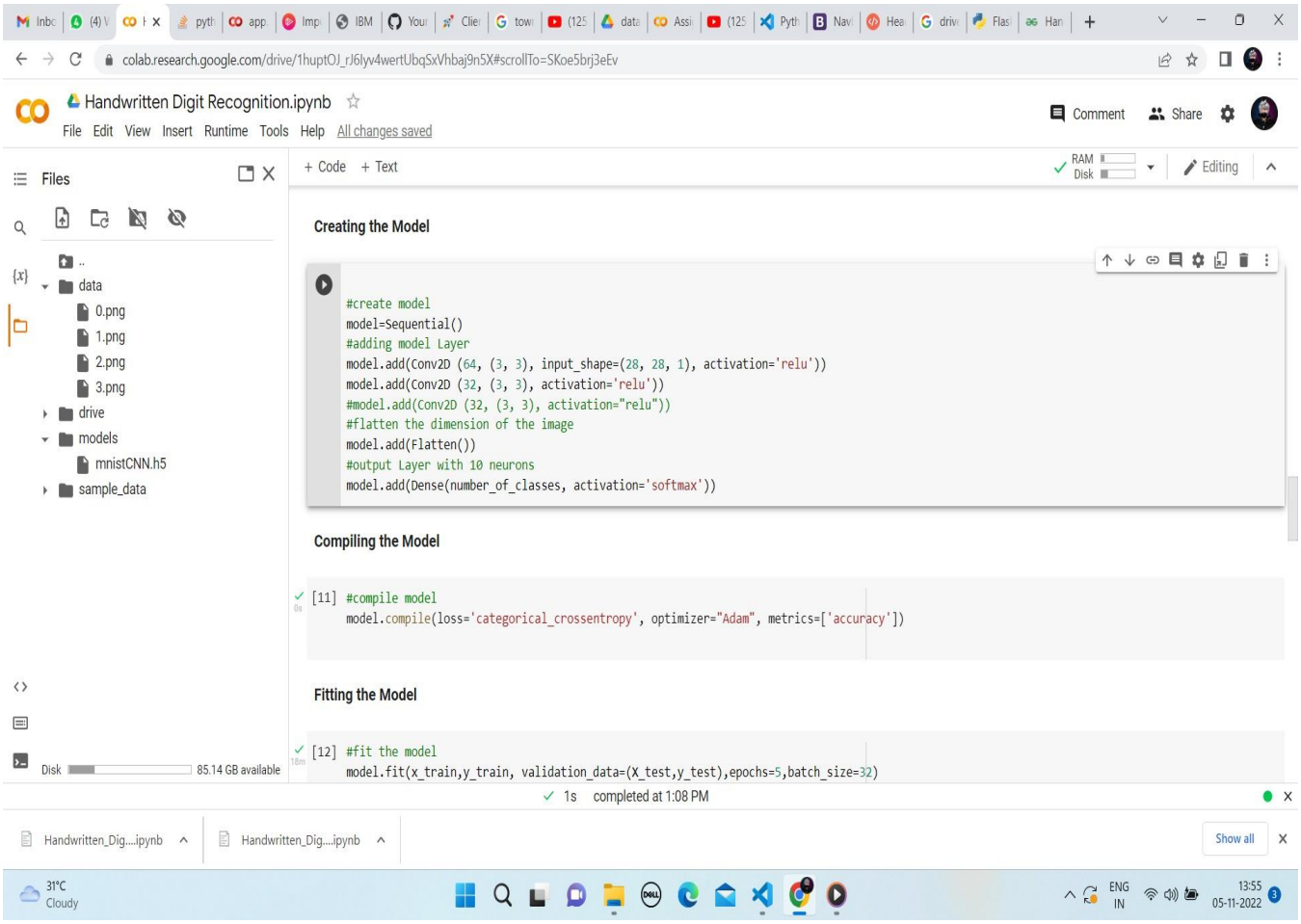
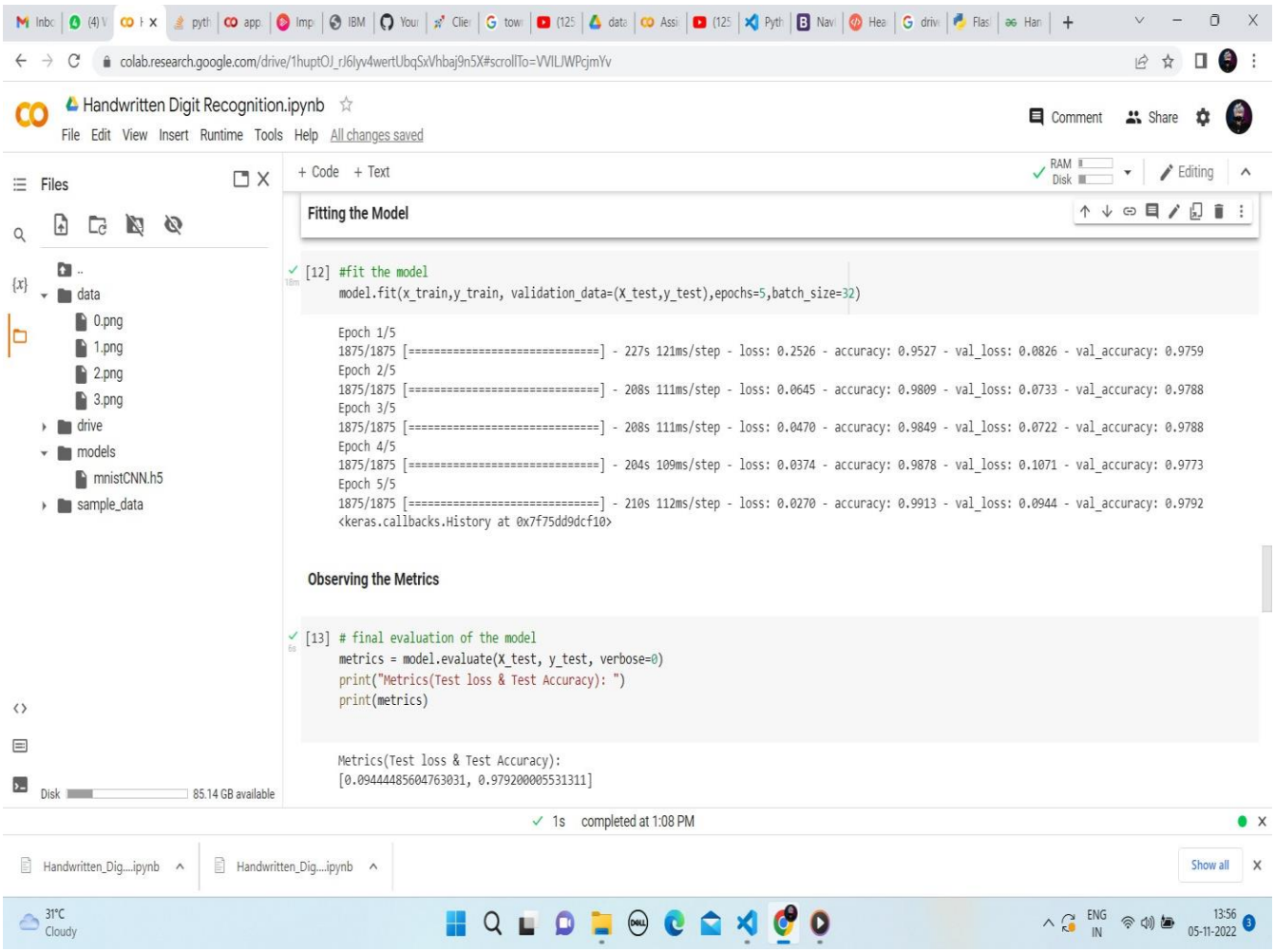
Project Development Phase
Sprint-2

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

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mnistCNN.h5
sample_data
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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]
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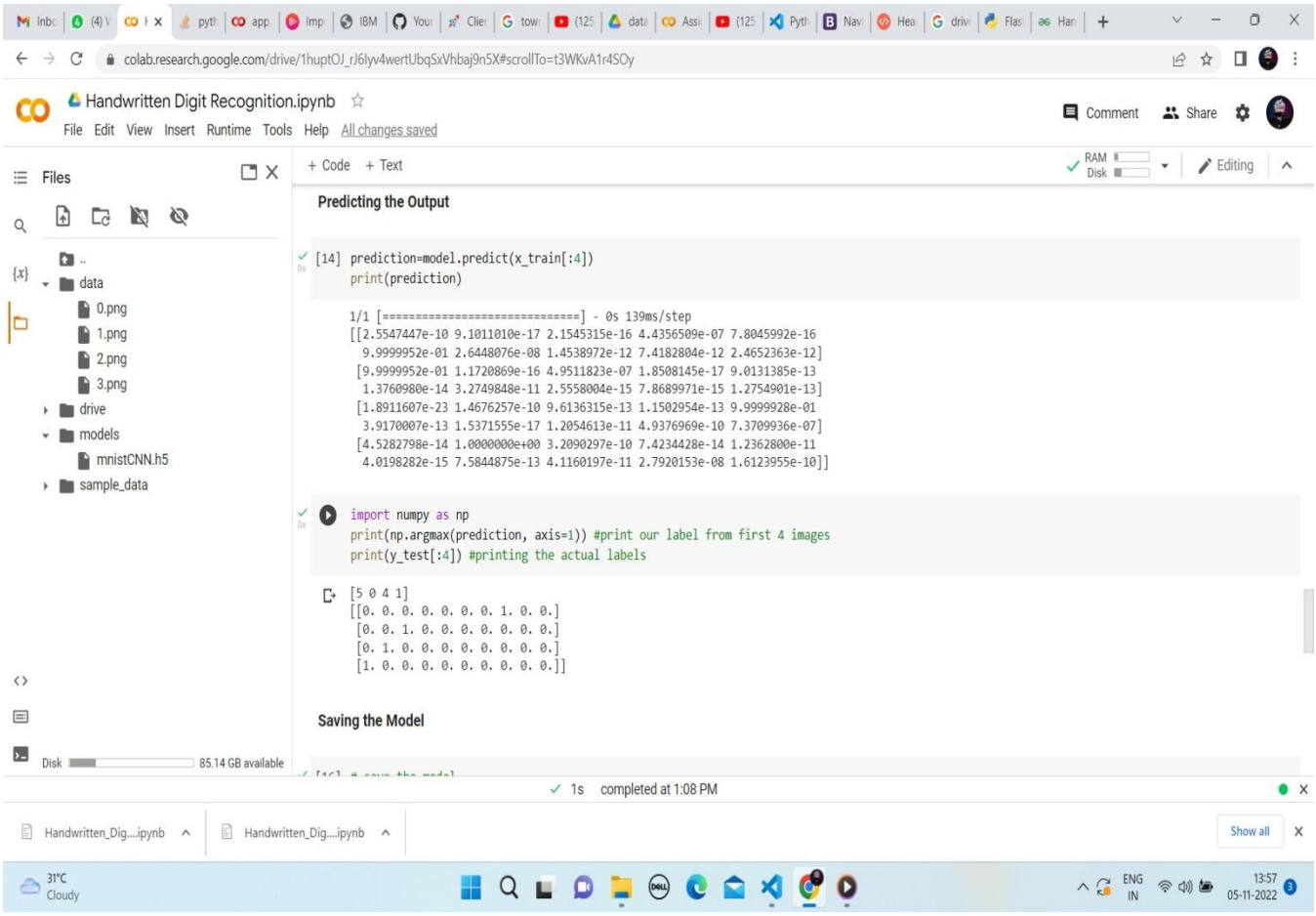
colab.research.google.com/drive/1huptOJ_rJ6Iyv4wertUbqSxVhbaj9n5X#scrollTo=t3WKvA1r4SOy
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Predicting the Output
