15 7.5844875e-13 4.1160197e-11 2.7920153e-08 1.6123955e-10]]

import numpy as np
print(np.argmax(prediction, axis=1)) #print our label from first 4 images
print(y_test[:4]) #printing the actual labels

[5 0 4 1]
[[0. 0. 0. 0. 0. 0. 0. 1. 0. 0.]
 [0. 0. 1. 0. 0. 0. 0. 0. 0. 0.]
 [0. 1. 0. 0. 0. 0. 0. 0. 0. 0.]
 [1. 0. 0. 0. 0. 0. 0. 0. 0. 0.]]
```

Saving the Model

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Handwritten_Dig...ipynb

Show all

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