A Novel Method for Handwritten Digit Recognition

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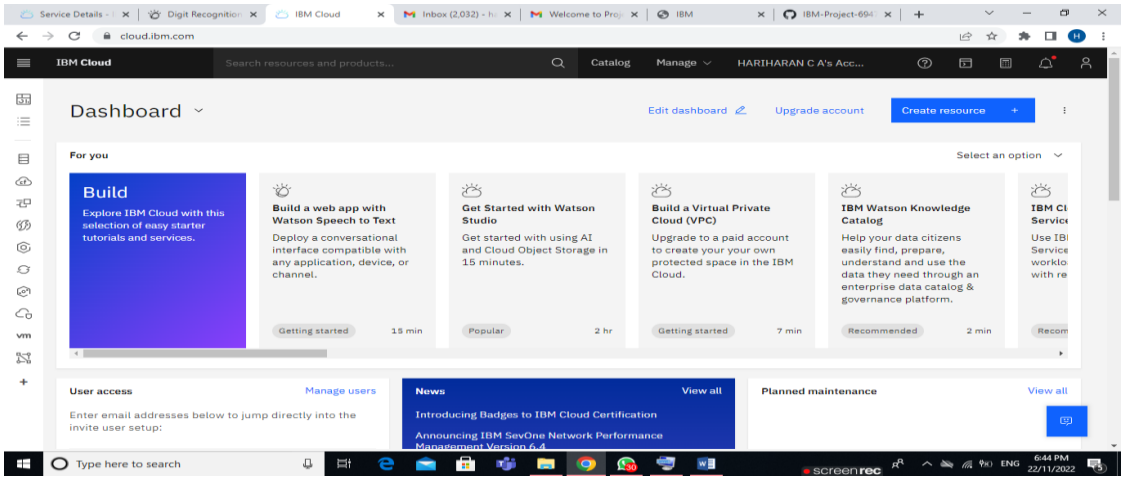
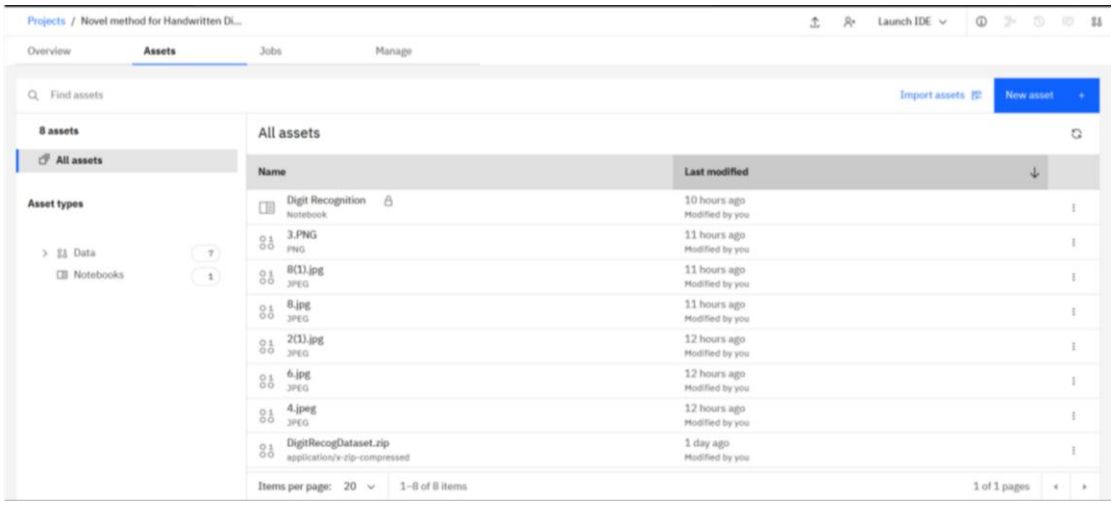
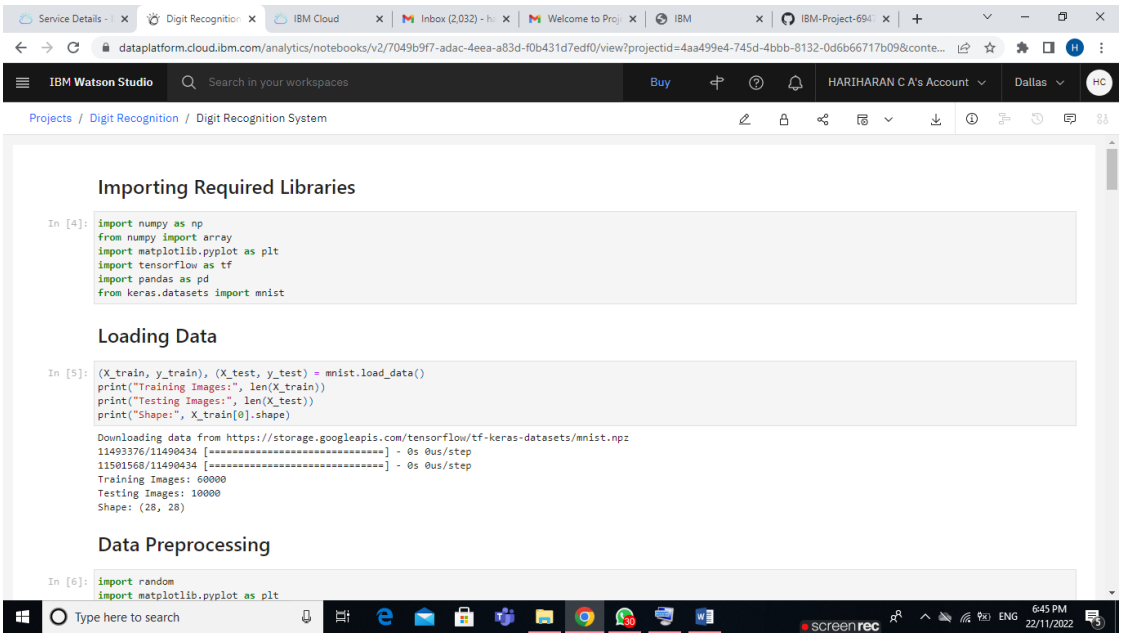
IBM Cloud Homepage:

