Downloading...

From: https://drive.google.com/uc?id=1VJaDVtDUtKQMmhRAqr3t-fgng899ZdRV

To: /content/Python Application Usage Log Data Set.xlsx

100%|█████████████| 1.68M/1.68M [00:00<00:00, 104MB/s]

Epoch 1/300

19/19 ———————————————————————— **12s** 138ms/step - loss: 0.4971 - val_loss: 0.2977 - learning_rate: 0.0010

Epoch 2/300

19/19 ———————————————————————— **2s** 88ms/step - loss: 0.3009 - val_loss: 0.3132 - learning_rate: 0.0010

Epoch 3/300

19/19 ———————————————————————— **2s** 110ms/step - loss: 0.2938 - val_loss: 0.2594 - learning_rate: 0.0010

Epoch 4/300

19/19 ———————————————————————— **2s** 82ms/step - loss: 0.2333 - val_loss: 0.2714 - learning_rate: 0.0010

Epoch 5/300

19/19 ———————————————————————— **1s** 56ms/step - loss: 0.2447 - val_loss: 0.2562 - learning_rate: 0.0010

Epoch 6/300

19/19 ———————————————————————— **1s** 55ms/step - loss: 0.2214 - val_loss: 0.3067 - learning_rate: 0.0010

Epoch 7/300

19/19 ———————————————————————— **1s** 60ms/step - loss: 0.2348 - val_loss: 0.2492 - learning_rate: 0.0010

Epoch 8/300

19/19 ———————————————————————— **1s** 61ms/step - loss: 0.2268 - val_loss: 0.2681 - learning_rate: 0.0010

Epoch 9/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 71ms/step - loss: 0.2451 - val_loss: 0.2296 - learning_rate: 0.0010

Epoch 10/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **2s** 83ms/step - loss: 0.2396 - val_loss: 0.3000 - learning_rate: 0.0010

Epoch 11/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **2s** 105ms/step - loss: 0.2427 - val_loss: 0.2628 - learning_rate: 0.0010

Epoch 12/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 66ms/step - loss: 0.2200 - val_loss: 0.2691 - learning_rate: 0.0010

Epoch 13/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 52ms/step - loss: 0.2072 - val_loss: 0.2363 - learning_rate: 0.0010

Epoch 14/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 60ms/step - loss: 0.1896 - val_loss: 0.2530 - learning_rate: 0.0010

Epoch 15/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **0s** 28ms/step - loss: 0.2049

Epoch 15: ReduceLROnPlateau reducing learning rate to 0.0005000000237487257.

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 32ms/step - loss: 0.2044 - val_loss: 0.2746 - learning_rate: 0.0010

Epoch 16/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 30ms/step - loss: 0.1970 - val_loss: 0.2890 - learning_rate: 5.0000e-04

Epoch 17/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 32ms/step - loss: 0.1928 - val_loss: 0.3169 - learning_rate: 5.0000e-04

Epoch 18/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 31ms/step - loss: 0.1819 - val_loss: 0.2739 - learning_rate: 5.0000e-04

Epoch 19/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 30ms/step - loss: 0.1994 - val_loss: 0.2914 - learning_rate: 5.0000e-04

Epoch 20/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 31ms/step - loss: 0.1770 - val_loss: 0.2836 - learning_rate: 5.0000e-04

Epoch 21/300

17/19 ━━━━━━━━━━━━━━━━━━━━ **0s** 26ms/step - loss: 0.2135

Epoch 21: ReduceLROnPlateau reducing learning rate to 0.0002500000118743628.

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 30ms/step - loss: 0.2111 - val_loss: 0.2890 - learning_rate: 5.0000e-04

Epoch 22/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 32ms/step - loss: 0.2087 - val_loss: 0.2844 - learning_rate: 2.5000e-04

Epoch 23/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 31ms/step - loss: 0.2183 - val_loss: 0.2671 - learning_rate: 2.5000e-04

Epoch 24/300

19/19 ━━━━━━━━━━━━━━━━━━━━━━━━━ **1s** 30ms/step - loss: 0.1779 - val_loss: 0.2714 - learning_rate: 2.5000e-04

VAL — MAE: 367.24 | RMSE: 489.73 | MAPE: 37.43%

VAL (accuracy-optimized) — thr: 499.056 | Acc: 96.15% | F1: 0.98 | P: 0.96 | R: 1.00

Confusion matrix [TN FP; FN TP]:

[[0 1]

 [0 25]]

Epoch 1/23

20/20 ———————————————————— **4s** 23ms/step - loss: 0.4062

Epoch 2/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.3488

Epoch 3/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.2363

Epoch 4/23

20/20 ———————————————————— **1s** 22ms/step - loss: 0.2689

Epoch 5/23

20/20 ———————————————————— **0s** 22ms/step - loss: 0.2143

Epoch 6/23

20/20 ———————————————————— **0s** 22ms/step - loss: 0.2335

Epoch 7/23

20/20 ———————————————————— **0s** 22ms/step - loss: 0.2172

Epoch 8/23

20/20 ———————————————————— **1s** 21ms/step - loss: 0.2348

Epoch 9/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.1914

Epoch 10/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.1822

Epoch 11/23

20/20 ———————————————————— **1s** 22ms/step - loss: 0.2113

Epoch 12/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.2115

Epoch 13/23

20/20 ———————————————————— **0s** 21ms/step - loss: 0.1971

Epoch 14/23

20/20 ─────────────── **0s** 23ms/step - loss: 0.1958

Epoch 15/23

20/20 ─────────────── **0s** 21ms/step - loss: 0.1915

Epoch 16/23

20/20 ─────────────── **1s** 24ms/step - loss: 0.1921

Epoch 17/23

20/20 ─────────────── **1s** 36ms/step - loss: 0.2035

Epoch 18/23

20/20 ─────────────── **1s** 36ms/step - loss: 0.1881

Epoch 19/23

20/20 ─────────────── **1s** 29ms/step - loss: 0.2049

Epoch 20/23

20/20 ─────────────── **0s** 22ms/step - loss: 0.1846

Epoch 21/23

20/20 ─────────────── **1s** 22ms/step - loss: 0.1674

Epoch 22/23

20/20 ─────────────── **0s** 22ms/step - loss: 0.2114

Epoch 23/23

20/20 ─────────────── **1s** 22ms/step - loss: 0.1818

GRU Backtest (Validation Window)

GRU — 2-Year Forecast (Weekly)
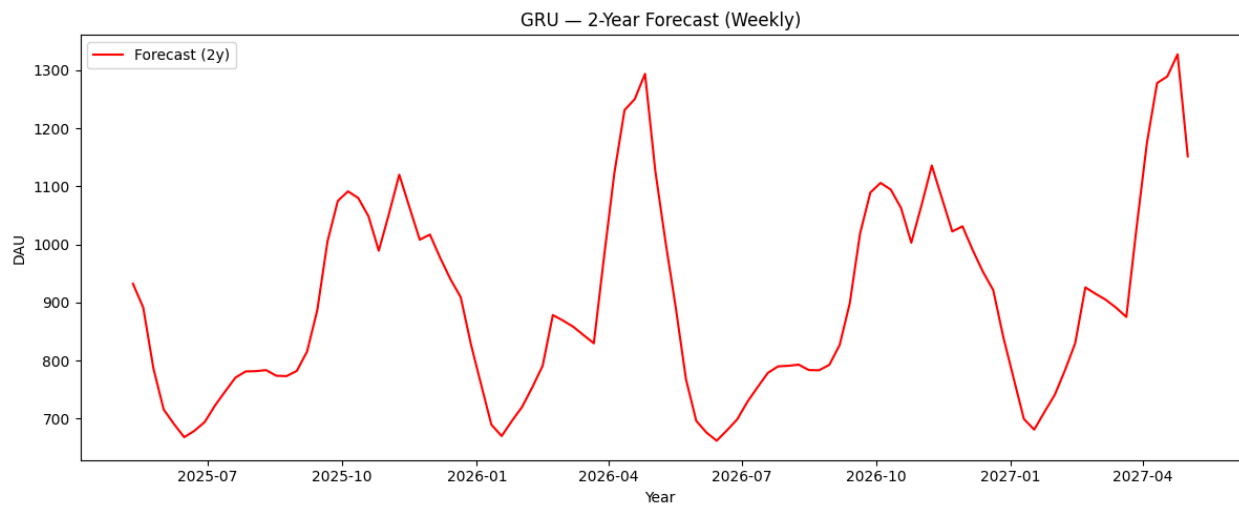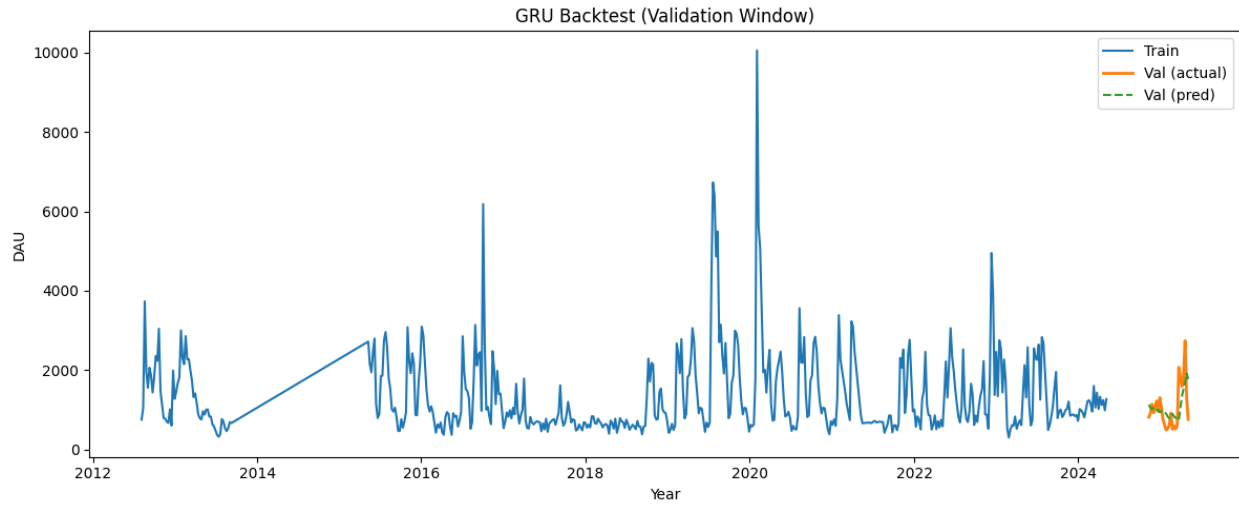
▶ Validation (fixed TRAIN-median threshold)

Threshold: 1003.513

Accuracy : 69.23%

F1 Score : 0.64

Precision: 0.64

Recall   : 0.64

Confusion matrix [TN FP; FN TP]:

[[11 4]

 [4 7]]

▶ Validation (accuracy-optimized threshold)

Threshold: 499.056

Accuracy : 96.15%

F1 Score : 0.98

Precision: 0.96

Recall   : 1.00

Confusion matrix [TN FP; FN TP]:

[[0 1]

 [0 25]]