Sign-Language-Digits-Models (DNN, SVM, CNN)

1. DNN Model:

Only   Last Iteration (Last Epoch):

1.1.   DNN Architecture1:

Training In Fold 1	Epoch 70/70 14/14 - 0s - loss: 0.5110 - accuracy: 0.8180 - 117ms/epoch - 8ms/step	Validation (Accuracy) In Fold : 1 0.8081847429275513
Training In Fold 2	Epoch 70/70 14/14 - 0s - loss: 0.4083 - accuracy: 0.8624 - 97ms/epoch - 7ms/step	Validation (Accuracy) In Fold : 2 0.8031206727027893
Training In Fold 3	Epoch 70/70 14/14 - 0s - loss: 0.4478 - accuracy: 0.8624 - 116ms/epoch - 8ms/step	Validation (Accuracy) In Fold : 3 0.7604233026504517
Training In Fold 4	Epoch 70/70 14/14 - 0s - loss: 0.5572 - accuracy: 0.7918 - 133ms/epoch - 9ms/step	Validation (Accuracy) In Fold : 4 0.8591171503067017
Training In Fold 5	Epoch 70/70 14/14 - 0s - loss: 0.4708 - accuracy: 0.8574 - 115ms/epoch - 8ms/step	Validation (Accuracy) In Fold : 5 0.9397475123405457
Training In Fold 6	Epoch 70/70 14/14 - 0s - loss: 0.4417 - accuracy: 0.8727 - 134ms/epoch - 10ms/step	Validation (Accuracy) In Fold : 6 0.6564966440200806

1.2. DNN Architecture2:

Training In Fold 1	Epoch 70/70 14/14 - 0s - loss: 0.3347 - accuracy: 0.8806 - 133ms/epoch - 10ms/step	Validation (Accuracy) In Fold : 1 0.7093026041984558
Training In Fold 2	Epoch 70/70 14/14 - 0s - loss: 0.3416 - accuracy: 0.8879 - 97ms/epoch - 7ms/step	Validation (Accuracy) In Fold : 2 0.8955885171890259
Training In Fold 3	Epoch 70/70 14/14 - 0s - loss: 0.3270 - accuracy: 0.8959 - 142ms/epoch - 10ms/step	Validation (Accuracy) In Fold : 3 0.6705671548843384
Training In Fold 4	Epoch 70/70 14/14 - 0s - loss: 0.3407 - accuracy: 0.8828 - 150ms/epoch - 11ms/step	Validation (Accuracy) In Fold : 4 0.6351206302642822
Training In Fold 5	Epoch 68/70 14/14 - 0s - loss: 0.3828 - accuracy: 0.8661 - 173ms/epoch - 12ms/step	Validation (Accuracy) In Fold : 5 0.8256098031997681
Training In Fold 6	Epoch 70/70 14/14 - 0s - loss: 0.2913 - accuracy: 0.9091 - 240ms/epoch - 17ms/step	Validation (Accuracy) In Fold : 6 0.5470712184906006

--------------------DNN Model Summary Of Best Expirment ----------------------------
Model: "sequential_12"

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Layer (type)	Output Shape	Param #
flatten_12 (Flatten)	(None, 4096)	0
dense_42 (Dense)	(None, 110)	450670
dense_43 (Dense)	(None, 110)	12210
dense_44 (Dense)	(None, 10)	1110

Total params: 463,990
Trainable params: 463,990
Non-trainable params: 0

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Classification Report:

	precision	recall	f1-score	support
0	0.93	0.87	0.90	46
1	0.91	0.88	0.90	34
2	0.68	0.93	0.79	28
3	0.94	0.86	0.90	36
4	0.82	0.57	0.67	49
5	0.87	0.82	0.84	49
6	0.88	0.65	0.75	46
7	0.73	0.81	0.77	43
8	0.58	0.90	0.71	40
9	0.76	0.76	0.76	42
accuracy			0.79	413

