NumPy: 2.3.2

pandas: 2.3.1

scikit-learn: 1.7.1

##############################################################################################################################

stage 1 import neccessary packages completed successfully

##############################################################################################################################

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

3 3 11391 3 0.0 ... 0 1 1 0

4 4 11391 4 0.0 ... 0 1 1 0

[5 rows x 73 columns]

(8800110, 73)

experiment of time\_steps= 1

##############################################################################################################################

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

3 3 11391 3 0.0 ... 0 1 1 0

4 4 11391 4 0.0 ... 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 1

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

540 540 30268 0 0.0 ... 1 0 0 1

810 810 31604 0 0.0 ... 1 0 1 0

1080 1080 32885 0 0.0 ... 0 0 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

540 540 30268 0 0.0 ... 1 0 0 1

810 810 31604 0 0.0 ... 1 0 1 0

1080 1080 32885 0 0.0 ... 0 0 1 0

[5 rows x 73 columns]

(32593, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[0.00e+00 0.00e+00 1.00e+01 2.10e+01 0.00e+00 0.00e+00 1.50e+01 3.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 2.40e+02

1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 0.00e+00 1.00e+00 1.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 1.00e+00 0.00e+00 0.00e+00 1.00e+00 1.00e+00 0.00e+00]

[2.70e+02 0.00e+00 1.00e+01 4.00e+00 3.00e+00 3.00e+00 2.80e+01 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 6.00e+01

1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 1.00e+00 0.00e+00]

[5.40e+02 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 6.00e+01

1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 1.00e+00]

[8.10e+02 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 6.00e+01

1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 1.00e+00 0.00e+00]

[1.08e+03 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 6.00e+01

1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00

1.00e+00 0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 0.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00

0.00e+00 0.00e+00 1.00e+00 0.00e+00 0.00e+00 1.00e+00 0.00e+00]]

(32593, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Withdrawn' 'Pass' 'Pass']

(32593,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 3 2 2]

(32593,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.1 0.09722222 0. 0.

0.05597015 0.02362205 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(32593, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.69609107 0. 0.2 0.00462963 0.06015038 0.

0.07835821 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.02272727

0. 0. 0. 0.11428571 0.16666667 0.048

0. 0. 0. 0. 0. 1.

0. 1. 0. 0. 0. 1.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(22593, 71)

##############################################################################################################################

y\_train

[2]

(22593,)

##############################################################################################################################

x\_test

[[0.65543692 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(10000, 71)

##############################################################################################################################

y\_test

[2]

(10000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(22593, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(10000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[0.69609107 0. 0.2 ... 0. 1. 0. ]]

[[0.14273441 0. 0.01 ... 0. 1. 0. ]]

[[0.9449865 0. 0. ... 0. 1. 0. ]]

...

[[0.29970545 0. 0. ... 0. 1. 0. ]]

[[0.64988341 0. 0. ... 0. 1. 0. ]]

[[0.95667649 0. 0. ... 0. 1. 0. ]]]

(22593, 1, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]]]

(22593, 1, 4)

##############################################################################################################################

x\_test

[[[0.65543692 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]]

(10000, 1, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]]]

(10000, 1, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

2025-08-08 16:59:03.452671: I tensorflow/core/platform/cpu\_feature\_guard.cc:210] This TensorFlow binary is optimized to use available CPU instructions in performance-critical operations.

To enable the following instructions: SSE3 SSE4.1 SSE4.2 AVX AVX2 AVX\_VNNI FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 1, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 1, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 1, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 1, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 0s 2ms/step - categorical\_accuracy: 0.4322 - loss: 1.2687

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_1.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-1 model → Train15\_Daywise\_Models\model\_day\_1.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 2ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.31 0.05 0.09 910

Fail 0.31 0.06 0.10 2140

Pass 0.51 0.28 0.36 3851

Withdrawn 0.53 0.31 0.39 3099

micro avg 0.49 0.22 0.30 10000

macro avg 0.42 0.17 0.23 10000

weighted avg 0.46 0.22 0.29 10000

samples avg 0.22 0.22 0.22 10000

time steps=1 Evaluation Accuracy: 0.432% (+/-0.000)

experiment of time\_steps= 2

##############################################################################################################################

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

3 3 11391 3 0.0 ... 0 1 1 0

4 4 11391 4 0.0 ... 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 2

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

271 271 28400 1 1.0 ... 1 0 1 0

540 540 30268 0 0.0 ... 1 0 0 1

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

271 271 28400 1 1.0 ... 1 0 1 0

540 540 30268 0 0.0 ... 1 0 0 1

[5 rows x 73 columns]

(65186, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[270. 0. 10. 4. 3. 3. 28. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.

0.]

[271. 1. 1. 11. 2. 2. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.

0.]

[540. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0.

1.]]

(65186, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Withdrawn']

(65186,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 3]

(65186,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.04761905 0.02307692 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(65186, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.92875553 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 1. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 1. 0. ]]

(45186, 71)

##############################################################################################################################

y\_train

[3]

(45186,)

##############################################################################################################################

x\_test

[[0.59499257 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.192

0. 0. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(20000, 71)

##############################################################################################################################

y\_test

[3]

(20000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 0. 1.]]

(45186, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(20000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[9.28755531e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.04823167e-02 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[6.04166712e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[2.51380792e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.43341954e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.09247747e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[5.12395735e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.05131127e-02 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.96600461e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.51515647e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[4.60327635e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.68004490e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]]

(22593, 2, 71)

##############################################################################################################################

y\_train

[[[0. 0. 0. 1.]

[0. 0. 0. 1.]]]

(22593, 2, 4)

##############################################################################################################################

x\_test

[[[5.94992569e-01 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.92000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.31934316e-01 1.00000000e+00 7.32064422e-04 0.00000000e+00

2.25563910e-02 1.66666667e-01 0.00000000e+00 3.07692308e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 2, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]]]

(10000, 2, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_1"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 2, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 2, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 2, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 2, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 0s 3ms/step - categorical\_accuracy: 0.4300 - loss: 1.3505

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_2.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-2 model → Train15\_Daywise\_Models\model\_day\_2.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 3ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.27 0.08 0.12 1863

Fail 0.35 0.14 0.20 4379

Pass 0.51 0.32 0.39 7532

Withdrawn 0.50 0.35 0.41 6226

micro avg 0.47 0.27 0.34 20000

macro avg 0.41 0.22 0.28 20000

weighted avg 0.45 0.27 0.33 20000

samples avg 0.27 0.27 0.27 20000

time steps=2 Evaluation Accuracy: 0.430% (+/-0.000)

experiment of time\_steps= 3

##############################################################################################################################

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

3 3 11391 3 0.0 ... 0 1 1 0

4 4 11391 4 0.0 ... 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 3

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

271 271 28400 1 1.0 ... 1 0 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage ... age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 ... 0 1 1 0

1 1 11391 1 9.0 ... 0 1 1 0

2 2 11391 2 3.0 ... 0 1 1 0

270 270 28400 0 10.0 ... 1 0 1 0

271 271 28400 1 1.0 ... 1 0 1 0

[5 rows x 73 columns]

(97779, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[270. 0. 10. 4. 3. 3. 28. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.

0.]

[271. 1. 1. 11. 2. 2. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.

0.]]

(97779, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(97779,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(97779,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.04201681 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(97779, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[6.69734866e-01 5.00000000e-01 2.44021474e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(67779, 71)

##############################################################################################################################

y\_train

[0]

(67779,)

##############################################################################################################################

x\_test

[[0.14141527 1. 0.00170815 0. 0. 0.

0.03641457 0. 0. 0. 0. 0.

0. 0. 0. 0.00183824 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(30000, 71)

##############################################################################################################################

y\_test

[0]

(30000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[1. 0. 0. 0.]]

(67779, 4)

##############################################################################################################################

y\_test

[[1. 0. 0. 0.]]