[14] prediction=model.predict(x_train[:4])
print(prediction)
1/1 [==============================] - 0s 139ms/step
[[2.5547447e-10 9.1011010e-17 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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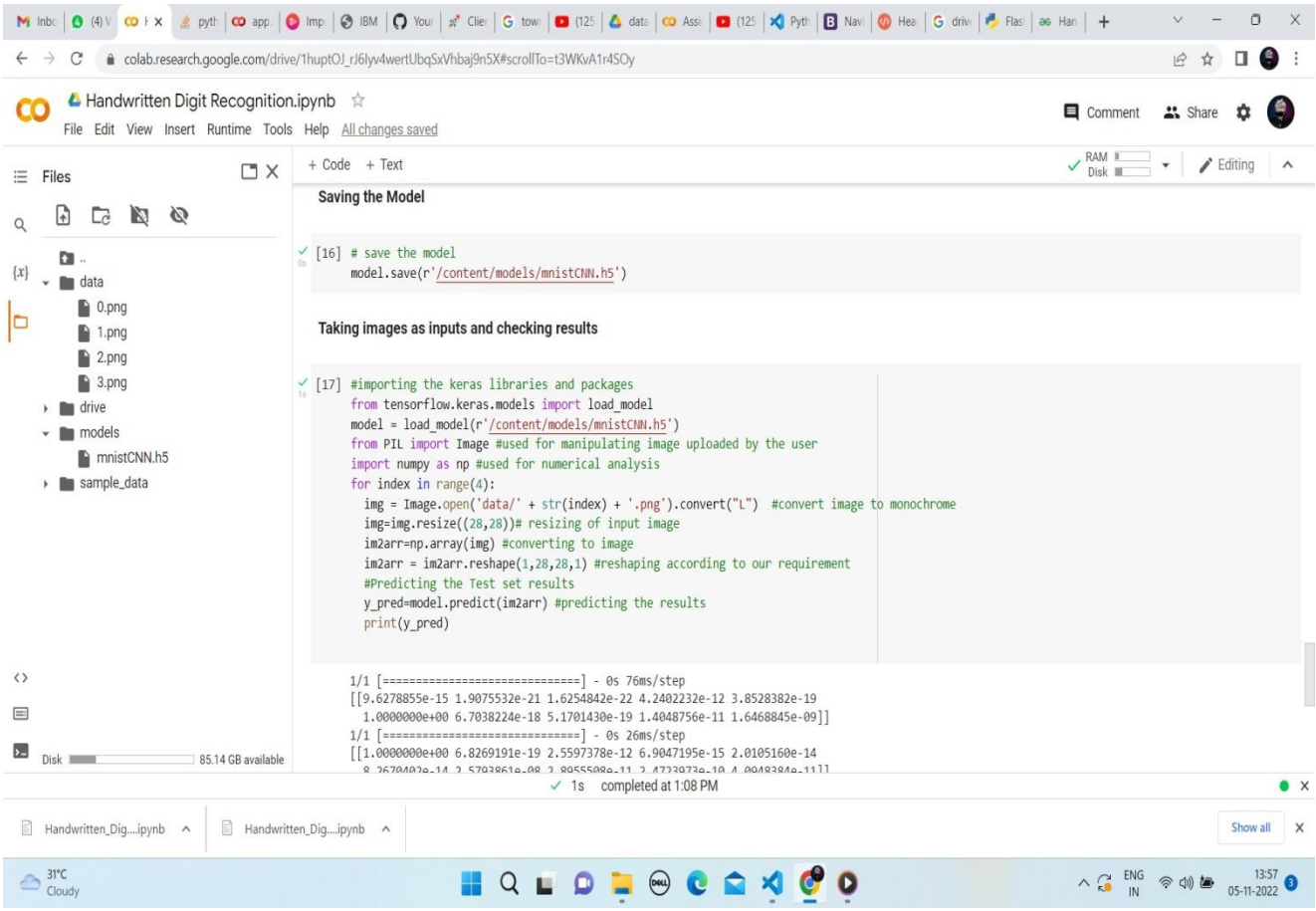
colab.research.google.com/drive/1huptOJ_rJ6lyv4wertUbqSxVhbaj9n5X#scrollTo=t3WKvA1r4SOy
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Saving the Model
[16] # save the model
model.save(r'/content/models/mnistCNN.h5')
Taking images as inputs and checking results
[17] #importing the keras libraries and packages
from tensorflow.keras.models import load_model
model = load_model(r'/content/models/mnistCNN.h5')
from PIL import Image #used for manipulating image uploaded by the user
import numpy as np #used for numerical analysis
for index in range(4):
img = Image.open('data/' + str(index) + '.png').convert("L") #convert image to monochrome
img=img.resize((28,28))# resizing of input image
im2arr=np.array(img) #converting to image
im2arr = im2arr.reshape(1,28,28,1) #reshaping according to our requirement
#Predicting the Test set results
y_pred=model.predict(im2arr) #predicting the results
print(y_pred)
1/1 [==============================] - 0s 76ms/step
[[9.6278855e-15 1.9075532e-21 1.6254842e-22 4.2402232e-12 3.8528382e-19
1.0000000e+00 6.7038224e-18 5.1701430e-19 1.4048756e-11 1.6468845e-09]]
1/1 [==============================] - 0s 26ms/step
[[1.0000000e+00 6.8269191e-19 2.5597378e-12 6.9047195e-15 2.0105160e-14
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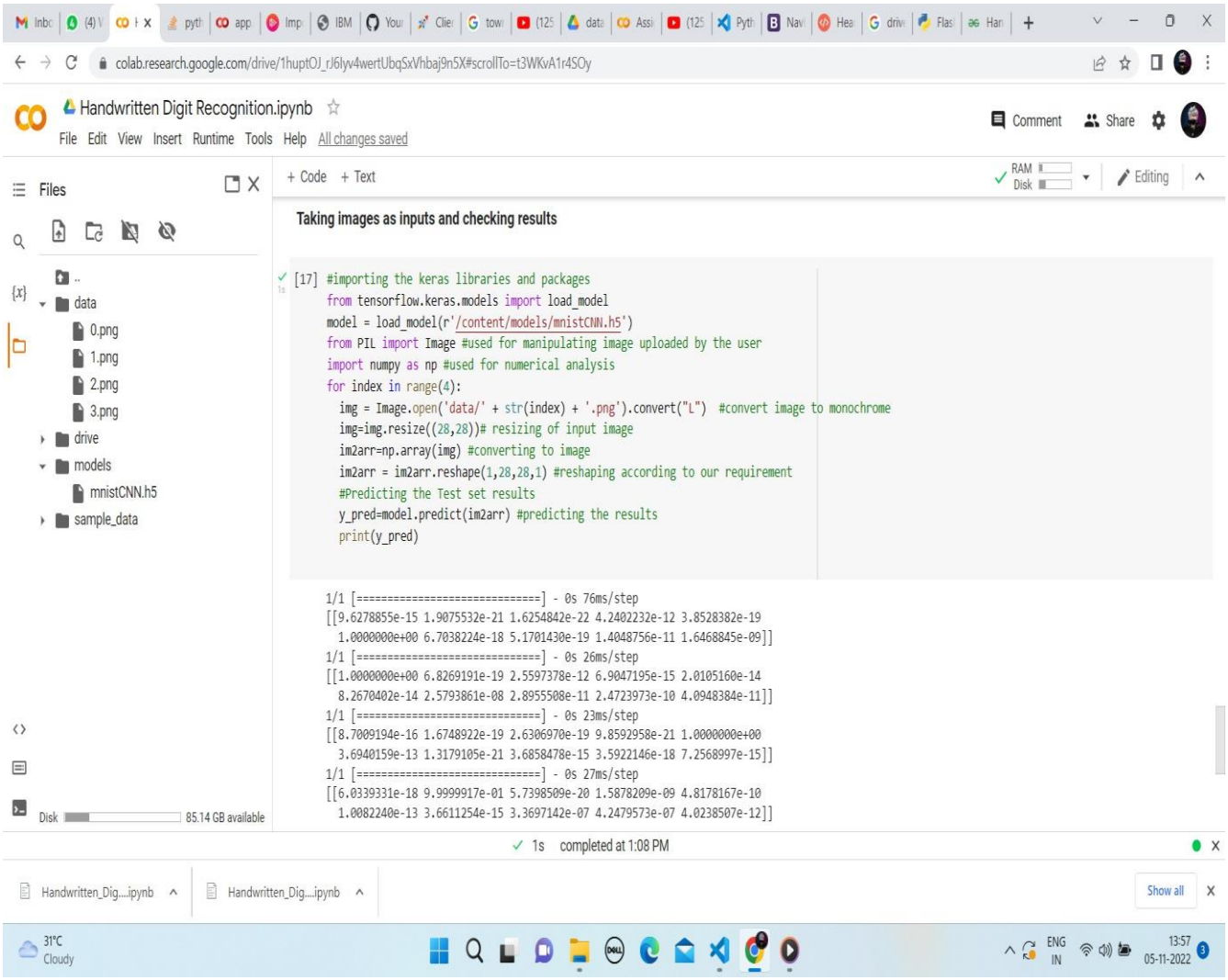
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1.0000000e+00 6.7038224e-18 5.1701430e-19 1.4048756e-11 1.6468845e-09]]
1/1 [==============================] - 0s 26ms/step
[[1.0000000e+00 6.8269191e-19 2.5597378e-12 6.9047195e-15 2.0105160e-14
8.2670402e-14 2.5793861e-08 2.8955508e-11 2.4723973e-10 4.0948384e-11]]
1/1 [==============================] - 0s 23ms/step
[[8.7009194e-16 1.6748922e-19 2.6306970e-19 9.8592958e-21 1.0000000e+00
3.6940159e-13 1.3179105e-21 3.6858478e-15 3.5922146e-18 7.2568997e-15]]
1/1 [==============================] - 0s 27ms/step
[[6.0339331e-18 9.9999917e-01 5.7398509e-20 1.5878209e-09 4.8178167e-10
1.0082240e-13 3.6611254e-15 3.3697142e-07 4.2479573e-07 4.0238507e-12]]
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