2.CNN MODEL:
2.1. Architecture1

Training In Fold 1	Epoch 20/20 14/14 - 4s - loss: 0.0067 - accuracy: 0.9992 - 4s/epoch - 259ms/step	Validation (Accuracy) In Fold : 1 0.3696884214878082
Training In Fold 2	Epoch 20/20 14/14 - 4s - loss: 0.0022 - accuracy: 1.0000 - 4s/epoch - 288ms/step	Validation (Accuracy) In Fold : 2 0.6508221626281738
Training In Fold 3	Epoch 20/20 14/14 - 4s - loss: 0.0039 - accuracy: 1.0000 - 4s/epoch - 255ms/step	Validation (Accuracy) In Fold : 3 0.5302697420120239
Training In Fold 4	Epoch 20/20 14/14 - 3s - loss: 0.0025 - accuracy: 1.0000 - 3s/epoch - 232ms/step	Validation (Accuracy) In Fold : 4 0.6996122598648071
Training In Fold 5	Epoch 20/20 14/14 - 3s - loss: 0.0023 - accuracy: 1.0000 - 3s/epoch - 234ms/step	Validation (Accuracy) In Fold : 5 0.48683059215545654

2.2. Architecture2

Training In Fold 1	Epoch 20/20 14/14 - 5s - loss: 0.0074 - accuracy: 0.9992 - 5s/epoch - 360ms/step	Validation (Accuracy) In Fold : 1 0.3210214674472809
Training In Fold 2	Epoch 20/20 14/14 - 6s - loss: 0.0110 - accuracy: 0.9985 - 6s/epoch - 399ms/step	Validation (Accuracy) In Fold : 2 0.4440746009349823
Training In Fold 3	Epoch 20/20 14/14 - 6s - loss: 0.0430 - accuracy: 0.9864 - 6s/epoch - 442ms/step	Validation (Accuracy) In Fold : 3 0.2969528138637543
Training In Fold 4	Epoch 20/20 14/14 - 6s - loss: 0.0084 - accuracy: 0.9992 - 6s/epoch - 439ms/ste	Validation (Accuracy) In Fold : 4 0.44269877672195435
Training In Fold 5	Epoch 20/20 14/14 - 5s - loss: 0.0629 - accuracy: 0.9811 - 5s/epoch - 377ms/step	Validation (Accuracy) In Fold : 5 0.24307666718959808

The Result Of Best CNN Model To Predict Is:

--------------------CNN Model Summary Of Best Experiment ---------------------------

Model: "model_10"

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 Layer (type)   Output Shape   Param #

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 input_11 (InputLayer)   [(None, 64, 64, 3)]   0

 conv2d_25 (Conv2D)   (None, 60, 60, 20)   1520

 average_pooling2d_25 (Avera (None, 30, 30, 20)   0
 gePooling2D)

conv2d_26 (Conv2D)   (None, 26, 26, 20)   10020

average_pooling2d_26 (Avera (None, 13, 13, 20)   0
gePooling2D)

flatten_23 (Flatten)   (None, 3380)   0

dense_80 (Dense)   (None, 120)   405720

dense_81 (Dense)   (None, 120)   14520

dense_82 (Dense)   (None, 10)   1210

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Total params: 432,990
Trainable params: 432,990
Non-trainable params: 0

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Classification Report:
        precision   recall f1-score   support

    0   0.90   0.97   0.94   37
    1   0.92   0.90   0.91   51
    2   0.95   0.89   0.92   44
    3   1.00   0.91   0.96   47
    4   0.83   0.85   0.84   41
    5   1.00   1.00   1.00   36
    6   0.82   0.95   0.88   44
    7   0.85   0.81   0.83   48
    8   0.94   0.86   0.90   35
    9   0.91   0.97   0.94   30

  accuracy   0.91   413

3.Comparing:

The Accuracy Of Three Models:

The Accuracy Of CNN: 0.9079903147699758

The Accuracy Of DNN: 0.7941888619854721

The Accuracy Of SVM: 0.837772397094431