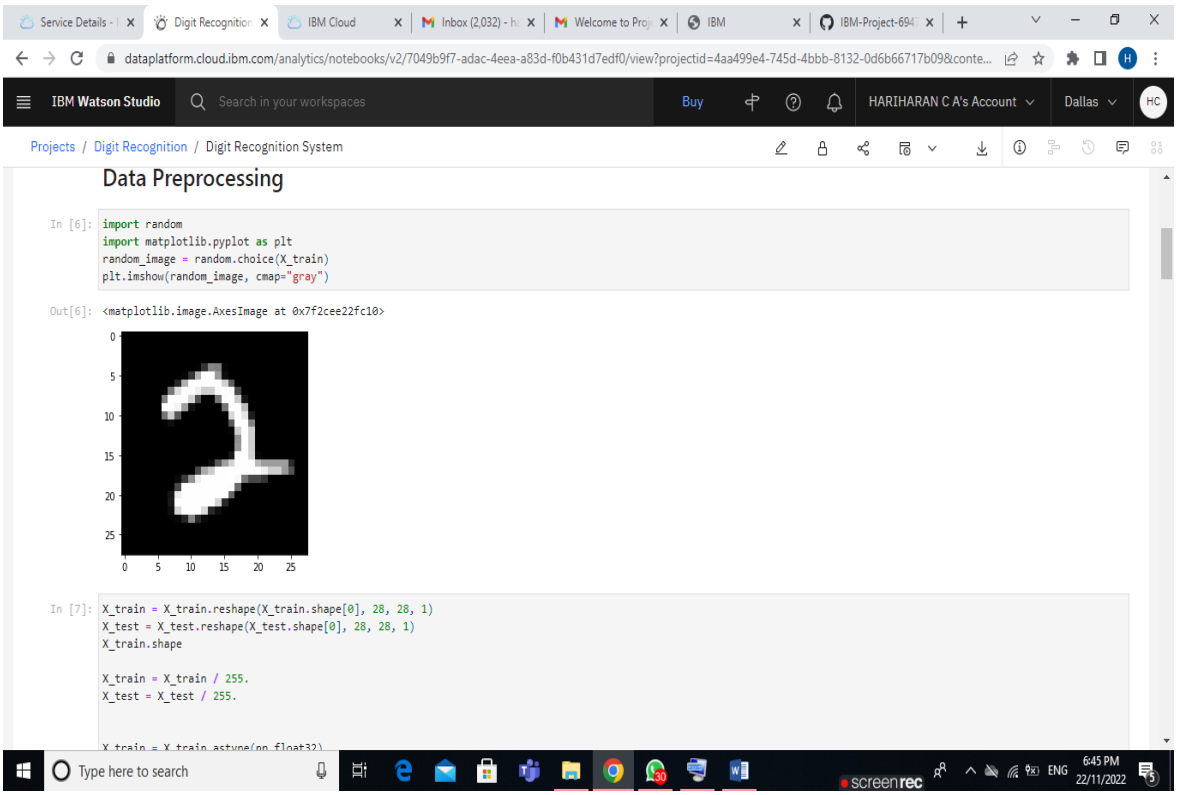


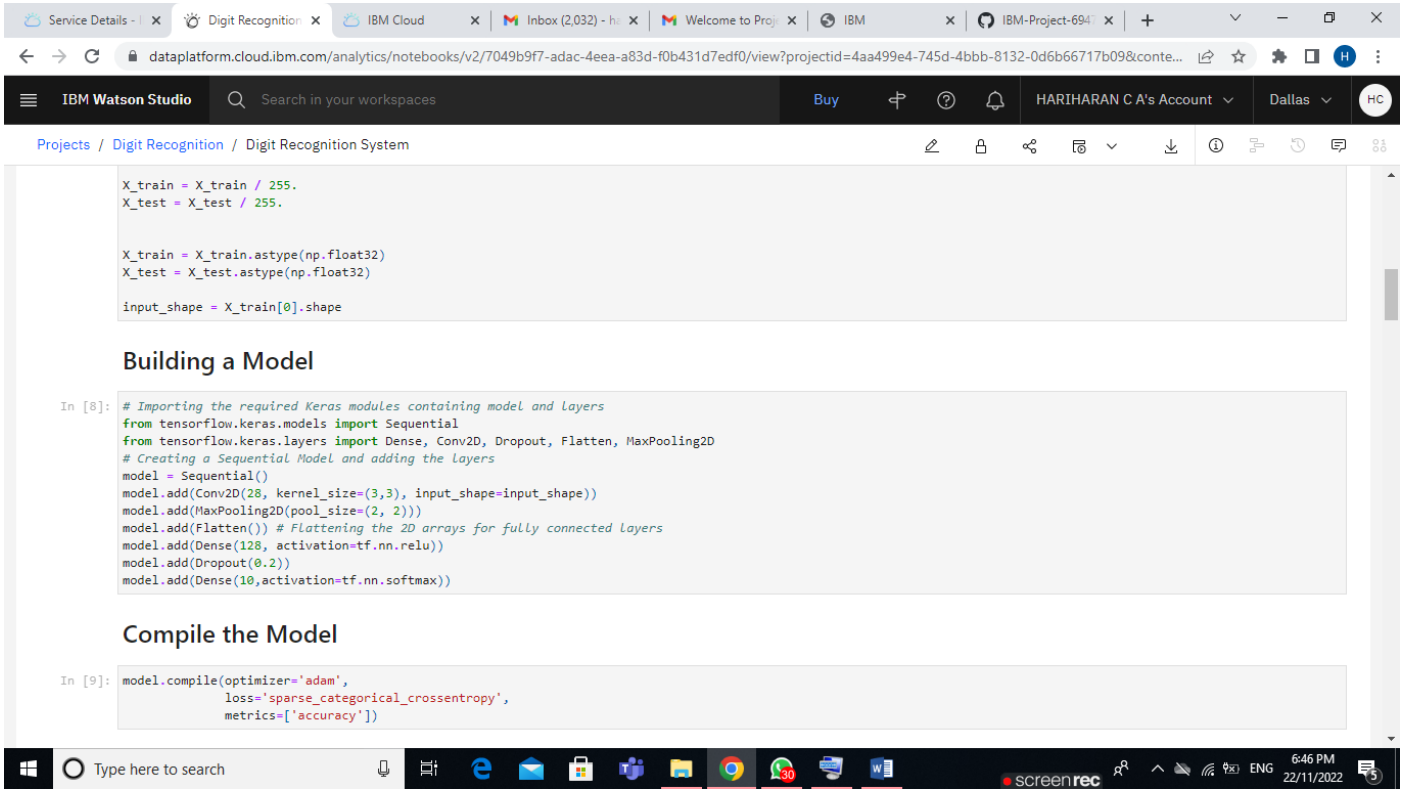
IBM Watson Studio:



IBM NOTEBOOK:







```
X_train = X_train / 255.
X_test = X_test / 255.


X_train = X_train.astype(np.float32)
X_test = X_test.astype(np.float32)

input_shape = X_train[0].shape
```

