

## Project Development Phase Model Performance Test

Date	10 November 2022
Team ID	PNT2022TMID29441
Project Name	Project – A Novel Method for Handwritten Digit Recognition System
Maximum Marks	10 Marks

### Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	-	Screenshot1 Screenshot2
2.	Accuracy	Training Accuracy -  Validation Accuracy -	Screenshot3  Screenshot4

### Screenshot 1

The screenshot shows the IBM Watson Studio interface. The browser address bar indicates the URL: `dataplatform.cloud.ibm.com/analytics/notebooks/v2/b9214ca5-99da-40ad-a134-6471bc7378e3/view?projectId=3b973fe3-c545-41d1-8da9-06e08f004002&context=cpdaas`. The interface displays a Jupyter Notebook with the following content:

```
In [9]: model.summary()
Model: "sequential"
```

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 26, 26, 64)	640
conv2d_1 (Conv2D)	(None, 24, 24, 64)	36928
max_pooling2d (MaxPooling2D)	(None, 12, 12, 64)	0
batch_normalization (Batch Normalization)	(None, 12, 12, 64)	256
conv2d_2 (Conv2D)	(None, 10, 10, 128)	73856
conv2d_3 (Conv2D)	(None, 8, 8, 128)	147584
max_pooling2d_1 (MaxPooling2D)	(None, 4, 4, 128)	0
batch_normalization_1 (Batch Normalization)	(None, 4, 4, 128)	512
conv2d_4 (Conv2D)	(None, 2, 2, 256)	295168
max_pooling2d_2 (MaxPooling2D)	(None, 1, 1, 256)	0
batch_normalization_2 (Batch Normalization)	(None, 1, 1, 256)	1024

The bottom of the screenshot shows the Windows taskbar with the date and time: 12:06, 18-11-2022.

## Screenshot 2

The screenshot shows the IBM Watson Studio interface. The browser address bar displays a URL from `dataplatform.cloud.ibm.com`. The top navigation bar includes the IBM Watson Studio logo, a search bar, and user account information for DHANACHEZIAN S's Account. The main content area shows a project titled "A Novel Method For Handwritten ..." with a "Model" tab selected. The model summary lists the following layers and their parameters:

Layer	Parameters	Value
batch_normalization (Batch Normalization)	(None, 12, 12, 64)	256
conv2d_2 (Conv2D)	(None, 10, 10, 128)	73856
conv2d_3 (Conv2D)	(None, 8, 8, 128)	147584
max_pooling2d_1 (MaxPooling2D)	(None, 4, 4, 128)	0
batch_normalization_1 (Batch Normalization)	(None, 4, 4, 128)	512
conv2d_4 (Conv2D)	(None, 2, 2, 256)	295168
max_pooling2d_2 (MaxPooling2D)	(None, 1, 1, 256)	0
batch_normalization_2 (Batch Normalization)	(None, 1, 1, 256)	1024
flatten (Flatten)	(None, 256)	0
dense (Dense)	(None, 512)	131584
dense_1 (Dense)	(None, 10)	5130

Summary statistics:

- Total params: 692,682
- Trainable params: 691,786
- Non-trainable params: 896

The bottom of the screenshot shows the Windows taskbar with the temperature at 29°C and the date 18-11-2022.

## Screenshot 3

The screenshot shows a Google Colab notebook titled "Save The Model.ipynb". The code in the notebook defines a Keras model with 9 layers and trains it for 3 epochs. The output shows the training progress and metrics for each epoch.

```
[ ] model.add(layer_1)
[ ] model.add(layer_2)
[ ] model.add(layer_3)
[ ] model.add(layer_4)
[ ] model.add(layer_5)
[ ] model.add(layer_6)
[ ] model.add(layer_7)
[ ] model.add(layer_8)
[ ] model.add(layer_9)

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

[ ] model.fit(X_train, y_train, validation_data=(X_test, y_test), epochs=3)

Epoch 1/3
1875/1875 [=====] - 76s 40ms/step - loss: 0.9001 - accuracy: 0.7727 - val_loss: 0.1338 - val_accuracy: 0.9622
Epoch 2/3
1875/1875 [=====] - 75s 40ms/step - loss: 0.2897 - accuracy: 0.9124 - val_loss: 0.0913 - val_accuracy: 0.9718
Epoch 3/3
1875/1875 [=====] - 74s 30ms/step - loss: 0.2170 - accuracy: 0.9357 - val_loss: 0.0735 - val_accuracy: 0.9758
<keras.callbacks.History at 0x7f4ddb1dd650>

[ ] example = X_train[22]
prediction = model.predict(example.reshape(1, 28, 1))
print ("Prediction (Softmax) from the neural network:\n\n {}".format(prediction))
hard_maxed_prediction = np.zeros(prediction.shape)
```

The bottom of the screenshot shows the Windows taskbar with the temperature at 29°C and the date 18-11-2022.

## Screenshot 4

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colab.research.google.com/drive/1Ubm5D5\_rO4nO9GFmeXEqaHfIHf3kYAP

Gmail YouTube Maps

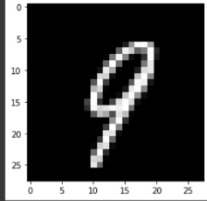
Save The Model.ipynb ☆

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[ ] ----- Prediction -----



Final Output: 9

```
metrics-model.evaluate(X_test,y_test,verbose=0)
print("Metrics(test loss and Test Accuracy):")
print(metrics)
```

```
Metrics(test loss and Test Accuracy):
[0.07350398600101471, 0.9757999777793884]
```

OBS-Studio-28.12...exe Performance Test...docx Performance Test...docx Show all

29°C Mostly sunny Search ENG IN 12:03 18-11-2022