(30000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[6.69734866e-01 5.00000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.13083121e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.80893089e-02 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.41341470e-01 5.00000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.00724172e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.30265248e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.90316463e-01 0.00000000e+00 3.41630063e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.53632781e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.50110241e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

...

[[8.19188572e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.29199570e-02 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.14070889e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.76208846e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.58253500e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.96256751e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.48367846e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.01018791e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.80131166e-02 5.00000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 3, 71)

##############################################################################################################################

y\_train

[[[1. 0. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]]]

(22593, 3, 4)

##############################################################################################################################

x\_test

[[[0.14141527 1. 0.00170815 0. 0. 0.

0.03641457 0. 0. 0. 0. 0.

0. 0. 0. 0.00183824 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]

[0.08517448 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 1.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.73241906 1. 0. 0.02037037 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 1. 0. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 1. 0. ]]]

(10000, 3, 71)

##############################################################################################################################

y\_test

[[[1. 0. 0. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]]]

(10000, 3, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_2"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 3, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 3, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 3, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 3, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 0s 4ms/step - categorical\_accuracy: 0.4424 - loss: 1.3121

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_3.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-3 model → Train15\_Daywise\_Models\model\_day\_3.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 3ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.31 0.07 0.12 2855

Fail 0.35 0.12 0.18 6283

Pass 0.51 0.40 0.44 11540

Withdrawn 0.53 0.32 0.40 9322

micro avg 0.49 0.29 0.36 30000

macro avg 0.43 0.23 0.29 30000

weighted avg 0.46 0.29 0.35 30000

samples avg 0.29 0.29 0.29 30000

time steps=3 Evaluation Accuracy: 0.442% (+/-0.000)

experiment of time\_steps= 4

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 4

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

270 270 28400 0 10.0 4.0 3.0 3.0 28.0 ... 0 0 0 0 1 0 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

270 270 28400 0 10.0 4.0 3.0 3.0 28.0 ... 0 0 0 0 1 0 1 0

[5 rows x 73 columns]

(130372, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[270. 0. 10. 4. 3. 3. 28. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 60. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.

0.]]

(130372, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(130372,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(130372,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.04201681 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(130372, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.78740189 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(90372, 71)

##############################################################################################################################

y\_train

[3]

(90372,)

##############################################################################################################################

x\_test

[[0.40215377 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0.16666667 0.144

0. 0. 0. 1. 0. 0.

0. 1. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(40000, 71)

##############################################################################################################################

y\_test

[1]

(40000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 0. 1.]]

(90372, 4)

##############################################################################################################################

y\_test

[[0. 1. 0. 0.]]

(40000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[7.87401889e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.46643423e-01 6.66666667e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.33210718e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.08691382e-02 6.66666667e-01 2.44021474e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[4.99233111e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[2.77460632e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.68384936e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.72668353e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.18298974e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.89666043e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.75337492e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.11218371e-02 3.33333333e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[3.55639413e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.42010329e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.98968800e-01 0.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.20759677e-01 6.66666667e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[8.63831321e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.75110374e-01 3.33333333e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.06664187e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.87487936e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.96882569e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.26721579e-02 1.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.84296743e-01 3.33333333e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.49416893e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 4, 71)

##############################################################################################################################

y\_train

[[[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]]]

(22593, 4, 4)

##############################################################################################################################

x\_test

[[[0.40215377 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0.16666667 0.144

0. 0. 0. 1. 0. 0.

0. 1. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.64512742 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.56421813 0.33333333 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.58299586 0.66666667 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 1. 0. ]]]

(10000, 4, 71)

##############################################################################################################################

y\_test

[[[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]]]

(10000, 4, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_3"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 4, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 4, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 4, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 4, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 6ms/step - categorical\_accuracy: 0.4466 - loss: 1.3225

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_4.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-4 model → Train15\_Daywise\_Models\model\_day\_4.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 4ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.31 0.08 0.13 3696

Fail 0.38 0.14 0.20 8660

Pass 0.51 0.37 0.43 15190

Withdrawn 0.52 0.33 0.41 12454

micro avg 0.49 0.28 0.36 40000

macro avg 0.43 0.23 0.29 40000

weighted avg 0.47 0.28 0.35 40000

samples avg 0.28 0.28 0.28 40000

time steps=4 Evaluation Accuracy: 0.447% (+/-0.000)

experiment of time\_steps= 5

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 5

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(162965, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(162965, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(162965,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(162965,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.02106742 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(162965, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.01396082 0.75 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(112965, 71)

##############################################################################################################################

y\_train

[2]

(112965,)

##############################################################################################################################

x\_test

[[0.71342651 0.5 0.00268424 0.01851852 0.08270677 0.

0.03792135 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.13636364

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 1. 0. 0. 0. 0.

1. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(50000, 71)

##############################################################################################################################

y\_test

[2]

(50000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(112965, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(50000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[1.39608157e-02 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.82768876e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.34266357e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.27362599e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.82940379e-02 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.71041918e-01 2.50000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.38310134e-01 5.00000000e-01 2.68423621e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.67096258e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.80240445e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.20280814e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.91144707e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.35284603e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.77138640e-02 7.50000000e-01 2.68423621e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.90746518e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.82662602e-02 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[2.52393224e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.98612998e-01 2.50000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.41918289e-01 1.00000000e+00 7.32064422e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[1.38224382e-01 7.50000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.93955575e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[5.56977260e-01 7.50000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.12837250e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.37052270e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.48667954e-01 0.00000000e+00 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.76318944e-01 0.00000000e+00 3.17227916e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.95501716e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.54283167e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.55737488e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.99253305e-02 5.00000000e-01 2.44021474e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.52871778e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 5, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]]]

(22593, 5, 4)

##############################################################################################################################

x\_test

[[[0.71342651 0.5 0.00268424 0.01851852 0.08270677 0.

0.03792135 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.13636364

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 1. 0. 0. 0. 0.

1. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]

[0.72487092 0.25 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 1. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]

[0.09361211 0.5 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 0. 1. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.4981286 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0.16666667 0.048

0. 0. 0. 1. 0. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 1. ]

[0.04350793 0.75 0.00195217 0. 0.0075188 0.

0.03651685 0.00221729 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 1. 0. 0. 0. 1.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]]

(10000, 5, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]]]

(10000, 5, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_4"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 5, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 5, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 5, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 5, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 5ms/step - categorical\_accuracy: 0.4483 - loss: 1.2832

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_5.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-5 model → Train15\_Daywise\_Models\model\_day\_5.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 4ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.34 0.08 0.12 4691

Fail 0.39 0.13 0.20 10783

Pass 0.53 0.35 0.42 19084

Withdrawn 0.52 0.38 0.44 15442

micro avg 0.50 0.29 0.36 50000

macro avg 0.44 0.23 0.29 50000

weighted avg 0.48 0.29 0.35 50000

samples avg 0.29 0.29 0.29 50000

time steps=5 Evaluation Accuracy: 0.448% (+/-0.000)

experiment of time\_steps= 6

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 6

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(195558, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(195558, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(195558,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(195558,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.02106742 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(195558, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[5.68053755e-01 1.00000000e+00 2.44021474e-04 1.11111111e-02

1.35135135e-02 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(135558, 71)

##############################################################################################################################

y\_train

[2]

(135558,)

##############################################################################################################################

x\_test

[[0.32762645 0.4 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.24

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. ]]

(60000, 71)

##############################################################################################################################

y\_test

[2]

(60000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(135558, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(60000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[5.68053755e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.60014637e-01 4.00000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.28430273e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.30326386e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.39868770e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.01049280e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[8.26891837e-02 4.00000000e-01 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.77638527e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.11057581e-01 2.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.66629810e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.05946014e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.68992806e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[6.33928439e-01 4.00000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.30707984e-02 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.64300962e-02 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.33664627e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.79829588e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.95519921e-01 2.00000000e-01 5.61249390e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[2.64788868e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.34450664e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.53319746e-01 0.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.87444665e-01 4.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.06283747e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.81093190e-01 0.00000000e+00 1.70815032e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.31928517e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.46637242e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.09290732e-01 8.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.44483795e-01 1.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.03669610e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.81909795e-01 1.00000000e+00 1.70815032e-03 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[6.30676108e-01 4.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.29142218e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[3.32780861e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.78160013e-01 4.00000000e-01 3.41630063e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.27387414e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.03498073e-01 1.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 6, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]]]

(22593, 6, 4)

##############################################################################################################################

x\_test

[[[0.32762645 0.4 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.24

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. ]

[0.23987468 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.24

0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.46198439 0.2 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.096

0. 0. 0. 1. 0. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 1. ]

[0.77942418 0.4 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

1. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]

[0.14966911 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 0. 0. 1. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

1. 0. 0. 1. 0. ]

[0.88521673 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144

0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 0. 1. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]]

(10000, 6, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(10000, 6, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_5"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 6, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 6, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 6, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 6, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 6ms/step - categorical\_accuracy: 0.4565 - loss: 1.2518

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_6.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-6 model → Train15\_Daywise\_Models\model\_day\_6.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 1s 4ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.36 0.08 0.13 5548

Fail 0.41 0.11 0.17 13100

Pass 0.53 0.40 0.45 22852

Withdrawn 0.53 0.35 0.42 18500

micro avg 0.51 0.29 0.37 60000

macro avg 0.46 0.23 0.29 60000

weighted avg 0.49 0.29 0.35 60000

samples avg 0.29 0.29 0.29 60000

time steps=6 Evaluation Accuracy: 0.456% (+/-0.000)

experiment of time\_steps= 7

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 7

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(228151, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(228151, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(228151,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(228151,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.02106742 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(228151, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[8.81903501e-01 8.33333333e-01 7.32064422e-04 3.70370370e-03

4.05405405e-02 0.00000000e+00 5.61797753e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 2.77777778e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 2.27272727e-02 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(158151, 71)

##############################################################################################################################

y\_train

[3]

(158151,)

##############################################################################################################################

x\_test

[[0.6976555 0.16666667 0.00219619 0.00555556 0.05405405 0.00809717

0.03651685 0.00221729 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.02272727

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 1. 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. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(70000, 71)

##############################################################################################################################

y\_test

[2]

(70000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 0. 1.]]

(158151, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(70000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[8.81903501e-01 8.33333333e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.56216279e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.84830166e-02 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.04718537e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.46446881e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.05087634e-01 8.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.60548469e-01 1.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.59056988e-02 0.00000000e+00 3.66032211e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.81983480e-01 8.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.20814819e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.79921330e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.04105572e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.57294025e-02 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.16605359e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.70968628e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.17912632e-01 1.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.16359445e-01 3.33333333e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.90335058e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

...

[[3.86229827e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.39414758e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.35125319e-01 8.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.08437875e-01 8.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.23373864e-01 1.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.34480990e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.39384417e-01 1.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.67924530e-01 5.00000000e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.50423291e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.80222290e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.79848693e-02 1.66666667e-01 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.26755241e-01 8.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.08719312e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.94108306e-02 0.00000000e+00 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.03890795e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.42046781e-01 3.33333333e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.05676008e-01 1.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.40641825e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 7, 71)

##############################################################################################################################

y\_train

[[[0. 0. 0. 1.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]]]

(22593, 7, 4)

##############################################################################################################################

x\_test

[[[6.97655504e-01 1.66666667e-01 2.19619327e-03 5.55555556e-03

5.40540541e-02 8.09716599e-03 3.65168539e-02 2.21729490e-03

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 2.27272727e-02 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[3.01116860e-01 3.33333333e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[4.76803912e-01 1.66666667e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.61266459e-01 5.00000000e-01 7.32064422e-04 5.18518519e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.41108151e-01 5.00000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.82062550e-01 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.16126169e-02 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 7, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(10000, 7, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_6"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 7, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 7, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 7, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 7, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 7ms/step - categorical\_accuracy: 0.4740 - loss: 1.2071

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_7.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-7 model → Train15\_Daywise\_Models\model\_day\_7.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 4ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.41 0.07 0.12 6548

Fail 0.46 0.10 0.16 15216

Pass 0.54 0.43 0.48 26718

Withdrawn 0.54 0.41 0.46 21518

micro avg 0.53 0.32 0.40 70000

macro avg 0.49 0.25 0.31 70000

weighted avg 0.51 0.32 0.37 70000

samples avg 0.32 0.32 0.32 70000

time steps=7 Evaluation Accuracy: 0.474% (+/-0.000)

experiment of time\_steps= 8

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 8

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(260744, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(260744, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(260744,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(260744,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.02106742 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(260744, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.66761774 0.57142857 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(180744, 71)

##############################################################################################################################

y\_train

[2]

(180744,)

##############################################################################################################################

x\_test

[[4.93526308e-01 8.57142857e-01 7.32064422e-04 0.00000000e+00

1.35135135e-02 0.00000000e+00 5.61797753e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

3.01204819e-03 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(80000, 71)

##############################################################################################################################

y\_test

[1]

(80000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(180744, 4)

##############################################################################################################################

y\_test

[[0. 1. 0. 0.]]

(80000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[6.67617744e-01 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.05136782e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.32940130e-01 1.42857143e-01 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.79620759e-01 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.90156954e-01 7.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.42163938e-01 7.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.86806759e-01 7.14285714e-01 4.39238653e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.05841511e-01 2.85714286e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[1.04443066e-01 4.28571429e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.28400164e-02 1.42857143e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.65580390e-01 7.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.02289426e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.85793958e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.46254281e-04 1.00000000e+00 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.39942035e-01 2.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.65488286e-01 1.42857143e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.45189172e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.39095305e-01 7.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[9.73950343e-01 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.56848182e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.87677729e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.00423280e-01 4.28571429e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.70421531e-01 1.42857143e-01 2.92825769e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.75969673e-01 7.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.44232314e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.13181263e-01 8.57142857e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.92505222e-02 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.68673205e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.12561230e-01 1.42857143e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.84444218e-01 7.14285714e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.14365386e-01 2.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.23735424e-01 1.42857143e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.18145531e-01 2.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.87297450e-01 4.28571429e-01 2.44021474e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.94857683e-01 8.57142857e-01 4.63640800e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.72317905e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 8, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(22593, 8, 4)

##############################################################################################################################

x\_test

[[[4.93526308e-01 8.57142857e-01 7.32064422e-04 0.00000000e+00

1.35135135e-02 0.00000000e+00 5.61797753e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

3.01204819e-03 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.90623632e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.71299285e-01 1.42857143e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[3.22533676e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00]

[2.14470433e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.09652452e-01 4.28571429e-01 2.44021474e-03 3.70370370e-03

6.08108108e-02 8.09716599e-03 1.96629213e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 9.09090909e-02 0.00000000e+00 1.11111111e-02

0.00000000e+00 2.22222222e-02 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.39206511e-01 8.57142857e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[2.03086940e-01 5.71428571e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 2.64000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 8, 71)

##############################################################################################################################

y\_test

[[[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]]]

(10000, 8, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_7"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 8, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 8, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 8, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 8, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 7ms/step - categorical\_accuracy: 0.4816 - loss: 1.1786

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_8.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-8 model → Train15\_Daywise\_Models\model\_day\_8.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 5ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.45 0.09 0.15 7362

Fail 0.47 0.14 0.22 17102

Pass 0.56 0.39 0.46 30523

Withdrawn 0.57 0.36 0.44 25013

micro avg 0.55 0.30 0.39 80000

macro avg 0.51 0.25 0.32 80000

weighted avg 0.53 0.30 0.37 80000

samples avg 0.30 0.30 0.30 80000

time steps=8 Evaluation Accuracy: 0.482% (+/-0.000)

experiment of time\_steps= 9

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 9

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(293337, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(293337, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(293337,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(293337,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.02106742 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(293337, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.2457047 0.5 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0.

0. 0. 0.144 0. 1. 0. 0.

0. 0. 0. 0. 0. 0. 1.

1. 0. 0. 0. 0. 0. 1.

0. 0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0. 1.

0. ]]

(203337, 71)

##############################################################################################################################

y\_train

[3]

(203337,)

##############################################################################################################################

x\_test

[[7.30243295e-02 3.75000000e-01 9.76085896e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 2.24719101e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(90000, 71)

##############################################################################################################################

y\_test

[2]

(90000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 0. 1.]]

(203337, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(90000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[2.45704699e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.42654123e-01 3.75000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.34008724e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

...

[4.73520793e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.05037678e-01 5.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.71686079e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.89230269e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.11555018e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[6.68875985e-01 8.75000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.87880245e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.66979566e-01 5.00000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.55688462e-01 5.00000000e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.12298076e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.45999067e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.58369713e-01 3.75000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.38462983e-01 2.50000000e-01 2.92825769e-03 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[5.80908898e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.53626517e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[6.90445790e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.52908028e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.99723291e-01 3.75000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.16592923e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.74668381e-01 5.00000000e-01 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.77521839e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[5.98428746e-01 2.50000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.50288028e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.41193484e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.05628552e-03 6.25000000e-01 4.88042948e-03 ... 1.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.70955930e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.97502275e-01 0.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.22576663e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.61597928e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.15881002e-01 5.00000000e-01 1.70815032e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.38065248e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.13518233e-01 2.50000000e-01 3.17227916e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.17943628e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 9, 71)

##############################################################################################################################

y\_train

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]]]

(22593, 9, 4)

##############################################################################################################################

x\_test

[[[7.30243295e-02 3.75000000e-01 9.76085896e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 2.24719101e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[2.14009947e-01 6.25000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.42666805e-01 6.25000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.71790126e-01 1.25000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.87561308e-01 6.25000000e-01 1.22010737e-03 0.00000000e+00

6.75675676e-03 0.00000000e+00 5.19662921e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.83823529e-03

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[2.89734323e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00]

[1.36874182e-01 2.50000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[9.81897074e-01 6.25000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.66666667e-01 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[2.00202890e-01 6.25000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.66666667e-01 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 9, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(10000, 9, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_8"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 9, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 9, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 9, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 9, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 8ms/step - categorical\_accuracy: 0.4942 - loss: 1.1405

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_9.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-9 model → Train15\_Daywise\_Models\model\_day\_9.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 5ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.46 0.11 0.18 8258

Fail 0.49 0.16 0.24 19429

Pass 0.59 0.38 0.47 34319

Withdrawn 0.59 0.37 0.45 27994

micro avg 0.57 0.31 0.40 90000

macro avg 0.53 0.26 0.34 90000

weighted avg 0.56 0.31 0.39 90000

samples avg 0.31 0.31 0.31 90000

time steps=9 Evaluation Accuracy: 0.494% (+/-0.000)

experiment of time\_steps= 10

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 10

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(325930, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(325930, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(325930,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(325930,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(325930, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[6.20274734e-01 4.44444444e-01 4.88042948e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 2.17864924e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(225930, 71)

##############################################################################################################################

y\_train

[1]

(225930,)

##############################################################################################################################

x\_test

[[0.14546522 0.22222222 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0.16666667 0.048

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 1.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(100000, 71)

##############################################################################################################################

y\_test

[1]

(100000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 1. 0. 0.]]

(225930, 4)

##############################################################################################################################

y\_test

[[0. 1. 0. 0.]]

(100000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[6.20274734e-01 4.44444444e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.86112466e-01 1.11111111e-01 3.17227916e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.00389245e-02 8.88888889e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.29270900e-01 4.44444444e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.66568722e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.44992511e-01 2.22222222e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.09414037e-01 7.77777778e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.04148412e-01 5.55555556e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.91538309e-01 8.88888889e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.99625062e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.47587919e-01 1.11111111e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.91666652e-01 7.77777778e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.21257535e-01 8.88888889e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.46526855e-01 4.44444444e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.30412045e-01 1.11111111e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.88015851e-01 6.66666667e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.41936981e-01 4.44444444e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.17132942e-01 2.22222222e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[6.56449446e-01 6.66666667e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.01663483e-01 8.88888889e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.52849236e-02 2.22222222e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.64046474e-01 4.44444444e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.85112767e-01 4.44444444e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.97496071e-01 5.55555556e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.60806509e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.57149072e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.92844264e-01 0.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.27963525e-01 4.44444444e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.83812825e-02 1.11111111e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.53056069e-01 5.55555556e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.27485142e-01 0.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.01275783e-01 1.11111111e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.47521225e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.34437273e-01 2.22222222e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.64414037e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.88267776e-01 8.88888889e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 10, 71)

##############################################################################################################################

y\_train

[[[0. 1. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]]]

(22593, 10, 4)

##############################################################################################################################

x\_test

[[[1.45465223e-01 2.22222222e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.66666667e-01 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[2.17906239e-01 2.22222222e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.78564837e-01 3.33333333e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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[4.16054866e-02 2.22222222e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.66666667e-01 2.40000000e-01

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[1.91152144e-02 1.11111111e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.86456665e-01 5.55555556e-01 0.00000000e+00 0.00000000e+00

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[4.27037555e-01 6.66666667e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[8.98870083e-01 1.11111111e-01 7.32064422e-04 7.40740741e-03

6.75675676e-03 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

3.22580645e-02 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.15396639e-01 3.33333333e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.32610116e-01 1.00000000e+00 4.88042948e-03 0.00000000e+00

4.72972973e-02 1.61943320e-02 1.52505447e-02 4.43458980e-03

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0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

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0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 10, 71)

##############################################################################################################################

y\_test

[[[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]]]

(10000, 10, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_9"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 10, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 10, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 10, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 10, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 12ms/step - categorical\_accuracy: 0.5040 - loss: 1.1127

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_10.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-10 model → Train15\_Daywise\_Models\model\_day\_10.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.50 0.14 0.22 9237

Fail 0.52 0.17 0.25 21665

Pass 0.61 0.37 0.46 37894

Withdrawn 0.60 0.38 0.47 31204

micro avg 0.59 0.31 0.41 100000

macro avg 0.56 0.27 0.35 100000

weighted avg 0.57 0.31 0.40 100000

samples avg 0.31 0.31 0.31 100000

time steps=10 Evaluation Accuracy: 0.504% (+/-0.000)

experiment of time\_steps= 11

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 11

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(358523, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(358523, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(358523,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(358523,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(358523, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[1.24580533e-02 9.00000000e-01 4.88042948e-04 9.25925926e-03

6.75675676e-03 4.04858300e-03 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(248523, 71)

##############################################################################################################################

y\_train

[2]

(248523,)

##############################################################################################################################

x\_test

[[0.34615874 0.5 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(110000, 71)

##############################################################################################################################

y\_test

[2]

(110000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(248523, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(110000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[1.24580533e-02 9.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.90279380e-01 0.00000000e+00 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.37346773e-01 6.00000000e-01 2.92825769e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.28792536e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.55798224e-01 1.00000000e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.31938613e-02 4.00000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[4.54620363e-01 1.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.86358290e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.84744740e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.08088774e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.70342449e-01 8.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.63168804e-01 1.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.87279329e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.58621681e-01 7.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.20447053e-01 6.00000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.05185884e-03 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.69200952e-01 3.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.86603749e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[2.61321500e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.89003903e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.31443377e-01 2.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.62910277e-01 1.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.95226169e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.04474508e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.99730450e-01 8.00000000e-01 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.50589953e-01 9.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.89519140e-01 1.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.48994017e-01 5.00000000e-01 2.92825769e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.12375211e-02 4.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.66219311e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.58800207e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.95127758e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.64917811e-01 7.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.04498031e-01 7.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.64451326e-01 7.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.36425053e-02 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 11, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]]]

(22593, 11, 4)

##############################################################################################################################

x\_test

[[[3.46158741e-01 5.00000000e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[5.81437184e-02 6.00000000e-01 0.00000000e+00 0.00000000e+00

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[9.65143838e-01 1.00000000e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.00000000e+00 0.00000000e+00]

[9.04914516e-01 2.00000000e-01 2.44021474e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 2.94117647e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[9.45326341e-02 3.00000000e-01 9.76085896e-04 0.00000000e+00

3.37837838e-02 4.04858300e-03 0.00000000e+00 6.65188470e-03

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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[3.52816582e-01 3.00000000e-01 0.00000000e+00 0.00000000e+00

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[1.16256413e-01 9.00000000e-01 0.00000000e+00 0.00000000e+00

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[5.49889714e-01 7.00000000e-01 7.32064422e-04 0.00000000e+00

6.75675676e-03 0.00000000e+00 4.35729847e-03 0.00000000e+00

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[5.63327784e-01 0.00000000e+00 2.19619327e-03 0.00000000e+00

6.75675676e-03 0.00000000e+00 4.35729847e-03 2.21729490e-03

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[4.10192219e-01 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.23373694e-01 5.00000000e-01 2.44021474e-04 7.40740741e-03

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 11, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]]]

(10000, 11, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_10"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 11, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 11, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 11, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 11, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 10ms/step - categorical\_accuracy: 0.5159 - loss: 1.0865

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_11.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-11 model → Train15\_Daywise\_Models\model\_day\_11.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.54 0.12 0.19 10217

Fail 0.54 0.18 0.27 23894

Pass 0.61 0.42 0.50 41842

Withdrawn 0.64 0.35 0.45 34047

micro avg 0.61 0.32 0.42 110000

macro avg 0.58 0.27 0.35 110000

weighted avg 0.60 0.32 0.41 110000

samples avg 0.32 0.32 0.32 110000

time steps=11 Evaluation Accuracy: 0.516% (+/-0.000)

experiment of time\_steps= 12

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 12

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(391116, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(391116, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(391116,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(391116,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(391116, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.75184 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.144 0. 0. 0.

0. 0. 1. 0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0. 0. 1. ]]

(271116, 71)

##############################################################################################################################

y\_train

[1]

(271116,)

##############################################################################################################################

x\_test

[[0.7449983 0.36363636 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

1. 0. 0. 0. 1. ]]

(120000, 71)

##############################################################################################################################

y\_test

[2]

(120000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 1. 0. 0.]]

(271116, 4)

##############################################################################################################################

y\_test

[[0. 0. 1. 0.]]

(120000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[7.51840003e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.93874805e-01 0.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.39605091e-01 3.63636364e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.16789387e-02 9.09090909e-02 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[8.62388579e-01 9.09090909e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.07068949e-01 9.09090909e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.33299405e-03 9.09090909e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.46299932e-01 7.27272727e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.20464835e-01 2.72727273e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.91531107e-01 5.45454545e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.52196747e-01 3.63636364e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.62672118e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.47889663e-01 6.36363636e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.90689524e-02 4.54545455e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[8.80093311e-01 9.09090909e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.21041538e-01 2.72727273e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.80589467e-01 9.09090909e-02 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.02312448e-01 0.00000000e+00 4.39238653e-03 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

...

[[2.57240946e-01 1.81818182e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.22430482e-02 6.36363636e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.13358999e-01 7.27272727e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.39899164e-01 1.81818182e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.83566142e-02 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.81099112e-01 5.45454545e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.84486862e-01 1.81818182e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.26988332e-01 8.18181818e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.48227169e-01 6.36363636e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.05542117e-01 9.09090909e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.78797368e-01 9.09090909e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.36242614e-01 9.09090909e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.70268474e-01 7.27272727e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.40558619e-02 7.27272727e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.13579469e-01 2.72727273e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.98656409e-01 6.36363636e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.16726999e-01 9.09090909e-02 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[5.61272799e-01 6.36363636e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 12, 71)

##############################################################################################################################

y\_train

[[[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]]]

(22593, 12, 4)

##############################################################################################################################

x\_test

[[[7.44998296e-01 3.63636364e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00]

[9.29797561e-01 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[9.33081481e-01 7.27272727e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[5.74772686e-01 3.63636364e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[4.06756433e-01 5.45454545e-01 7.32064422e-04 7.40740741e-03

0.00000000e+00 0.00000000e+00 4.35729847e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[9.42408798e-01 6.36363636e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[5.19237542e-01 2.72727273e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.66666667e-01 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[4.26393356e-01 7.27272727e-01 4.88042948e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.08932462e-02 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.81302956e-01 8.18181818e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 4.04858300e-03 3.26797386e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[3.43765707e-01 6.36363636e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.19170541e-01 2.72727273e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[4.45385609e-01 6.36363636e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.92000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 12, 71)

##############################################################################################################################

y\_test

[[[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]]]

(10000, 12, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_11"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 12, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 12, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 12, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 12, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 10ms/step - categorical\_accuracy: 0.5290 - loss: 1.0651

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_12.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-12 model → Train15\_Daywise\_Models\model\_day\_12.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.60 0.13 0.21 11123

Fail 0.58 0.19 0.28 26014

Pass 0.64 0.42 0.50 45580

Withdrawn 0.63 0.41 0.49 37283

micro avg 0.63 0.34 0.44 120000

macro avg 0.61 0.28 0.37 120000

weighted avg 0.62 0.34 0.42 120000

samples avg 0.34 0.34 0.34 120000

time steps=12 Evaluation Accuracy: 0.529% (+/-0.000)

experiment of time\_steps= 13

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 13

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(423709, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(423709, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(423709,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(423709,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03888889 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(423709, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[4.07585264e-01 8.33333333e-01 2.44021474e-04 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.08932462e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]

(293709, 71)

##############################################################################################################################

y\_train

[2]

(293709,)

##############################################################################################################################

x\_test

[[0.01825656 0.41666667 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.24

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(130000, 71)

##############################################################################################################################

y\_test

[3]

(130000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(293709, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(130000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[4.07585264e-01 8.33333333e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.70772508e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.62702827e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.32804552e-01 1.66666667e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.43165135e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.83952003e-01 1.66666667e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[7.50582283e-01 2.50000000e-01 2.44021474e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[2.06553815e-01 2.50000000e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.31124660e-01 6.66666667e-01 0.00000000e+00 ... 1.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.14120033e-01 9.16666667e-01 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.22631472e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.63211427e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.05541639e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.82884735e-01 4.16666667e-01 2.68423621e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.42614762e-03 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.46004001e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.28159428e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.97410138e-01 5.00000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[4.93985694e-01 8.33333333e-02 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.31639532e-01 3.33333333e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.39721759e-01 5.00000000e-01 9.76085896e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

...

[2.65101049e-02 4.16666667e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.12690736e-01 5.83333333e-01 1.70815032e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.50729762e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.35842330e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.60168057e-01 5.00000000e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.42310257e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.43175294e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.23815196e-01 8.33333333e-02 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.80289623e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.48012376e-01 5.83333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.22201237e-01 3.33333333e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.17943575e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.92850107e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.73668398e-01 5.83333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.26822633e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 13, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]]]

(22593, 13, 4)

##############################################################################################################################

x\_test

[[[1.82565570e-02 4.16666667e-01 0.00000000e+00 0.00000000e+00

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[8.48060399e-01 5.00000000e-01 0.00000000e+00 0.00000000e+00

2.02702703e-02 0.00000000e+00 0.00000000e+00 4.43458980e-03

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[5.08499347e-01 7.50000000e-01 0.00000000e+00 0.00000000e+00

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[7.38709242e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

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[1.97595141e-01 6.66666667e-01 0.00000000e+00 0.00000000e+00

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[7.42697718e-01 8.33333333e-01 0.00000000e+00 0.00000000e+00

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[7.38095482e-01 9.16666667e-01 2.44021474e-04 0.00000000e+00

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[9.79595566e-01 5.00000000e-01 0.00000000e+00 0.00000000e+00

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[1.86425976e-01 8.33333333e-02 0.00000000e+00 0.00000000e+00

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[5.48232743e-01 5.83333333e-01 0.00000000e+00 0.00000000e+00

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[9.26270351e-01 1.00000000e+00 0.00000000e+00 0.00000000e+00

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[8.73527191e-02 8.33333333e-02 1.22010737e-03 0.00000000e+00

0.00000000e+00 8.09716599e-03 5.33769063e-02 0.00000000e+00

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[3.98904436e-03 2.50000000e-01 9.76085896e-04 2.96296296e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 5.26315789e-02

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1.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 13, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]]]

(10000, 13, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_12"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 13, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 13, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 13, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 13, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 1s 11ms/step - categorical\_accuracy: 0.5408 - loss: 1.0420

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_13.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-13 model → Train15\_Daywise\_Models\model\_day\_13.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 2s 6ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.60 0.15 0.24 12005

Fail 0.61 0.19 0.29 28010

Pass 0.66 0.41 0.51 49252

Withdrawn 0.64 0.42 0.51 40733

micro avg 0.64 0.34 0.45 130000

macro avg 0.63 0.29 0.39 130000

weighted avg 0.63 0.34 0.44 130000

samples avg 0.34 0.34 0.34 130000

time steps=13 Evaluation Accuracy: 0.541% (+/-0.000)

experiment of time\_steps= 14

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 14

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(456302, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(456302, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(456302,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(456302,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03730018 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(456302, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.26420635 0.53846154 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 1. 0. 1. 0. ]]

(316302, 71)

##############################################################################################################################

y\_train

[2]

(316302,)

##############################################################################################################################

x\_test

[[0.63064565 0.69230769 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 1. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(140000, 71)

##############################################################################################################################

y\_test

[3]

(140000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(316302, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(140000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[2.64206345e-01 5.38461538e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.92403350e-01 1.00000000e+00 2.68423621e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.12941716e-01 5.38461538e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.68802297e-01 4.61538462e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.59905217e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.35523912e-01 5.38461538e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[6.77170403e-02 7.69230769e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.75436419e-01 7.69230769e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.79271029e-01 3.07692308e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.69268248e-01 7.69230769e-02 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.67782530e-01 3.07692308e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.40291503e-01 5.38461538e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[5.50687494e-01 6.92307692e-01 4.39238653e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.44624564e-01 9.23076923e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.37513172e-01 8.46153846e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.73961792e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.26374520e-01 6.92307692e-01 6.34455832e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.42949263e-01 6.92307692e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[9.53054898e-01 2.30769231e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[8.83835560e-01 2.30769231e-01 7.32064422e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[2.52301601e-01 5.38461538e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.48624812e-01 2.30769231e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.83062217e-01 2.30769231e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.97022678e-01 2.30769231e-01 1.70815032e-03 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[8.83660216e-02 6.15384615e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.41642377e-01 6.15384615e-01 0.00000000e+00 ... 1.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.06867808e-01 8.46153846e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.62199084e-01 3.07692308e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.62604807e-01 6.92307692e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.16912180e-02 8.46153846e-01 7.80868716e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.77141266e-01 2.30769231e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.87266833e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.94078935e-01 9.23076923e-01 9.76085896e-04 ... 1.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.55406744e-01 1.00000000e+00 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.81835435e-01 7.69230769e-02 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.69948691e-01 0.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 14, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]]]

(22593, 14, 4)

##############################################################################################################################

x\_test

[[[6.30645648e-01 6.92307692e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[3.80461128e-01 1.53846154e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[4.77632183e-01 2.30769231e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.03031948e-01 4.61538462e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.16248669e-01 2.30769231e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.44000000e-01

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00]

[4.24551865e-01 3.07692308e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[5.48907919e-01 6.92307692e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.66666667e-01 1.44000000e-01

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[8.36492382e-01 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 9.60000000e-02

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[2.15697353e-01 3.84615385e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 0.00000000e+00 1.00000000e+00]

[2.21742340e-01 7.69230769e-01 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 1.66666667e-01 4.80000000e-02

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0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.45618455e-01 7.69230769e-02 7.32064422e-04 0.00000000e+00

1.35135135e-02 4.04858300e-03 0.00000000e+00 2.21729490e-03

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

0.00000000e+00 1.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

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1.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[6.21317879e-01 4.61538462e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 1.00000000e+00 0.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[1.82928851e-01 5.38461538e-01 0.00000000e+00 0.00000000e+00

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0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 4.80000000e-02

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0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]

[7.07873188e-01 7.69230769e-01 1.46412884e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 4.35729847e-03 0.00000000e+00

0.00000000e+00 0.00000000e+00 0.00000000e+00 0.00000000e+00

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0.00000000e+00 1.32075472e-01 0.00000000e+00 9.60000000e-02

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0.00000000e+00 0.00000000e+00 0.00000000e+00 1.00000000e+00

0.00000000e+00 1.00000000e+00 0.00000000e+00]]]

(10000, 14, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]]]

(10000, 14, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_13"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 14, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 14, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 14, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 14, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 2s 16ms/step - categorical\_accuracy: 0.5492 - loss: 1.0282

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_14.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-14 model → Train15\_Daywise\_Models\model\_day\_14.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 3s 7ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.61 0.17 0.26 13069

Fail 0.62 0.21 0.32 30095

Pass 0.67 0.40 0.50 53172

Withdrawn 0.65 0.43 0.52 43664

micro avg 0.65 0.35 0.45 140000

macro avg 0.64 0.30 0.40 140000

weighted avg 0.65 0.35 0.44 140000

samples avg 0.35 0.35 0.35 140000

time steps=14 Evaluation Accuracy: 0.549% (+/-0.000)

experiment of time\_steps= 15

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 15

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(488895, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(488895, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(488895,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(488895,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03730018 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(488895, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.78822899 0. 0.00195217 0.0053286 0.00675676 0.

0.02723312 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.096

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(338895, 71)

##############################################################################################################################

y\_train

[2]

(338895,)

##############################################################################################################################

x\_test

[[0.04571678 0.07142857 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0.16666667 0.144

0. 1. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 0. 1. ]]

(150000, 71)

##############################################################################################################################

y\_test

[3]

(150000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(338895, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(150000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[7.88228987e-01 0.00000000e+00 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.61523680e-01 7.14285714e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.97613074e-01 5.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.90955577e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.78798398e-01 9.28571429e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.25503196e-01 4.28571429e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.80761613e-01 1.42857143e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.68142562e-02 2.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.46851686e-01 3.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.48453349e-01 7.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.60858782e-02 6.42857143e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.60690211e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.46287382e-01 2.14285714e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.11272892e-01 9.28571429e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.44686628e-01 8.57142857e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.71212886e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.61640114e-01 7.14285714e-02 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[7.68501159e-01 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[7.01275385e-01 7.14285714e-02 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.11861470e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.60979171e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.71545687e-01 1.00000000e+00 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.32068532e-01 5.00000000e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.04159524e-01 7.14285714e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[3.74509509e-01 6.42857143e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.72887823e-02 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.90807893e-01 5.00000000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.08586347e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.48575056e-01 1.42857143e-01 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.66255395e-01 7.85714286e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.09499385e-01 7.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.86935851e-01 6.42857143e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.89942606e-01 5.71428571e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.06319878e-01 7.14285714e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.45780214e-02 9.28571429e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.45238001e-01 2.85714286e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 15, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]]]

(22593, 15, 4)

##############################################################################################################################

x\_test

[[[0.04571678 0.07142857 0. ... 0. 0. 1. ]

[0.08532767 0.07142857 0. ... 0. 1. 0. ]

[0.95633859 0.71428571 0. ... 0. 0. 1. ]

...

[0.42703708 0.28571429 0. ... 0. 1. 0. ]

[0.36466003 0.35714286 0. ... 0. 1. 0. ]

[0.24552066 0.42857143 0. ... 0. 1. 0. ]]]

(10000, 15, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]]]

(10000, 15, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_14"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 15, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 15, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 15, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 15, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 2s 15ms/step - categorical\_accuracy: 0.5583 - loss: 1.0092

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_15.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-15 model → Train15\_Daywise\_Models\model\_day\_15.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 3s 7ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.64 0.18 0.28 13938

Fail 0.65 0.18 0.28 32489

Pass 0.66 0.46 0.54 56870

Withdrawn 0.68 0.41 0.51 46703

micro avg 0.66 0.36 0.46 150000

macro avg 0.65 0.31 0.40 150000

weighted avg 0.66 0.36 0.45 150000

samples avg 0.36 0.36 0.36 150000

time steps=15 Evaluation Accuracy: 0.558% (+/-0.000)

experiment of time\_steps= 16

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 16

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(521488, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(521488, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(521488,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(521488,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03730018 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(521488, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.73861581 0.13333333 0.00122011 0. 0. 0.

0.02723312 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 0. 0. 0. 1.

0. 0. 1. 0. 0. 0.

1. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 1. 0. 1. 0. ]]

(361488, 71)

##############################################################################################################################

y\_train

[2]

(361488,)

##############################################################################################################################

x\_test

[[0.30940067 0.06666667 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.096

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

1. 0. 0. 1. 0. ]]

(160000, 71)

##############################################################################################################################

y\_test

[3]

(160000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(361488, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(160000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[7.38615807e-01 1.33333333e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.12912088e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.29805775e-01 8.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.01122632e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[6.88972602e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.53062352e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[5.46329457e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.47276177e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.84548666e-01 4.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.28323592e-03 1.33333333e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.36162414e-01 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.86721713e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[2.56014332e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.04398709e-02 3.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.66543937e-01 6.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.21330465e-01 4.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.04356720e-01 4.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.31049262e-02 6.66666667e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[1.51173173e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.69175628e-01 2.66666667e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.24966093e-02 9.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.73233536e-01 6.66666667e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.11443654e-01 0.00000000e+00 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.61672323e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.47740730e-02 7.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.32259338e-01 2.66666667e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[4.82694999e-01 4.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.27185846e-02 8.66666667e-01 2.68423621e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.96919892e-01 9.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.73654793e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[6.78877095e-01 0.00000000e+00 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.58329882e-02 5.33333333e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.45913995e-01 8.66666667e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.73011487e-01 6.00000000e-01 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.99915112e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.42361039e-01 8.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 16, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]]]

(22593, 16, 4)

##############################################################################################################################

x\_test

[[[3.09400666e-01 6.66666667e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.37689030e-01 1.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.38265460e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.66382685e-02 6.66666667e-01 7.32064422e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[4.21115121e-01 1.33333333e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.68815168e-01 6.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(10000, 16, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(10000, 16, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_15"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 16, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 16, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 16, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 16, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 2s 15ms/step - categorical\_accuracy: 0.5692 - loss: 0.9910

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_16.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-16 model → Train15\_Daywise\_Models\model\_day\_16.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 3s 7ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.66 0.18 0.28 14888

Fail 0.64 0.24 0.35 34550

Pass 0.69 0.44 0.54 60842

Withdrawn 0.69 0.42 0.52 49720

micro avg 0.68 0.37 0.48 160000

macro avg 0.67 0.32 0.42 160000

weighted avg 0.68 0.37 0.47 160000

samples avg 0.37 0.37 0.37 160000

time steps=16 Evaluation Accuracy: 0.569% (+/-0.000)

experiment of time\_steps= 17

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 17

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(554081, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(554081, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(554081,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(554081,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03730018 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(554081, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.52160013 0.375 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.096

0. 0. 0. 1. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 1. 1. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(384081, 71)

##############################################################################################################################

y\_train

[3]

(384081,)

##############################################################################################################################

x\_test

[[0.25257788 0.5625 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 1. 1.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(170000, 71)

##############################################################################################################################

y\_test

[1]

(170000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 0. 1.]]

(384081, 4)

##############################################################################################################################

y\_test

[[0. 1. 0. 0.]]

(170000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[5.21600126e-01 3.75000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.69458682e-01 6.25000000e-01 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.72157590e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[6.93972833e-01 6.25000000e-02 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.40864351e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.09050830e-01 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.47368775e-01 8.75000000e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[8.70367083e-01 9.37500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.84984277e-01 8.12500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[5.45378924e-01 3.75000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.37303951e-01 3.12500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.21963018e-01 4.37500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[9.10345578e-02 6.25000000e-02 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.75090456e-01 0.00000000e+00 2.44021474e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.61892217e-01 8.12500000e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.61726510e-01 0.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.34868434e-01 8.75000000e-01 7.32064422e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.49557584e-01 6.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

...

[[5.48049423e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.33069223e-01 5.00000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.83247340e-01 9.37500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.15868510e-01 1.87500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.66843571e-01 1.87500000e-01 5.61249390e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.74307511e-01 6.87500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.20023259e-01 6.87500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.71311008e-01 4.37500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.74938067e-01 5.62500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.78603150e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.98987143e-01 3.12500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.40213249e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[4.76312453e-01 6.25000000e-02 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.87849574e-01 3.75000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.50379461e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.66802184e-01 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.83873827e-02 7.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.20796977e-01 8.75000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 17, 71)

##############################################################################################################################

y\_train

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]]]

(22593, 17, 4)

##############################################################################################################################

x\_test

[[[2.52577883e-01 5.62500000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.17882384e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[3.69261838e-01 6.25000000e-02 9.76085896e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[1.96950041e-01 1.25000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.25667670e-01 6.25000000e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.51365841e-02 2.50000000e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(10000, 17, 71)

##############################################################################################################################

y\_test

[[[0. 1. 0. 0.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]]]

(10000, 17, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_16"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 17, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 17, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 17, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 17, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 2s 15ms/step - categorical\_accuracy: 0.5809 - loss: 0.9749

[Saved] train/val curves → Train15\_Daywise\_Models\trainval\_day\_17.png

WARNING:absl:You are saving your model as an HDF5 file via `model.save()` or `keras.saving.save\_model(model)`. This file format is considered legacy. We recommend using instead the native Keras format, e.g. `model.save('my\_model.keras')` or `keras.saving.save\_model(model, 'my\_model.keras')`.

[Saved] day-17 model → Train15\_Daywise\_Models\model\_day\_17.h5

313/313 ━━━━━━━━━━━━━━━━━━━━ 3s 8ms/step

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\sklearn\metrics\\_classification.py:1731: UndefinedMetricWarning: Precision is ill-defined and being set to 0.0 in samples with no predicted labels. Use `zero\_division` parameter to control this behavior.

\_warn\_prf(average, modifier, f"{metric.capitalize()} is", result.shape[0])

precision recall f1-score support

Distinction 0.68 0.16 0.26 15942

Fail 0.68 0.22 0.33 36947

Pass 0.69 0.47 0.56 64232

Withdrawn 0.70 0.45 0.54 52879

micro avg 0.69 0.38 0.49 170000

macro avg 0.69 0.33 0.42 170000

weighted avg 0.69 0.38 0.48 170000

samples avg 0.38 0.38 0.38 170000

time steps=17 Evaluation Accuracy: 0.581% (+/-0.000)

experiment of time\_steps= 18

##############################################################################################################################

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

19- custom\_steps containing dataset rang of time\_steps= 18

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

##############################################################################################################################

sample\_rows containing

Unnamed: 0 id\_student date homepage oucontent subpage url forumng ... imd\_band\_70-80% imd\_band\_80-90% imd\_band\_90-100% age\_band\_0-35 age\_band\_35-55 age\_band\_55<= disability\_N disability\_Y

0 0 11391 0 10.0 21.0 0.0 0.0 15.0 ... 0 0 1 0 0 1 1 0

1 1 11391 1 9.0 102.0 8.0 1.0 3.0 ... 0 0 1 0 0 1 1 0

2 2 11391 2 3.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

3 3 11391 3 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

4 4 11391 4 0.0 0.0 0.0 0.0 0.0 ... 0 0 1 0 0 1 1 0

[5 rows x 73 columns]

(586674, 73)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y numby arrays

##############################################################################################################################

X numpy containing sample\_rows except final\_result column

[[ 0. 0. 10. 21. 0. 0. 15. 3. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 1. 1. 9. 102. 8. 1. 3. 4. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 2. 2. 3. 0. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 3. 3. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]

[ 4. 4. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 240. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0. 0. 0. 1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 1.

0.]]

(586674, 71)

##############################################################################################################################

Y numpy containing sample\_rows final\_result column

['Pass' 'Pass' 'Pass' 'Pass' 'Pass']

(586674,)

##############################################################################################################################

##############################################################################################################################

stage 6 prepare X and Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 7 # apply one hot encoder for final result feature in Y

##############################################################################################################################

Y after apply fit\_transform(y) label encoder

[2 2 2 2 2]

(586674,)

##############################################################################################################################

##############################################################################################################################

stage 7 apply one hot encoder for Y completed successfully

##############################################################################################################################

##############################################################################################################################

stage 8 apply minmax scaler for features in X

##############################################################################################################################

X after apply minmax transforming

[[0. 0. 0.00244021 0.03730018 0. 0.

0.01633987 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.336

1. 0. 0. 0. 0. 0.

0. 0. 1. 0. 0. 0.

1. 1. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

0. 0. 1. 1. 0. ]]

(586674, 71)

##############################################################################################################################

##############################################################################################################################

stage 8 Scaling features in X completed successfully

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30

##############################################################################################################################

x\_train

[[0.34934977 0.47058824 0.00195217 0. 0.04 0.00404858

0.0087146 0.00665188 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.048

0. 0. 1. 0. 0. 0.

0. 0. 0. 0. 1. 0.

1. 0. 1. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 1.

1. 0. 0. 1. 0. ]]

(406674, 71)

##############################################################################################################################

y\_train

[2]

(406674,)

##############################################################################################################################

x\_test

[[0.29341613 0.58823529 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.

0. 0. 0. 0. 0. 0.096

0. 0. 1. 0. 0. 0.

0. 0. 0. 1. 0. 0.

1. 0. 0. 0. 0. 0.

0. 1. 0. 0. 0. 0.

0. 0. 0. 1. 0. 0.

0. 0. 0. 0. 1. 0.

0. 0. 0. 0. 0. 0.

1. 0. 0. 1. 0. ]]

(180000, 71)

##############################################################################################################################

y\_test

[3]

(180000,)

##############################################################################################################################

##############################################################################################################################

stage 9 splitting dataset X,Y to train test 70 30 completted successfully

##############################################################################################################################

##############################################################################################################################

stage 10 Converts Y arrays to binary class matrix using to\_categorical

##############################################################################################################################

y\_train

[[0. 0. 1. 0.]]

(406674, 4)

##############################################################################################################################

y\_test

[[0. 0. 0. 1.]]

(180000, 4)

##############################################################################################################################

##############################################################################################################################

stage 10 Converts a class vector (integers) to binary class matrix completed successfully

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test to (round(len(x\_train)/time\_steps),time\_steps,77) and ,y\_train,y\_test to (round(len(y\_train)/time\_steps),time\_steps,4)

##############################################################################################################################

xxx\_train

[[[3.49349768e-01 4.70588235e-01 1.95217179e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.26005889e-01 4.70588235e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.78388808e-01 9.41176471e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[7.59572570e-01 5.88235294e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.83898966e-01 9.41176471e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.31559274e-01 4.11764706e-01 3.41630063e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.24594956e-01 7.05882353e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.02284003e-01 9.41176471e-01 1.22010737e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.10659707e-01 6.47058824e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[8.63247550e-01 2.94117647e-01 7.32064422e-04 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

[2.33502658e-02 5.29411765e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.93556259e-01 7.64705882e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

[[6.68937802e-01 1.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.76435924e-01 4.70588235e-01 1.46412884e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.28816855e-01 4.11764706e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[9.58179775e-01 8.82352941e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.78283193e-01 4.70588235e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.88942275e-01 2.94117647e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]]

...

[[5.43844065e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.91881448e-01 2.94117647e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.56552817e-01 4.70588235e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[4.36670732e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.89327917e-01 0.00000000e+00 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[4.93709955e-01 4.11764706e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[1.29418467e-01 2.35294118e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.45605787e-02 5.88235294e-02 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[8.43673028e-01 7.05882353e-01 0.00000000e+00 ... 0.00000000e+00

0.00000000e+00 1.00000000e+00]

...

[7.81112352e-01 1.00000000e+00 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[3.15477058e-01 7.64705882e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.11224421e-01 5.29411765e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]

[[7.58559940e-01 5.29411765e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.10591615e-01 9.41176471e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[9.43206918e-01 9.41176471e-01 2.19619327e-03 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[2.50491798e-01 7.05882353e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[1.24877029e-02 0.00000000e+00 1.22010737e-03 ... 1.00000000e+00

1.00000000e+00 0.00000000e+00]

[5.12549465e-01 7.05882353e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(22593, 18, 71)

##############################################################################################################################

y\_train

[[[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]]]

(22593, 18, 4)

##############################################################################################################################

x\_test

[[[2.93416132e-01 5.88235294e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.16526473e-01 7.05882353e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[2.29720324e-01 9.41176471e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

...

[3.64751836e-01 2.35294118e-01 4.88042948e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[7.48495572e-01 2.35294118e-01 0.00000000e+00 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]

[6.12429270e-02 5.29411765e-01 2.44021474e-04 ... 0.00000000e+00

1.00000000e+00 0.00000000e+00]]]

(10000, 18, 71)

##############################################################################################################################

y\_test

[[[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 1. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[1. 0. 0. 0.]

[1. 0. 0. 0.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[1. 0. 0. 0.]

[0. 0. 0. 1.]

[0. 0. 1. 0.]

[0. 0. 0. 1.]

[0. 1. 0. 0.]]]

(10000, 18, 4)

##############################################################################################################################

##############################################################################################################################

stage 11 reshaping x\_train,x\_test ,y\_train,y\_test completted successfully

##############################################################################################################################

C:\Users\S\_CSIS-PostGrad\Desktop\HumanDigitalTwin\_LSTM\venv\Lib\site-packages\keras\src\layers\rnn\rnn.py:199: UserWarning: Do not pass an `input\_shape`/`input\_dim` argument to a layer. When using Sequential models, prefer using an `Input(shape)` object as the first layer in the model instead.

super().\_\_init\_\_(\*\*kwargs)

Model: "sequential\_17"

┏━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓

┃ Layer (type) ┃ Output Shape ┃ Param # ┃

┡━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩

│ LSTM\_Layer (LSTM) │ (None, 18, 200) │ 217,600 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ Dropout\_layer (Dropout) │ (None, 18, 200) │ 0 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Hidden\_Layer (Dense) │ (None, 18, 100) │ 20,100 │

├──────────────────────────────────────┼─────────────────────────────┼─────────────────┤

│ ANN\_Output\_Layer (Dense) │ (None, 18, 4) │ 404 │

└──────────────────────────────────────┴─────────────────────────────┴─────────────────┘

Total params: 238,104 (930.09 KB)

Trainable params: 238,104 (930.09 KB)

Non-trainable params: 0 (0.00 B)

None

100/100 ━━━━━━━━━━━━━━━━━━━━ 2s 15ms/step - categorical\_accuracy: 0.5834 - loss: 0.9619

[Saved] train/val c