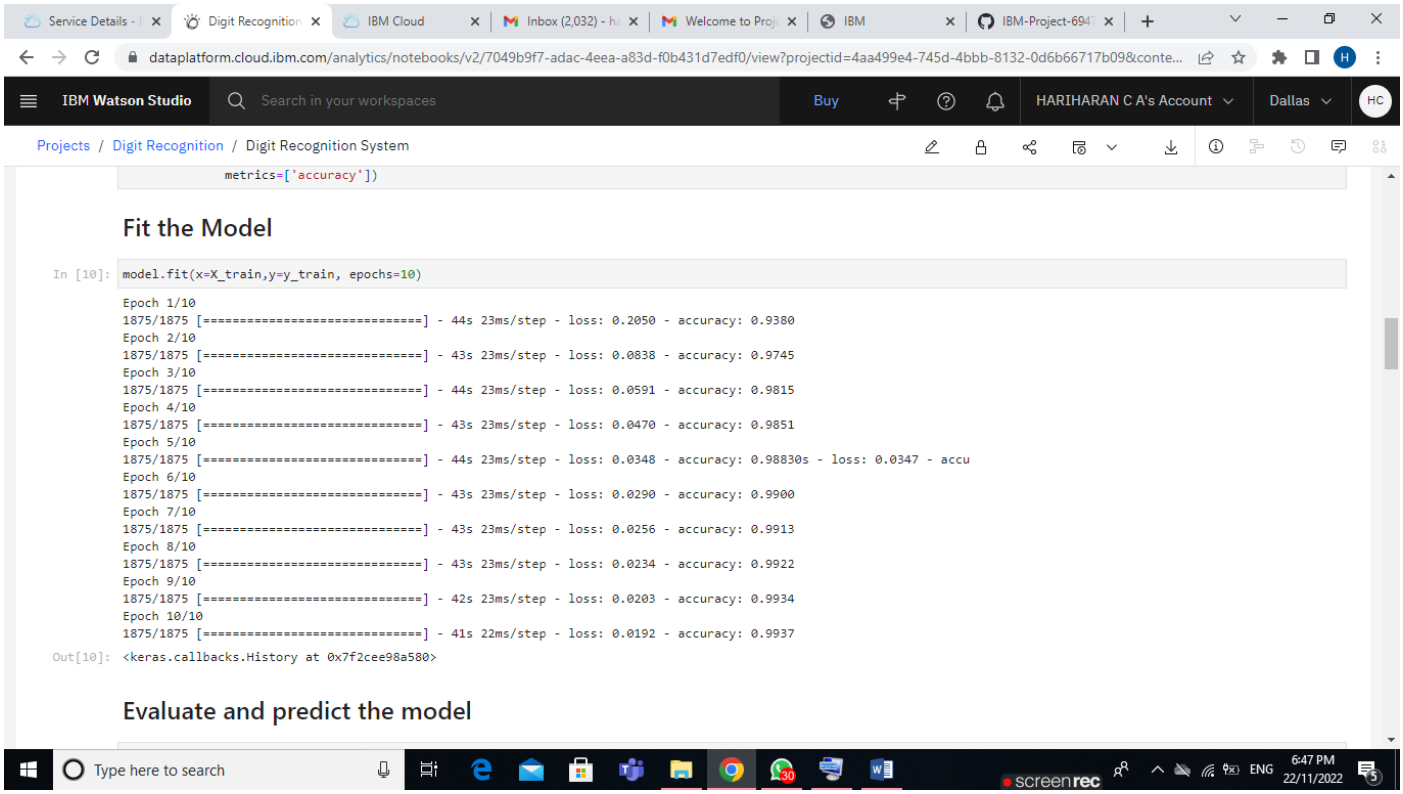
Building a Model

```
In [8]: # Importing the required Keras modules containing model and layers
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Conv2D, Dropout, Flatten, MaxPooling2D
# Creating a Sequential Model and adding the layers
model = Sequential()
model.add(Conv2D(28, kernel_size=(3,3), input_shape=input_shape))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Flatten()) # Flattening the 2D arrays for fully connected layers
model.add(Dense(128, activation=tf.nn.relu))
model.add(Dropout(0.2))
model.add(Dense(10,activation=tf.nn.softmax))
```

Compile the Model

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

TRAINING THE MODEL:



```
              metrics=['accuracy'])
```

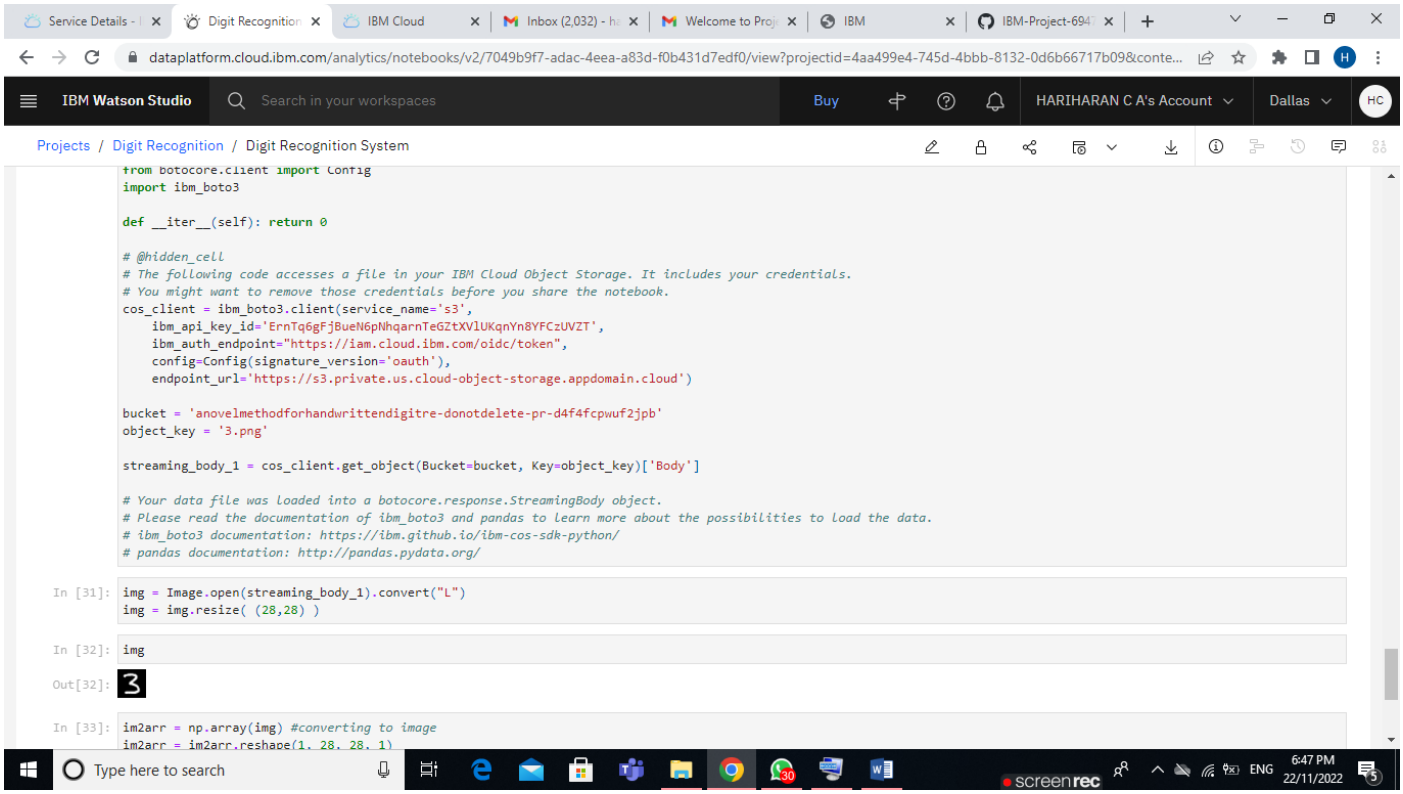
Fit the Model

```
In [10]: model.fit(x=X_train,y=y_train, epochs=10)

Epoch 1/10
1875/1875 [==============================] - 44s 23ms/step - loss: 0.2050 - accuracy: 0.9380
Epoch 2/10
1875/1875 [==============================] - 43s 23ms/step - loss: 0.0838 - accuracy: 0.9745
Epoch 3/10
1875/1875 [==============================] - 44s 23ms/step - loss: 0.0591 - accuracy: 0.9815
Epoch 4/10
1875/1875 [==============================] - 43s 23ms/step - loss: 0.0470 - accuracy: 0.9851
Epoch 5/10
1875/1875 [==============================] - 44s 23ms/step - loss: 0.0348 - accuracy: 0.98830s - loss: 0.0347 - accu
Epoch 6/10
1875/1875 [==============================] - 43s 23ms/step - loss: 0.0290 - accuracy: 0.9900
Epoch 7/10
1875/1875 [==============================] - 43s 23ms/step - loss: 0.0256 - accuracy: 0.9913
Epoch 8/10
1875/1875 [==============================] - 43s 23ms/step - loss: 0.0234 - accuracy: 0.9922
Epoch 9/10
1875/1875 [==============================] - 42s 23ms/step - loss: 0.0203 - accuracy: 0.9934
Epoch 10/10
1875/1875 [==============================] - 41s 22ms/step - loss: 0.0192 - accuracy: 0.9937
Out[10]: <keras.callbacks.History at 0x7f2cee98a580>
```

Evaluate and predict the model

Test Case:



IBM Deployment space: