1. APPENDIX A – BASELINE MODEL RESULTS

```
Transforming data...
Evaluating data...
Creating cross validation folds...

        Training new baseline model for fold 1
        --------------------------------------
Epoch 1/16
625/625 [==============================] - 3s 5ms/step - loss: 2.0651 - accuracy:
0.2440 - val_loss: 1.6797 - val_accuracy: 0.4048
Epoch 2/16
625/625 [==============================] - 3s 4ms/step - loss: 1.6073 - accuracy:
0.4264 - val_loss: 1.5285 - val_accuracy: 0.4625
Epoch 3/16
625/625 [==============================] - 3s 4ms/step - loss: 1.4706 - accuracy:
0.4728 - val_loss: 1.4563 - val_accuracy: 0.4806
Epoch 4/16
625/625 [==============================] - 3s 4ms/step - loss: 1.3712 - accuracy:
0.5095 - val_loss: 1.3642 - val_accuracy: 0.5214
Epoch 5/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2968 - accuracy:
0.5417 - val_loss: 1.3066 - val_accuracy: 0.5415
Epoch 6/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2467 - accuracy:
0.5609 - val_loss: 1.2694 - val_accuracy: 0.5526
Epoch 7/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1835 - accuracy:
0.5878 - val_loss: 1.2574 - val_accuracy: 0.5643
Epoch 8/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1406 - accuracy:
0.6001 - val_loss: 1.2247 - val_accuracy: 0.5759
Epoch 9/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0836 - accuracy:
0.6259 - val_loss: 1.1968 - val_accuracy: 0.5815
Epoch 10/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0321 - accuracy:
0.6392 - val_loss: 1.1616 - val_accuracy: 0.5972
Epoch 11/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9957 - accuracy:
0.6546 - val_loss: 1.1820 - val_accuracy: 0.5895
Epoch 12/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9566 - accuracy:
0.6678 - val_loss: 1.1518 - val_accuracy: 0.6023
Epoch 13/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9160 - accuracy:
0.6875 - val_loss: 1.0990 - val_accuracy: 0.6215
Epoch 14/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8864 - accuracy:
0.6958 - val_loss: 1.1213 - val_accuracy: 0.6165
Epoch 15/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8482 - accuracy:
0.7090 - val_loss: 1.0876 - val_accuracy: 0.6274
Epoch 16/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8060 - accuracy:
0.7220 - val_loss: 1.0907 - val_accuracy: 0.6282
```

```
313/313 [==============================] - 1s 3ms/step - loss: 1.0907 - accuracy:
0.6282
            ------------------------------------
        Fold 1/5 Validation Accuracy: 62.820



        Training new baseline model for fold 2
        ----------------------------------------
Epoch 1/16
625/625 [==============================] - 3s 5ms/step - loss: 1.9919 - accuracy:
0.2713 - val_loss: 1.6099 - val_accuracy: 0.4348
Epoch 2/16
625/625 [==============================] - 3s 4ms/step - loss: 1.5866 - accuracy:
0.4353 - val_loss: 1.4870 - val_accuracy: 0.4693
Epoch 3/16
625/625 [==============================] - 3s 4ms/step - loss: 1.4482 - accuracy:
0.4823 - val_loss: 1.4222 - val_accuracy: 0.4982
Epoch 4/16
625/625 [==============================] - 3s 4ms/step - loss: 1.3456 - accuracy:
0.5220 - val_loss: 1.3158 - val_accuracy: 0.5352
Epoch 5/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2811 - accuracy:
0.5474 - val_loss: 1.2804 - val_accuracy: 0.5425
Epoch 6/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2283 - accuracy:
0.5703 - val_loss: 1.2499 - val_accuracy: 0.5520
Epoch 7/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1814 - accuracy:
0.5823 - val_loss: 1.2165 - val_accuracy: 0.5674
Epoch 8/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1349 - accuracy:
0.6058 - val_loss: 1.2130 - val_accuracy: 0.5700
Epoch 9/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0790 - accuracy:
0.6227 - val_loss: 1.1756 - val_accuracy: 0.5824
Epoch 10/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0422 - accuracy:
0.6349 - val_loss: 1.1523 - val_accuracy: 0.5947
Epoch 11/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0103 - accuracy:
0.6480 - val_loss: 1.1464 - val_accuracy: 0.5974
Epoch 12/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9651 - accuracy:
0.6652 - val_loss: 1.1232 - val_accuracy: 0.6110
Epoch 13/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9326 - accuracy:
0.6706 - val_loss: 1.1773 - val_accuracy: 0.5926
Epoch 14/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8817 - accuracy:
0.6925 - val_loss: 1.1198 - val_accuracy: 0.6178
Epoch 15/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8554 - accuracy:
0.7007 - val_loss: 1.0959 - val_accuracy: 0.6212
Epoch 16/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8215 - accuracy:
0.7149 - val_loss: 1.1028 - val_accuracy: 0.6241
313/313 [==============================] - 1s 3ms/step - loss: 1.1028 - accuracy:
0.6241
```

```
                  --------------------------------------
                  Fold 2/5 Validation Accuracy: 62.410



           Training new baseline model for fold 3
           --------------------------------------
Epoch 1/16
625/625 [==============================] - 3s 5ms/step - loss: 2.0008 - accuracy:
0.2768 - val_loss: 1.6247 - val_accuracy: 0.4240
Epoch 2/16
625/625 [==============================] - 3s 4ms/step - loss: 1.5856 - accuracy:
0.4354 - val_loss: 1.4708 - val_accuracy: 0.4776
Epoch 3/16
625/625 [==============================] - 3s 4ms/step - loss: 1.4388 - accuracy:
0.4840 - val_loss: 1.3723 - val_accuracy: 0.5127
Epoch 4/16
625/625 [==============================] - 3s 4ms/step - loss: 1.3577 - accuracy:
0.5196 - val_loss: 1.3265 - val_accuracy: 0.5306
Epoch 5/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2934 - accuracy:
0.5411 - val_loss: 1.3066 - val_accuracy: 0.5370
Epoch 6/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2440 - accuracy:
0.5607 - val_loss: 1.2513 - val_accuracy: 0.5601
Epoch 7/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1826 - accuracy:
0.5808 - val_loss: 1.2323 - val_accuracy: 0.5671
Epoch 8/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1465 - accuracy:
0.5987 - val_loss: 1.2199 - val_accuracy: 0.5751
Epoch 9/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0931 - accuracy:
0.6152 - val_loss: 1.2009 - val_accuracy: 0.5773
Epoch 10/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0742 - accuracy:
0.6196 - val_loss: 1.1684 - val_accuracy: 0.5907
Epoch 11/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0202 - accuracy:
0.6430 - val_loss: 1.1346 - val_accuracy: 0.6039
Epoch 12/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9913 - accuracy:
0.6550 - val_loss: 1.1502 - val_accuracy: 0.6053
Epoch 13/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9460 - accuracy:
0.6705 - val_loss: 1.1147 - val_accuracy: 0.6135
Epoch 14/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9138 - accuracy:
0.6829 - val_loss: 1.1641 - val_accuracy: 0.6029
Epoch 15/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8821 - accuracy:
0.6912 - val_loss: 1.1033 - val_accuracy: 0.6204
Epoch 16/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8401 - accuracy:
0.7098 - val_loss: 1.1328 - val_accuracy: 0.6122
313/313 [==============================] - 1s 3ms/step - loss: 1.1328 - accuracy:
0.6123
                  --------------------------------------
                  Fold 3/5 Validation Accuracy: 61.230
```

```
        Training new baseline model for fold 4
        --------------------------------------
Epoch 1/16
625/625 [==============================] - 3s 5ms/step - loss: 2.0458 - accuracy:
0.2527 - val_loss: 1.6682 - val_accuracy: 0.4030
Epoch 2/16
625/625 [==============================] - 3s 4ms/step - loss: 1.5918 - accuracy:
0.4390 - val_loss: 1.4973 - val_accuracy: 0.4628
Epoch 3/16
625/625 [==============================] - 3s 4ms/step - loss: 1.4340 - accuracy:
0.4894 - val_loss: 1.4032 - val_accuracy: 0.4979
Epoch 4/16
625/625 [==============================] - 3s 4ms/step - loss: 1.3470 - accuracy:
0.5192 - val_loss: 1.3445 - val_accuracy: 0.5221
Epoch 5/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2946 - accuracy:
0.5391 - val_loss: 1.3331 - val_accuracy: 0.5239
Epoch 6/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2379 - accuracy:
0.5659 - val_loss: 1.3016 - val_accuracy: 0.5383
Epoch 7/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1974 - accuracy:
0.5782 - val_loss: 1.2665 - val_accuracy: 0.5535
Epoch 8/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1408 - accuracy:
0.6014 - val_loss: 1.2455 - val_accuracy: 0.5571
Epoch 9/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1003 - accuracy:
0.6167 - val_loss: 1.2197 - val_accuracy: 0.5691
Epoch 10/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0565 - accuracy:
0.6326 - val_loss: 1.2120 - val_accuracy: 0.5779
Epoch 11/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0259 - accuracy:
0.6454 - val_loss: 1.1735 - val_accuracy: 0.5859
Epoch 12/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9805 - accuracy:
0.6586 - val_loss: 1.1362 - val_accuracy: 0.5994
Epoch 13/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9621 - accuracy:
0.6667 - val_loss: 1.1982 - val_accuracy: 0.5818
Epoch 14/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9288 - accuracy:
0.6742 - val_loss: 1.1350 - val_accuracy: 0.5982
Epoch 15/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8764 - accuracy:
0.6962 - val_loss: 1.1088 - val_accuracy: 0.6099
Epoch 16/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8479 - accuracy:
0.7059 - val_loss: 1.0937 - val_accuracy: 0.6160
313/313 [==============================] - 1s 3ms/step - loss: 1.0937 - accuracy:
0.6160
        --------------------------------------
        Fold 4/5 Validation Accuracy: 61.600
```

```
      Training new baseline model for fold 5
      -----------------------------------------
Epoch 1/16
625/625 [==============================] - 3s 5ms/step - loss: 2.0428 - accuracy:
0.2608 - val_loss: 1.6620 - val_accuracy: 0.4167
Epoch 2/16
625/625 [==============================] - 3s 4ms/step - loss: 1.6111 - accuracy:
0.4349 - val_loss: 1.5292 - val_accuracy: 0.4591
Epoch 3/16
625/625 [==============================] - 3s 4ms/step - loss: 1.4512 - accuracy:
0.4801 - val_loss: 1.3926 - val_accuracy: 0.5077
Epoch 4/16
625/625 [==============================] - 3s 4ms/step - loss: 1.3534 - accuracy:
0.5209 - val_loss: 1.3392 - val_accuracy: 0.5265
Epoch 5/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2806 - accuracy:
0.5480 - val_loss: 1.2750 - val_accuracy: 0.5484
Epoch 6/16
625/625 [==============================] - 3s 4ms/step - loss: 1.2294 - accuracy:
0.5665 - val_loss: 1.2563 - val_accuracy: 0.5601
Epoch 7/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1683 - accuracy:
0.5864 - val_loss: 1.2423 - val_accuracy: 0.5636
Epoch 8/16
625/625 [==============================] - 3s 4ms/step - loss: 1.1173 - accuracy:
0.6079 - val_loss: 1.2082 - val_accuracy: 0.5763
Epoch 9/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0663 - accuracy:
0.6292 - val_loss: 1.2047 - val_accuracy: 0.5716
Epoch 10/16
625/625 [==============================] - 3s 4ms/step - loss: 1.0376 - accuracy:
0.6371 - val_loss: 1.1742 - val_accuracy: 0.5907
Epoch 11/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9925 - accuracy:
0.6525 - val_loss: 1.1453 - val_accuracy: 0.5941
Epoch 12/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9529 - accuracy:
0.6670 - val_loss: 1.1333 - val_accuracy: 0.6015
Epoch 13/16
625/625 [==============================] - 3s 4ms/step - loss: 0.9136 - accuracy:
0.6814 - val_loss: 1.1360 - val_accuracy: 0.6060
Epoch 14/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8758 - accuracy:
0.6964 - val_loss: 1.1411 - val_accuracy: 0.6062
Epoch 15/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8539 - accuracy:
0.7034 - val_loss: 1.1149 - val_accuracy: 0.6151
Epoch 16/16
625/625 [==============================] - 3s 4ms/step - loss: 0.8213 - accuracy:
0.7152 - val_loss: 1.1164 - val_accuracy: 0.6165
313/313 [==============================] - 1s 3ms/step - loss: 1.1164 - accuracy:
0.6165
      ------------------------------------
      Fold 5/5 Validation Accuracy: 61.650
```

2. APPENDIX B - IMPROVED MODEL RESULTS

```
Transforming data...
Evaluating data...
Creating cross validation folds...

        Training new improved model for fold 1
        ---------------------------------------
Epoch 1/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.9878 - accuracy:
0.2830 - val_loss: 1.5545 - val_accuracy: 0.4535
Epoch 2/20
1250/1250 [==============================] - 4s 4ms/step - loss: 1.4900 - accuracy:
0.4644 - val_loss: 1.3722 - val_accuracy: 0.5120
Epoch 3/20
1250/1250 [==============================] - 4s 4ms/step - loss: 1.3242 - accuracy:
0.5309 - val_loss: 1.3071 - val_accuracy: 0.5400
Epoch 4/20
1250/1250 [==============================] - 4s 4ms/step - loss: 1.2293 - accuracy:
0.5687 - val_loss: 1.2605 - val_accuracy: 0.5597
Epoch 5/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.1490 - accuracy:
0.5999 - val_loss: 1.1606 - val_accuracy: 0.5970
Epoch 6/20
1250/1250 [==============================] - 4s 4ms/step - loss: 1.0655 - accuracy:
0.6329 - val_loss: 1.1516 - val_accuracy: 0.6012
Epoch 7/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.9944 - accuracy:
0.6575 - val_loss: 1.0937 - val_accuracy: 0.6178
Epoch 8/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.9365 - accuracy:
0.6764 - val_loss: 1.0610 - val_accuracy: 0.6327
Epoch 9/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8846 - accuracy:
0.6916 - val_loss: 1.0473 - val_accuracy: 0.6410
Epoch 10/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8351 - accuracy:
0.7118 - val_loss: 1.0391 - val_accuracy: 0.6395
Epoch 11/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7870 - accuracy:
0.7327 - val_loss: 1.0334 - val_accuracy: 0.6460
Epoch 12/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7439 - accuracy:
0.7453 - val_loss: 1.0554 - val_accuracy: 0.6454
Epoch 13/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.6902 - accuracy:
0.7650 - val_loss: 0.9997 - val_accuracy: 0.6608
Epoch 14/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.6466 - accuracy:
0.7817 - val_loss: 1.0110 - val_accuracy: 0.6597
Epoch 15/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.6075 - accuracy:
0.7933 - val_loss: 1.0359 - val_accuracy: 0.6564
Epoch 16/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5648 - accuracy:
0.8092 - val_loss: 1.0130 - val_accuracy: 0.6630
Epoch 17/20
```

```
1250/1250 [==============================] - 4s 4ms/step - loss: 0.5153 - accuracy:
0.8293 - val_loss: 1.0210 - val_accuracy: 0.6679
Epoch 18/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.4732 - accuracy:
0.8449 - val_loss: 1.0753 - val_accuracy: 0.6596
Epoch 19/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.4317 - accuracy:
0.8594 - val_loss: 1.0748 - val_accuracy: 0.6622
Epoch 20/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.3875 - accuracy:
0.8760 - val_loss: 1.1226 - val_accuracy: 0.6553
313/313 [==============================] - 1s 3ms/step - loss: 1.1226 - accuracy:
0.6553
        -------------------------------------
        Fold 1/5 Validation Accuracy: 65.530



        Training new improved model for fold 2
        -------------------------------------
Epoch 1/20
1250/1250 [==============================] - 5s 4ms/step - loss: 2.0894 - accuracy:
0.2350 - val_loss: 1.6991 - val_accuracy: 0.4071
Epoch 2/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.6166 - accuracy:
0.4285 - val_loss: 1.4300 - val_accuracy: 0.4970
Epoch 3/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.3880 - accuracy:
0.5118 - val_loss: 1.3311 - val_accuracy: 0.5195
Epoch 4/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.2639 - accuracy:
0.5538 - val_loss: 1.2254 - val_accuracy: 0.5629
Epoch 5/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.1755 - accuracy:
0.5883 - val_loss: 1.1883 - val_accuracy: 0.5750
Epoch 6/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0914 - accuracy:
0.6209 - val_loss: 1.1227 - val_accuracy: 0.6017
Epoch 7/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0221 - accuracy:
0.6449 - val_loss: 1.0720 - val_accuracy: 0.6226
Epoch 8/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9551 - accuracy:
0.6661 - val_loss: 1.0580 - val_accuracy: 0.6281
Epoch 9/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9152 - accuracy:
0.6857 - val_loss: 1.0439 - val_accuracy: 0.6335
Epoch 10/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8652 - accuracy:
0.7036 - val_loss: 1.0317 - val_accuracy: 0.6376
Epoch 11/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8091 - accuracy:
0.7209 - val_loss: 1.0080 - val_accuracy: 0.6486
Epoch 12/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7680 - accuracy:
0.7371 - val_loss: 1.0211 - val_accuracy: 0.6482
Epoch 13/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7281 - accuracy:
0.7551 - val_loss: 1.0186 - val_accuracy: 0.6462
```

```
Epoch 14/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6734 - accuracy:
0.7696 - val_loss: 1.0202 - val_accuracy: 0.6535
Epoch 15/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6381 - accuracy:
0.7856 - val_loss: 0.9930 - val_accuracy: 0.6619
Epoch 16/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5843 - accuracy:
0.8034 - val_loss: 1.0070 - val_accuracy: 0.6618
Epoch 17/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5359 - accuracy:
0.8233 - val_loss: 1.0436 - val_accuracy: 0.6561
Epoch 18/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5048 - accuracy:
0.8358 - val_loss: 1.0376 - val_accuracy: 0.6590
Epoch 19/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4575 - accuracy:
0.8518 - val_loss: 1.0491 - val_accuracy: 0.6609
Epoch 20/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4127 - accuracy:
0.8686 - val_loss: 1.0697 - val_accuracy: 0.6630
313/313 [==============================] - 1s 3ms/step - loss: 1.0697 - accuracy:
0.6630
        -------------------------------------
        Fold 2/5 Validation Accuracy: 66.300



        Training new improved model for fold 3
        -------------------------------------
Epoch 1/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.9598 - accuracy:
0.2929 - val_loss: 1.5383 - val_accuracy: 0.4593
Epoch 2/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.5148 - accuracy:
0.4612 - val_loss: 1.3919 - val_accuracy: 0.5076
Epoch 3/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.3461 - accuracy:
0.5222 - val_loss: 1.2712 - val_accuracy: 0.5545
Epoch 4/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.2201 - accuracy:
0.5689 - val_loss: 1.2260 - val_accuracy: 0.5611
Epoch 5/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.1393 - accuracy:
0.6007 - val_loss: 1.1796 - val_accuracy: 0.5860
Epoch 6/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0663 - accuracy:
0.6281 - val_loss: 1.1439 - val_accuracy: 0.6019
Epoch 7/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0044 - accuracy:
0.6482 - val_loss: 1.0844 - val_accuracy: 0.6158
Epoch 8/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9504 - accuracy:
0.6704 - val_loss: 1.0695 - val_accuracy: 0.6227
Epoch 9/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8972 - accuracy:
0.6911 - val_loss: 1.0457 - val_accuracy: 0.6383
Epoch 10/20
```

```
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8316 - accuracy:
0.7154 - val_loss: 1.0236 - val_accuracy: 0.6458
Epoch 11/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7836 - accuracy:
0.7309 - val_loss: 1.0111 - val_accuracy: 0.6511
Epoch 12/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7253 - accuracy:
0.7520 - val_loss: 1.0238 - val_accuracy: 0.6463
Epoch 13/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6819 - accuracy:
0.7651 - val_loss: 0.9795 - val_accuracy: 0.6670
Epoch 14/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6394 - accuracy:
0.7855 - val_loss: 0.9933 - val_accuracy: 0.6638
Epoch 15/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5965 - accuracy:
0.8018 - val_loss: 1.0130 - val_accuracy: 0.6578
Epoch 16/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5497 - accuracy:
0.8151 - val_loss: 0.9960 - val_accuracy: 0.6686
Epoch 17/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5082 - accuracy:
0.8333 - val_loss: 1.0038 - val_accuracy: 0.6675
Epoch 18/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4695 - accuracy:
0.8443 - val_loss: 1.0185 - val_accuracy: 0.6712
Epoch 19/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4176 - accuracy:
0.8671 - val_loss: 1.0902 - val_accuracy: 0.6602
Epoch 20/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.3821 - accuracy:
0.8786 - val_loss: 1.0811 - val_accuracy: 0.6674
313/313 [==============================] - 1s 3ms/step - loss: 1.0811 - accuracy:
0.6674
        -----------------------------------
        Fold 3/5 Validation Accuracy: 66.740


        Training new improved model for fold 4
        ---------------------------------------
Epoch 1/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.9690 - accuracy:
0.2858 - val_loss: 1.5686 - val_accuracy: 0.4378
Epoch 2/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.4972 - accuracy:
0.4681 - val_loss: 1.4038 - val_accuracy: 0.4993
Epoch 3/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.3262 - accuracy:
0.5293 - val_loss: 1.3080 - val_accuracy: 0.5364
Epoch 4/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.2044 - accuracy:
0.5768 - val_loss: 1.2447 - val_accuracy: 0.5631
Epoch 5/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.1155 - accuracy:
0.6111 - val_loss: 1.1766 - val_accuracy: 0.5846
Epoch 6/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0401 - accuracy:
0.6404 - val_loss: 1.1321 - val_accuracy: 0.6036
```

```
Epoch 7/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9755 - accuracy:
0.6638 - val_loss: 1.0757 - val_accuracy: 0.6245
Epoch 8/20
1250/1250 [==============================] - 4s 4ms/step - loss: 0.8990 - accuracy:
0.6912 - val_loss: 1.0515 - val_accuracy: 0.6320
Epoch 9/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8549 - accuracy:
0.7062 - val_loss: 1.0199 - val_accuracy: 0.6492
Epoch 10/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8029 - accuracy:
0.7251 - val_loss: 1.0501 - val_accuracy: 0.6396
Epoch 11/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7500 - accuracy:
0.7470 - val_loss: 1.0144 - val_accuracy: 0.6572
Epoch 12/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7004 - accuracy:
0.7633 - val_loss: 1.0004 - val_accuracy: 0.6549
Epoch 13/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6496 - accuracy:
0.7795 - val_loss: 0.9978 - val_accuracy: 0.6624
Epoch 14/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6094 - accuracy:
0.7965 - val_loss: 1.0138 - val_accuracy: 0.6603
Epoch 15/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5646 - accuracy:
0.8102 - val_loss: 1.0066 - val_accuracy: 0.6646
Epoch 16/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5229 - accuracy:
0.8291 - val_loss: 1.0716 - val_accuracy: 0.6475
Epoch 17/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4777 - accuracy:
0.8431 - val_loss: 1.0464 - val_accuracy: 0.6624
Epoch 18/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4295 - accuracy:
0.8615 - val_loss: 1.0813 - val_accuracy: 0.6622
Epoch 19/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.3920 - accuracy:
0.8770 - val_loss: 1.1239 - val_accuracy: 0.6508
Epoch 20/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.3435 - accuracy:
0.8940 - val_loss: 1.1719 - val_accuracy: 0.6530
313/313 [==============================] - 1s 3ms/step - loss: 1.1719 - accuracy:
0.6530
        ------------------------------------
        Fold 4/5 Validation Accuracy: 65.300




        Training new improved model for fold 5
        ---------------------------------------
Epoch 1/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.9656 - accuracy:
0.2879 - val_loss: 1.5646 - val_accuracy: 0.4420
Epoch 2/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.5051 - accuracy:
0.4704 - val_loss: 1.3774 - val_accuracy: 0.5052
Epoch 3/20
```

```
1250/1250 [==============================] - 5s 4ms/step - loss: 1.3288 - accuracy:
0.5319 - val_loss: 1.2804 - val_accuracy: 0.5463
Epoch 4/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.2214 - accuracy:
0.5699 - val_loss: 1.2001 - val_accuracy: 0.5768
Epoch 5/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.1245 - accuracy:
0.6095 - val_loss: 1.1862 - val_accuracy: 0.5818
Epoch 6/20
1250/1250 [==============================] - 5s 4ms/step - loss: 1.0636 - accuracy:
0.6281 - val_loss: 1.1664 - val_accuracy: 0.5853
Epoch 7/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9857 - accuracy:
0.6575 - val_loss: 1.1148 - val_accuracy: 0.6104
Epoch 8/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.9368 - accuracy:
0.6793 - val_loss: 1.0531 - val_accuracy: 0.6366
Epoch 9/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8697 - accuracy:
0.7001 - val_loss: 1.0430 - val_accuracy: 0.6383
Epoch 10/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.8171 - accuracy:
0.7203 - val_loss: 1.0053 - val_accuracy: 0.6563
Epoch 11/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7654 - accuracy:
0.7387 - val_loss: 1.0129 - val_accuracy: 0.6552
Epoch 12/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.7182 - accuracy:
0.7559 - val_loss: 1.0573 - val_accuracy: 0.6437
Epoch 13/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6831 - accuracy:
0.7698 - val_loss: 1.0296 - val_accuracy: 0.6551
Epoch 14/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.6393 - accuracy:
0.7858 - val_loss: 1.0365 - val_accuracy: 0.6531
Epoch 15/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5928 - accuracy:
0.8002 - val_loss: 1.0337 - val_accuracy: 0.6584
Epoch 16/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5480 - accuracy:
0.8187 - val_loss: 1.0248 - val_accuracy: 0.6688
Epoch 17/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.5001 - accuracy:
0.8372 - val_loss: 1.0450 - val_accuracy: 0.6640
Epoch 18/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4553 - accuracy:
0.8515 - val_loss: 1.0809 - val_accuracy: 0.6583
Epoch 19/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.4210 - accuracy:
0.8651 - val_loss: 1.1062 - val_accuracy: 0.6567
Epoch 20/20
1250/1250 [==============================] - 5s 4ms/step - loss: 0.3762 - accuracy:
0.8793 - val_loss: 1.1297 - val_accuracy: 0.6589
313/313 [==============================] - 1s 3ms/step - loss: 1.1297 - accuracy:
0.6589
        -------------------------------------
        Fold 5/5 Validation Accuracy: 65.890
```

2.1. ADVANCED MODEL

```
Transforming data...
Evaluating data...
Creating cross validation folds...

        Training new advanced model for fold 1
        ----------------------------------------
/usr/local/lib/python3.7/dist-packages/tensorflow/python/keras/engine/training.py:1844:
UserWarning: `Model.fit_generator` is deprecated and will be removed in a future
version. Please use `Model.fit`, which supports generators.
  warnings.warn('`Model.fit_generator` is deprecated and '
Epoch 1/30
1406/1406 [==============================] - 35s 23ms/step - loss: 2.2263 - accuracy:
0.2609 - val_loss: 1.6841 - val_accuracy: 0.4562
Epoch 2/30
1406/1406 [==============================] - 32s 23ms/step - loss: 1.3084 - accuracy:
0.5309 - val_loss: 1.5522 - val_accuracy: 0.5150
Epoch 3/30
1406/1406 [==============================] - 32s 23ms/step - loss: 1.1239 - accuracy:
0.6078 - val_loss: 0.9337 - val_accuracy: 0.6730
Epoch 4/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.9823 - accuracy:
0.6627 - val_loss: 0.9417 - val_accuracy: 0.6818
Epoch 5/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.8633 - accuracy:
0.7116 - val_loss: 0.8694 - val_accuracy: 0.7046
Epoch 6/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.7998 - accuracy:
0.7305 - val_loss: 0.8797 - val_accuracy: 0.7430
Epoch 7/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.7195 - accuracy:
0.7632 - val_loss: 0.6374 - val_accuracy: 0.7802
Epoch 8/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.6610 - accuracy:
0.7844 - val_loss: 0.7527 - val_accuracy: 0.7560
Epoch 9/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.6606 - accuracy:
0.7826 - val_loss: 0.7078 - val_accuracy: 0.7696
Epoch 10/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5886 - accuracy:
0.8081 - val_loss: 0.6714 - val_accuracy: 0.7760
Epoch 11/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5684 - accuracy:
0.8149 - val_loss: 0.8044 - val_accuracy: 0.7732
Epoch 12/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5194 - accuracy:
0.8322 - val_loss: 0.7887 - val_accuracy: 0.8050
Epoch 13/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5022 - accuracy:
0.8385 - val_loss: 0.4770 - val_accuracy: 0.8388
Epoch 14/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4768 - accuracy:
0.8465 - val_loss: 0.4958 - val_accuracy: 0.8442
Epoch 15/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4592 - accuracy:
0.8525 - val_loss: 0.6331 - val_accuracy: 0.8446
```

```
Epoch 16/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.4395 - accuracy:
0.8592 - val_loss: 0.4873 - val_accuracy: 0.8366
Epoch 17/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4138 - accuracy:
0.8676 - val_loss: 0.5074 - val_accuracy: 0.8356
Epoch 18/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3991 - accuracy:
0.8726 - val_loss: 0.5300 - val_accuracy: 0.8316
Epoch 19/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3827 - accuracy:
0.8753 - val_loss: 0.4621 - val_accuracy: 0.8596
Epoch 20/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3799 - accuracy:
0.8772 - val_loss: 0.6167 - val_accuracy: 0.8214
Epoch 21/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3617 - accuracy:
0.8846 - val_loss: 0.4305 - val_accuracy: 0.8584
Epoch 22/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3483 - accuracy:
0.8876 - val_loss: 0.4535 - val_accuracy: 0.8616
Epoch 23/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3305 - accuracy:
0.8949 - val_loss: 0.4405 - val_accuracy: 0.8684
Epoch 24/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3255 - accuracy:
0.8977 - val_loss: 0.4036 - val_accuracy: 0.8676
Epoch 25/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3123 - accuracy:
0.8993 - val_loss: 0.5233 - val_accuracy: 0.8430
Epoch 26/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3072 - accuracy:
0.8994 - val_loss: 0.4427 - val_accuracy: 0.8830
Epoch 27/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2930 - accuracy:
0.9082 - val_loss: 0.4498 - val_accuracy: 0.8628
Epoch 28/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2821 - accuracy:
0.9086 - val_loss: 0.6275 - val_accuracy: 0.8802
Epoch 29/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2875 - accuracy:
0.9099 - val_loss: 0.3418 - val_accuracy: 0.8838
Epoch 30/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2617 - accuracy:
0.9161 - val_loss: 0.7992 - val_accuracy: 0.8838
157/157 [==============================] - 1s 4ms/step - loss: 0.7992 - accuracy:
0.8838
        ------------------------------------
        Fold 1/10 Validation Accuracy: 88.380



        Training new advanced model for fold 2
        ---------------------------------------
Epoch 1/30
1406/1406 [==============================] - 36s 24ms/step - loss: 2.2295 - accuracy:
0.2622 - val_loss: 1.4166 - val_accuracy: 0.5070
Epoch 2/30
```

```
1406/1406 [==============================] - 34s 24ms/step - loss: 1.3459 - accuracy:
0.5181 - val_loss: 1.3567 - val_accuracy: 0.5560
Epoch 3/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.0965 - accuracy:
0.6160 - val_loss: 1.2748 - val_accuracy: 0.5728
Epoch 4/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.9843 - accuracy:
0.6596 - val_loss: 0.8023 - val_accuracy: 0.7248
Epoch 5/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.8608 - accuracy:
0.7097 - val_loss: 0.9668 - val_accuracy: 0.6816
Epoch 6/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7816 - accuracy:
0.7424 - val_loss: 0.8991 - val_accuracy: 0.7272
Epoch 7/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7392 - accuracy:
0.7559 - val_loss: 0.7175 - val_accuracy: 0.7694
Epoch 8/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.6755 - accuracy:
0.7781 - val_loss: 0.7542 - val_accuracy: 0.7972
Epoch 9/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.6156 - accuracy:
0.7989 - val_loss: 0.6509 - val_accuracy: 0.7842
Epoch 10/30
1406/1406 [==============================] - 37s 27ms/step - loss: 0.5871 - accuracy:
0.8079 - val_loss: 0.5849 - val_accuracy: 0.8114
Epoch 11/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.5523 - accuracy:
0.8248 - val_loss: 0.5582 - val_accuracy: 0.8130
Epoch 12/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.5220 - accuracy:
0.8313 - val_loss: 0.5818 - val_accuracy: 0.8208
Epoch 13/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4949 - accuracy:
0.8408 - val_loss: 0.4741 - val_accuracy: 0.8468
Epoch 14/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4864 - accuracy:
0.8429 - val_loss: 0.4253 - val_accuracy: 0.8590
Epoch 15/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4609 - accuracy:
0.8517 - val_loss: 0.8835 - val_accuracy: 0.8286
Epoch 16/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4397 - accuracy:
0.8574 - val_loss: 0.4051 - val_accuracy: 0.8680
Epoch 17/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.4201 - accuracy:
0.8649 - val_loss: 0.3960 - val_accuracy: 0.8750
Epoch 18/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3993 - accuracy:
0.8734 - val_loss: 0.4344 - val_accuracy: 0.8578
Epoch 19/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3884 - accuracy:
0.8764 - val_loss: 0.5682 - val_accuracy: 0.8302
Epoch 20/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3750 - accuracy:
0.8785 - val_loss: 0.3665 - val_accuracy: 0.8810
Epoch 21/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.3588 - accuracy:
0.8829 - val_loss: 0.3925 - val_accuracy: 0.8740
```

```
Epoch 22/30
1406/1406 [==============================] - 37s 26ms/step - loss: 0.3588 - accuracy:
0.8829 - val_loss: 0.7851 - val_accuracy: 0.8526
Epoch 23/30
1406/1406 [==============================] - 37s 26ms/step - loss: 0.3341 - accuracy:
0.8918 - val_loss: 0.3961 - val_accuracy: 0.8716
Epoch 24/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3323 - accuracy:
0.8917 - val_loss: 0.3994 - val_accuracy: 0.8960
Epoch 25/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3118 - accuracy:
0.8995 - val_loss: 0.4297 - val_accuracy: 0.8734
Epoch 26/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3073 - accuracy:
0.9008 - val_loss: 1.6138 - val_accuracy: 0.8594
Epoch 27/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2937 - accuracy:
0.9050 - val_loss: 0.3710 - val_accuracy: 0.8820
Epoch 28/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2859 - accuracy:
0.9086 - val_loss: 0.4244 - val_accuracy: 0.8742
Epoch 29/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2763 - accuracy:
0.9106 - val_loss: 0.3600 - val_accuracy: 0.8886
Epoch 30/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2635 - accuracy:
0.9171 - val_loss: 1.3112 - val_accuracy: 0.8986
157/157 [==============================] - 1s 4ms/step - loss: 1.3112 - accuracy:
0.8986
        ------------------------------------
        Fold 2/10 Validation Accuracy: 89.860


        Training new advanced model for fold 3
        ----------------------------------------
Epoch 1/30
1406/1406 [==============================] - 37s 25ms/step - loss: 2.2210 - accuracy:
0.2676 - val_loss: 1.7370 - val_accuracy: 0.4474
Epoch 2/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.3230 - accuracy:
0.5295 - val_loss: 1.1907 - val_accuracy: 0.6072
Epoch 3/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.1015 - accuracy:
0.6163 - val_loss: 1.1885 - val_accuracy: 0.5986
Epoch 4/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.9929 - accuracy:
0.6545 - val_loss: 1.0990 - val_accuracy: 0.6274
Epoch 5/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.9490 - accuracy:
0.6752 - val_loss: 0.8158 - val_accuracy: 0.7248
Epoch 6/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.8270 - accuracy:
0.7239 - val_loss: 0.8339 - val_accuracy: 0.7274
Epoch 7/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7800 - accuracy:
0.7440 - val_loss: 0.6278 - val_accuracy: 0.7906
Epoch 8/30
```

```
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7258 - accuracy:
0.7597 - val_loss: 1.5026 - val_accuracy: 0.6002
Epoch 9/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7079 - accuracy:
0.7728 - val_loss: 0.8051 - val_accuracy: 0.7902
Epoch 10/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.6384 - accuracy:
0.7937 - val_loss: 0.8116 - val_accuracy: 0.7420
Epoch 11/30
1406/1406 [==============================] - 36s 26ms/step - loss: 0.5877 - accuracy:
0.8083 - val_loss: 1.3377 - val_accuracy: 0.8108
Epoch 12/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5582 - accuracy:
0.8209 - val_loss: 0.7663 - val_accuracy: 0.8046
Epoch 13/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5204 - accuracy:
0.8319 - val_loss: 1.1735 - val_accuracy: 0.8412
Epoch 14/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5551 - accuracy:
0.8219 - val_loss: 0.6507 - val_accuracy: 0.8100
Epoch 15/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4784 - accuracy:
0.8470 - val_loss: 0.4787 - val_accuracy: 0.8578
Epoch 16/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4564 - accuracy:
0.8533 - val_loss: 0.9050 - val_accuracy: 0.7794
Epoch 17/30
1406/1406 [==============================] - 34s 25ms/step - loss: 0.4461 - accuracy:
0.8582 - val_loss: 0.8414 - val_accuracy: 0.7878
Epoch 18/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4287 - accuracy:
0.8620 - val_loss: 0.5790 - val_accuracy: 0.8394
Epoch 19/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4058 - accuracy:
0.8677 - val_loss: 0.6208 - val_accuracy: 0.8356
Epoch 20/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3894 - accuracy:
0.8763 - val_loss: 1.0199 - val_accuracy: 0.8302
Epoch 21/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3770 - accuracy:
0.8808 - val_loss: 1.2752 - val_accuracy: 0.8600
Epoch 22/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3620 - accuracy:
0.8863 - val_loss: 1.0590 - val_accuracy: 0.8272
Epoch 23/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3474 - accuracy:
0.8897 - val_loss: 0.9213 - val_accuracy: 0.8684
Epoch 24/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3443 - accuracy:
0.8900 - val_loss: 0.9464 - val_accuracy: 0.8858
Epoch 25/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3286 - accuracy:
0.8940 - val_loss: 2.0151 - val_accuracy: 0.8756
Epoch 26/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.3111 - accuracy:
0.9001 - val_loss: 0.4387 - val_accuracy: 0.8760
Epoch 27/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.2991 - accuracy:
0.9058 - val_loss: 0.8999 - val_accuracy: 0.8538
```

```
Epoch 28/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.3034 - accuracy:
0.9025 - val_loss: 1.4527 - val_accuracy: 0.8684
Epoch 29/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2917 - accuracy:
0.9062 - val_loss: 0.4079 - val_accuracy: 0.8870
Epoch 30/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2765 - accuracy:
0.9130 - val_loss: 0.4567 - val_accuracy: 0.8652
157/157 [==============================] - 1s 4ms/step - loss: 0.4567 - accuracy:
0.8652
        --------------------------------------
        Fold 3/10 Validation Accuracy: 86.520



        Training new advanced model for fold 4
        --------------------------------------
Epoch 1/30
1406/1406 [==============================] - 38s 26ms/step - loss: 2.2608 - accuracy:
0.2596 - val_loss: 1.4671 - val_accuracy: 0.4736
Epoch 2/30
1406/1406 [==============================] - 36s 25ms/step - loss: 1.3339 - accuracy:
0.5223 - val_loss: 1.1546 - val_accuracy: 0.5844
Epoch 3/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.1245 - accuracy:
0.6054 - val_loss: 0.8827 - val_accuracy: 0.6788
Epoch 4/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.9752 - accuracy:
0.6632 - val_loss: 0.9986 - val_accuracy: 0.6712
Epoch 5/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.8774 - accuracy:
0.7059 - val_loss: 0.9470 - val_accuracy: 0.6750
Epoch 6/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.8718 - accuracy:
0.7081 - val_loss: 0.6147 - val_accuracy: 0.7872
Epoch 7/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7478 - accuracy:
0.7503 - val_loss: 0.6584 - val_accuracy: 0.7748
Epoch 8/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7001 - accuracy:
0.7692 - val_loss: 0.9612 - val_accuracy: 0.7300
Epoch 9/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.6508 - accuracy:
0.7870 - val_loss: 0.5472 - val_accuracy: 0.8216
Epoch 10/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.6053 - accuracy:
0.8038 - val_loss: 0.6027 - val_accuracy: 0.8092
Epoch 11/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5733 - accuracy:
0.8138 - val_loss: 0.5029 - val_accuracy: 0.8336
Epoch 12/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5535 - accuracy:
0.8206 - val_loss: 0.7189 - val_accuracy: 0.8238
Epoch 13/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.5381 - accuracy:
0.8270 - val_loss: 0.4780 - val_accuracy: 0.8448
Epoch 14/30
```

```
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4770 - accuracy:
0.8441 - val_loss: 0.4500 - val_accuracy: 0.8604
Epoch 15/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4663 - accuracy:
0.8489 - val_loss: 0.4606 - val_accuracy: 0.8582
Epoch 16/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4446 - accuracy:
0.8554 - val_loss: 0.4214 - val_accuracy: 0.8688
Epoch 17/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4283 - accuracy:
0.8606 - val_loss: 0.6374 - val_accuracy: 0.8082
Epoch 18/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4202 - accuracy:
0.8638 - val_loss: 0.7181 - val_accuracy: 0.8368
Epoch 19/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4064 - accuracy:
0.8673 - val_loss: 0.4263 - val_accuracy: 0.8590
Epoch 20/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3882 - accuracy:
0.8744 - val_loss: 0.4218 - val_accuracy: 0.8736
Epoch 21/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3636 - accuracy:
0.8811 - val_loss: 0.4231 - val_accuracy: 0.8686
Epoch 22/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3629 - accuracy:
0.8839 - val_loss: 0.3897 - val_accuracy: 0.8814
Epoch 23/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3429 - accuracy:
0.8877 - val_loss: 0.4978 - val_accuracy: 0.8610
Epoch 24/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3397 - accuracy:
0.8886 - val_loss: 0.3967 - val_accuracy: 0.8734
Epoch 25/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3173 - accuracy:
0.8987 - val_loss: 0.4858 - val_accuracy: 0.8606
Epoch 26/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3170 - accuracy:
0.9012 - val_loss: 0.3827 - val_accuracy: 0.8766
Epoch 27/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3023 - accuracy:
0.9021 - val_loss: 0.4110 - val_accuracy: 0.8690
Epoch 28/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3000 - accuracy:
0.9023 - val_loss: 0.3958 - val_accuracy: 0.8856
Epoch 29/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2810 - accuracy:
0.9115 - val_loss: 0.4220 - val_accuracy: 0.8708
Epoch 30/30
1406/1406 [==============================] - 36s 25ms/step - loss: 0.2783 - accuracy:
0.9111 - val_loss: 0.3583 - val_accuracy: 0.8894
157/157 [==============================] - 1s 5ms/step - loss: 0.3583 - accuracy:
0.8894
        --------------------------------------
        Fold 4/10 Validation Accuracy: 88.940



        Training new advanced model for fold 5
        --------------------------------------
```

```
Epoch 1/30
1406/1406 [==============================] - 37s 25ms/step - loss: 2.2317 - accuracy:
0.2688 - val_loss: 1.6077 - val_accuracy: 0.4660
Epoch 2/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.3233 - accuracy:
0.5278 - val_loss: 1.4971 - val_accuracy: 0.5396
Epoch 3/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.0906 - accuracy:
0.6172 - val_loss: 1.7183 - val_accuracy: 0.5332
Epoch 4/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.9725 - accuracy:
0.6678 - val_loss: 1.0744 - val_accuracy: 0.6402
Epoch 5/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.9133 - accuracy:
0.6921 - val_loss: 0.9153 - val_accuracy: 0.6978
Epoch 6/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.7797 - accuracy:
0.7421 - val_loss: 0.9691 - val_accuracy: 0.6924
Epoch 7/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7235 - accuracy:
0.7598 - val_loss: 0.8566 - val_accuracy: 0.7726
Epoch 8/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.6713 - accuracy:
0.7798 - val_loss: 0.6305 - val_accuracy: 0.7866
Epoch 9/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.6307 - accuracy:
0.7952 - val_loss: 0.6077 - val_accuracy: 0.8012
Epoch 10/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.6285 - accuracy:
0.7958 - val_loss: 0.6015 - val_accuracy: 0.7924
Epoch 11/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5555 - accuracy:
0.8201 - val_loss: 0.6055 - val_accuracy: 0.8054
Epoch 12/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5283 - accuracy:
0.8306 - val_loss: 0.6675 - val_accuracy: 0.7868
Epoch 13/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5073 - accuracy:
0.8356 - val_loss: 0.5732 - val_accuracy: 0.8234
Epoch 14/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4837 - accuracy:
0.8453 - val_loss: 0.4901 - val_accuracy: 0.8606
Epoch 15/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4474 - accuracy:
0.8538 - val_loss: 0.5967 - val_accuracy: 0.8350
Epoch 16/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4424 - accuracy:
0.8586 - val_loss: 0.4952 - val_accuracy: 0.8534
Epoch 17/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4167 - accuracy:
0.8653 - val_loss: 0.3784 - val_accuracy: 0.8764
Epoch 18/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4024 - accuracy:
0.8718 - val_loss: 0.4526 - val_accuracy: 0.8608
Epoch 19/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3846 - accuracy:
0.8782 - val_loss: 0.4484 - val_accuracy: 0.8506
Epoch 20/30
```

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1406/1406 [==============================] - 35s 25ms/step - loss: 0.3748 - accuracy:
0.8791 - val_loss: 0.4077 - val_accuracy: 0.8710
Epoch 21/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3619 - accuracy:
0.8848 - val_loss: 0.4823 - val_accuracy: 0.8532
Epoch 22/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3533 - accuracy:
0.8875 - val_loss: 0.4205 - val_accuracy: 0.8622
Epoch 23/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3386 - accuracy:
0.8908 - val_loss: 0.4283 - val_accuracy: 0.8702
Epoch 24/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3264 - accuracy:
0.8949 - val_loss: 0.5401 - val_accuracy: 0.8296
Epoch 25/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3338 - accuracy:
0.8930 - val_loss: 0.5155 - val_accuracy: 0.8776
Epoch 26/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3082 - accuracy:
0.9026 - val_loss: 0.3754 - val_accuracy: 0.8800
Epoch 27/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2886 - accuracy:
0.9057 - val_loss: 0.3889 - val_accuracy: 0.8790
Epoch 28/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2878 - accuracy:
0.9076 - val_loss: 0.5154 - val_accuracy: 0.8742
Epoch 29/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2779 - accuracy:
0.9107 - val_loss: 0.4258 - val_accuracy: 0.8696
Epoch 30/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2728 - accuracy:
0.9110 - val_loss: 0.4611 - val_accuracy: 0.8622
157/157 [==============================] - 1s 4ms/step - loss: 0.4611 - accuracy:
0.8622
        ------------------------------------
        Fold 5/10 Validation Accuracy: 86.220


        Training new advanced model for fold 6
        ----------------------------------------
Epoch 1/30
1406/1406 [==============================] - 36s 24ms/step - loss: 2.2316 - accuracy:
0.2674 - val_loss: 1.5421 - val_accuracy: 0.4606
Epoch 2/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.3328 - accuracy:
0.5247 - val_loss: 1.1415 - val_accuracy: 0.5910
Epoch 3/30
1406/1406 [==============================] - 33s 24ms/step - loss: 1.1167 - accuracy:
0.6071 - val_loss: 0.8243 - val_accuracy: 0.7146
Epoch 4/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.9930 - accuracy:
0.6547 - val_loss: 0.9190 - val_accuracy: 0.7030
Epoch 5/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.8620 - accuracy:
0.7073 - val_loss: 0.7628 - val_accuracy: 0.7344
Epoch 6/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.8147 - accuracy:
0.7302 - val_loss: 0.8149 - val_accuracy: 0.7242
```

```
Epoch 7/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.7455 - accuracy:
0.7526 - val_loss: 0.6006 - val_accuracy: 0.7924
Epoch 8/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.6745 - accuracy:
0.7775 - val_loss: 0.6237 - val_accuracy: 0.7878
Epoch 9/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.6296 - accuracy:
0.7938 - val_loss: 0.5862 - val_accuracy: 0.8130
Epoch 10/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.5935 - accuracy:
0.8076 - val_loss: 0.7617 - val_accuracy: 0.7598
Epoch 11/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5687 - accuracy:
0.8177 - val_loss: 0.4315 - val_accuracy: 0.8564
Epoch 12/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5280 - accuracy:
0.8295 - val_loss: 0.5266 - val_accuracy: 0.8258
Epoch 13/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.5040 - accuracy:
0.8394 - val_loss: 0.4419 - val_accuracy: 0.8498
Epoch 14/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.4769 - accuracy:
0.8462 - val_loss: 0.5487 - val_accuracy: 0.8210
Epoch 15/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4639 - accuracy:
0.8489 - val_loss: 0.5010 - val_accuracy: 0.8440
Epoch 16/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4340 - accuracy:
0.8582 - val_loss: 0.4227 - val_accuracy: 0.8678
Epoch 17/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.4096 - accuracy:
0.8664 - val_loss: 0.5292 - val_accuracy: 0.8424
Epoch 18/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.4018 - accuracy:
0.8718 - val_loss: 0.7554 - val_accuracy: 0.8476
Epoch 19/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3801 - accuracy:
0.8761 - val_loss: 0.4270 - val_accuracy: 0.8592
Epoch 20/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3810 - accuracy:
0.8768 - val_loss: 0.4389 - val_accuracy: 0.8670
Epoch 21/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3870 - accuracy:
0.8728 - val_loss: 0.3857 - val_accuracy: 0.8810
Epoch 22/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3533 - accuracy:
0.8871 - val_loss: 0.3787 - val_accuracy: 0.8788
Epoch 23/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3467 - accuracy:
0.8899 - val_loss: 0.4056 - val_accuracy: 0.8682
Epoch 24/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3307 - accuracy:
0.8928 - val_loss: 0.4119 - val_accuracy: 0.8720
Epoch 25/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3187 - accuracy:
0.8966 - val_loss: 0.3865 - val_accuracy: 0.8744
Epoch 26/30
```

```
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3149 - accuracy:
0.8992 - val_loss: 0.3553 - val_accuracy: 0.8836
Epoch 27/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2912 - accuracy:
0.9054 - val_loss: 0.3809 - val_accuracy: 0.8828
Epoch 28/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3041 - accuracy:
0.9024 - val_loss: 0.4452 - val_accuracy: 0.8594
Epoch 29/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2868 - accuracy:
0.9081 - val_loss: 0.3938 - val_accuracy: 0.8782
Epoch 30/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2721 - accuracy:
0.9106 - val_loss: 0.4486 - val_accuracy: 0.8658
157/157 [==============================] - 1s 4ms/step - loss: 0.4486 - accuracy:
0.8658
            -------------------------------------
      Fold 6/10 Validation Accuracy: 86.580



      Training new advanced model for fold 7
      -------------------------------------
Epoch 1/30
1406/1406 [==============================] - 35s 24ms/step - loss: 2.3079 - accuracy:
0.2514 - val_loss: 1.9327 - val_accuracy: 0.4054
Epoch 2/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.3433 - accuracy:
0.5112 - val_loss: 1.1101 - val_accuracy: 0.6054
Epoch 3/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.1004 - accuracy:
0.6141 - val_loss: 1.0321 - val_accuracy: 0.6286
Epoch 4/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.9828 - accuracy:
0.6629 - val_loss: 1.0563 - val_accuracy: 0.6572
Epoch 5/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.8680 - accuracy:
0.7093 - val_loss: 0.8408 - val_accuracy: 0.7186
Epoch 6/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7883 - accuracy:
0.7383 - val_loss: 1.3586 - val_accuracy: 0.5810
Epoch 7/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7370 - accuracy:
0.7566 - val_loss: 0.6547 - val_accuracy: 0.7836
Epoch 8/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.6546 - accuracy:
0.7847 - val_loss: 0.4990 - val_accuracy: 0.8316
Epoch 9/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.6234 - accuracy:
0.7978 - val_loss: 0.6006 - val_accuracy: 0.7994
Epoch 10/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5701 - accuracy:
0.8145 - val_loss: 0.5411 - val_accuracy: 0.8212
Epoch 11/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.5515 - accuracy:
0.8233 - val_loss: 0.5797 - val_accuracy: 0.8424
Epoch 12/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.5134 - accuracy:
0.8334 - val_loss: 0.5935 - val_accuracy: 0.8134
```

```
Epoch 13/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.4838 - accuracy:
0.8439 - val_loss: 0.4572 - val_accuracy: 0.8518
Epoch 14/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4644 - accuracy:
0.8501 - val_loss: 0.6051 - val_accuracy: 0.8350
Epoch 15/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4522 - accuracy:
0.8516 - val_loss: 0.4979 - val_accuracy: 0.8412
Epoch 16/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4425 - accuracy:
0.8606 - val_loss: 0.4203 - val_accuracy: 0.8626
Epoch 17/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4084 - accuracy:
0.8681 - val_loss: 0.9803 - val_accuracy: 0.8464
Epoch 18/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3958 - accuracy:
0.8732 - val_loss: 0.7125 - val_accuracy: 0.8428
Epoch 19/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3886 - accuracy:
0.8737 - val_loss: 1.0955 - val_accuracy: 0.8742
Epoch 20/30
1406/1406 [==============================] - 34s 25ms/step - loss: 0.3572 - accuracy:
0.8848 - val_loss: 0.5294 - val_accuracy: 0.8300
Epoch 21/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3586 - accuracy:
0.8859 - val_loss: 0.4617 - val_accuracy: 0.8624
Epoch 22/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3433 - accuracy:
0.8878 - val_loss: 0.4039 - val_accuracy: 0.8732
Epoch 23/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3365 - accuracy:
0.8909 - val_loss: 1.1280 - val_accuracy: 0.8816
Epoch 24/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3248 - accuracy:
0.8976 - val_loss: 0.5753 - val_accuracy: 0.8724
Epoch 25/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3109 - accuracy:
0.8993 - val_loss: 0.3481 - val_accuracy: 0.8898
Epoch 26/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3118 - accuracy:
0.9002 - val_loss: 0.4236 - val_accuracy: 0.8686
Epoch 27/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2844 - accuracy:
0.9075 - val_loss: 1.9075 - val_accuracy: 0.8740
Epoch 28/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2709 - accuracy:
0.9144 - val_loss: 0.3627 - val_accuracy: 0.8862
Epoch 29/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3011 - accuracy:
0.9024 - val_loss: 0.3763 - val_accuracy: 0.8924
Epoch 30/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.2627 - accuracy:
0.9160 - val_loss: 0.5855 - val_accuracy: 0.8808
157/157 [==============================] - 1s 4ms/step - loss: 0.5855 - accuracy:
0.8808
        -------------------------------------
        Fold 7/10 Validation Accuracy: 88.080
```

```
      Training new advanced model for fold 8
      ---------------------------------------
Epoch 1/30
1406/1406 [==============================] - 36s 25ms/step - loss: 2.2209 - accuracy:
0.2636 - val_loss: 1.2450 - val_accuracy: 0.5508
Epoch 2/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.3432 - accuracy:
0.5175 - val_loss: 1.3327 - val_accuracy: 0.5564
Epoch 3/30
1406/1406 [==============================] - 35s 25ms/step - loss: 1.0911 - accuracy:
0.6205 - val_loss: 1.0675 - val_accuracy: 0.6348
Epoch 4/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.9808 - accuracy:
0.6631 - val_loss: 0.9526 - val_accuracy: 0.6772
Epoch 5/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.8700 - accuracy:
0.7054 - val_loss: 1.1495 - val_accuracy: 0.6636
Epoch 6/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7763 - accuracy:
0.7417 - val_loss: 0.8249 - val_accuracy: 0.7366
Epoch 7/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7107 - accuracy:
0.7633 - val_loss: 0.6731 - val_accuracy: 0.7848
Epoch 8/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.6503 - accuracy:
0.7902 - val_loss: 0.6145 - val_accuracy: 0.7996
Epoch 9/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.6101 - accuracy:
0.8008 - val_loss: 0.6204 - val_accuracy: 0.8038
Epoch 10/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5658 - accuracy:
0.8160 - val_loss: 0.4942 - val_accuracy: 0.8392
Epoch 11/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5595 - accuracy:
0.8175 - val_loss: 0.6563 - val_accuracy: 0.8044
Epoch 12/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5347 - accuracy:
0.8246 - val_loss: 0.4703 - val_accuracy: 0.8436
Epoch 13/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4848 - accuracy:
0.8426 - val_loss: 0.5130 - val_accuracy: 0.8516
Epoch 14/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.4780 - accuracy:
0.8454 - val_loss: 0.5626 - val_accuracy: 0.8254
Epoch 15/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4493 - accuracy:
0.8561 - val_loss: 0.5116 - val_accuracy: 0.8418
Epoch 16/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4382 - accuracy:
0.8584 - val_loss: 0.4396 - val_accuracy: 0.8590
Epoch 17/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4141 - accuracy:
0.8664 - val_loss: 0.5541 - val_accuracy: 0.8364
Epoch 18/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4061 - accuracy:
0.8691 - val_loss: 0.4005 - val_accuracy: 0.8700
Epoch 19/30
```

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1406/1406 [==============================] - 34s 24ms/step - loss: 0.3833 - accuracy:
0.8766 - val_loss: 0.4999 - val_accuracy: 0.8430
Epoch 20/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3726 - accuracy:
0.8803 - val_loss: 0.4854 - val_accuracy: 0.8574
Epoch 21/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3477 - accuracy:
0.8856 - val_loss: 0.4193 - val_accuracy: 0.8756
Epoch 22/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3407 - accuracy:
0.8903 - val_loss: 0.5617 - val_accuracy: 0.8738
Epoch 23/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3421 - accuracy:
0.8906 - val_loss: 0.4674 - val_accuracy: 0.8558
Epoch 24/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.3209 - accuracy:
0.8971 - val_loss: 0.5152 - val_accuracy: 0.8548
Epoch 25/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3183 - accuracy:
0.8985 - val_loss: 0.4207 - val_accuracy: 0.8734
Epoch 26/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3003 - accuracy:
0.9032 - val_loss: 0.4355 - val_accuracy: 0.8818
Epoch 27/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2938 - accuracy:
0.9046 - val_loss: 0.4755 - val_accuracy: 0.8860
Epoch 28/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2908 - accuracy:
0.9074 - val_loss: 0.4019 - val_accuracy: 0.8742
Epoch 29/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2791 - accuracy:
0.9080 - val_loss: 0.4370 - val_accuracy: 0.8928
Epoch 30/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.2780 - accuracy:
0.9098 - val_loss: 0.4617 - val_accuracy: 0.8806
157/157 [==============================] - 1s 4ms/step - loss: 0.4617 - accuracy:
0.8806
        ------------------------------------
        Fold 8/10 Validation Accuracy: 88.060


        Training new advanced model for fold 9
        ------------------------------------
Epoch 1/30
1406/1406 [==============================] - 37s 25ms/step - loss: 2.1979 - accuracy:
0.2714 - val_loss: 1.2551 - val_accuracy: 0.5452
Epoch 2/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.3339 - accuracy:
0.5219 - val_loss: 1.1762 - val_accuracy: 0.5882
Epoch 3/30
1406/1406 [==============================] - 34s 24ms/step - loss: 1.0701 - accuracy:
0.6279 - val_loss: 0.9327 - val_accuracy: 0.6842
Epoch 4/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.9340 - accuracy:
0.6863 - val_loss: 1.1617 - val_accuracy: 0.6394
Epoch 5/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.8304 - accuracy:
0.7246 - val_loss: 1.4632 - val_accuracy: 0.6448
```

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Epoch 6/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.7687 - accuracy:
0.7481 - val_loss: 0.9831 - val_accuracy: 0.6916
Epoch 7/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.6779 - accuracy:
0.7797 - val_loss: 0.7230 - val_accuracy: 0.7566
Epoch 8/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.6471 - accuracy:
0.7884 - val_loss: 0.6350 - val_accuracy: 0.7880
Epoch 9/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5842 - accuracy:
0.8109 - val_loss: 0.6080 - val_accuracy: 0.7958
Epoch 10/30
1406/1406 [==============================] - 35s 25ms/step - loss: 0.5655 - accuracy:
0.8160 - val_loss: 0.5561 - val_accuracy: 0.8106
Epoch 11/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5327 - accuracy:
0.8263 - val_loss: 0.4708 - val_accuracy: 0.8408
Epoch 12/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.5011 - accuracy:
0.8357 - val_loss: 0.4637 - val_accuracy: 0.8476
Epoch 13/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4721 - accuracy:
0.8461 - val_loss: 0.4250 - val_accuracy: 0.8564
Epoch 14/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4541 - accuracy:
0.8534 - val_loss: 0.6147 - val_accuracy: 0.8398
Epoch 15/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4300 - accuracy:
0.8609 - val_loss: 0.5568 - val_accuracy: 0.8534
Epoch 16/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4401 - accuracy:
0.8580 - val_loss: 0.4230 - val_accuracy: 0.8616
Epoch 17/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3973 - accuracy:
0.8726 - val_loss: 0.4703 - val_accuracy: 0.8420
Epoch 18/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3891 - accuracy:
0.8746 - val_loss: 0.4807 - val_accuracy: 0.8458
Epoch 19/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.3733 - accuracy:
0.8823 - val_loss: 0.4492 - val_accuracy: 0.8478
Epoch 20/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3557 - accuracy:
0.8860 - val_loss: 0.4446 - val_accuracy: 0.8540
Epoch 21/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3453 - accuracy:
0.8887 - val_loss: 0.4802 - val_accuracy: 0.8504
Epoch 22/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3407 - accuracy:
0.8908 - val_loss: 0.3605 - val_accuracy: 0.8792
Epoch 23/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3293 - accuracy:
0.8929 - val_loss: 0.3883 - val_accuracy: 0.8866
Epoch 24/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3174 - accuracy:
0.8989 - val_loss: 0.3654 - val_accuracy: 0.8726
Epoch 25/30
```

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1406/1406 [==============================] - 33s 23ms/step - loss: 0.3060 - accuracy:
0.9008 - val_loss: 0.4083 - val_accuracy: 0.8680
Epoch 26/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2893 - accuracy:
0.9065 - val_loss: 0.3767 - val_accuracy: 0.8778
Epoch 27/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2879 - accuracy:
0.9080 - val_loss: 0.4058 - val_accuracy: 0.8742
Epoch 28/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2767 - accuracy:
0.9105 - val_loss: 0.3691 - val_accuracy: 0.8854
Epoch 29/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2669 - accuracy:
0.9127 - val_loss: 0.3557 - val_accuracy: 0.8910
Epoch 30/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2681 - accuracy:
0.9119 - val_loss: 0.9050 - val_accuracy: 0.8776
157/157 [==============================] - 1s 4ms/step - loss: 0.9050 - accuracy:
0.8776
        ------------------------------------
        Fold 9/10 Validation Accuracy: 87.760


        Training new advanced model for fold 10
        ---------------------------------------
Epoch 1/30
1406/1406 [==============================] - 35s 24ms/step - loss: 2.2499 - accuracy:
0.2601 - val_loss: 2.0652 - val_accuracy: 0.4522
Epoch 2/30
1406/1406 [==============================] - 33s 24ms/step - loss: 1.3296 - accuracy:
0.5258 - val_loss: 1.1644 - val_accuracy: 0.5978
Epoch 3/30
1406/1406 [==============================] - 33s 23ms/step - loss: 1.0624 - accuracy:
0.6317 - val_loss: 1.2726 - val_accuracy: 0.5910
Epoch 4/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.9375 - accuracy:
0.6811 - val_loss: 0.8858 - val_accuracy: 0.6982
Epoch 5/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.8202 - accuracy:
0.7258 - val_loss: 0.7129 - val_accuracy: 0.7620
Epoch 6/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.7654 - accuracy:
0.7419 - val_loss: 0.6143 - val_accuracy: 0.7930
Epoch 7/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.6934 - accuracy:
0.7722 - val_loss: 0.6224 - val_accuracy: 0.7926
Epoch 8/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.6530 - accuracy:
0.7876 - val_loss: 0.6490 - val_accuracy: 0.7842
Epoch 9/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.6038 - accuracy:
0.8034 - val_loss: 0.5431 - val_accuracy: 0.8276
Epoch 10/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.5569 - accuracy:
0.8186 - val_loss: 0.5363 - val_accuracy: 0.8256
Epoch 11/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.5270 - accuracy:
0.8321 - val_loss: 0.4937 - val_accuracy: 0.8326
Epoch 12/30
```

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1406/1406 [==============================] - 33s 23ms/step - loss: 0.4977 - accuracy:
0.8389 - val_loss: 0.6137 - val_accuracy: 0.8028
Epoch 13/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4785 - accuracy:
0.8457 - val_loss: 0.5512 - val_accuracy: 0.8274
Epoch 14/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.4658 - accuracy:
0.8479 - val_loss: 0.4921 - val_accuracy: 0.8354
Epoch 15/30
1406/1406 [==============================] - 34s 24ms/step - loss: 0.4487 - accuracy:
0.8557 - val_loss: 0.4975 - val_accuracy: 0.8366
Epoch 16/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.4271 - accuracy:
0.8624 - val_loss: 0.4344 - val_accuracy: 0.8610
Epoch 17/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3981 - accuracy:
0.8702 - val_loss: 0.5036 - val_accuracy: 0.8486
Epoch 18/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3873 - accuracy:
0.8772 - val_loss: 0.4918 - val_accuracy: 0.8474
Epoch 19/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3757 - accuracy:
0.8800 - val_loss: 0.3712 - val_accuracy: 0.8772
Epoch 20/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3629 - accuracy:
0.8816 - val_loss: 0.4835 - val_accuracy: 0.8588
Epoch 21/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3497 - accuracy:
0.8887 - val_loss: 0.3973 - val_accuracy: 0.8786
Epoch 22/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.3326 - accuracy:
0.8936 - val_loss: 0.5324 - val_accuracy: 0.8542
Epoch 23/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3314 - accuracy:
0.8935 - val_loss: 0.4157 - val_accuracy: 0.8694
Epoch 24/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.3108 - accuracy:
0.8984 - val_loss: 0.4593 - val_accuracy: 0.8610
Epoch 25/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.3094 - accuracy:
0.8981 - val_loss: 0.3952 - val_accuracy: 0.8806
Epoch 26/30
1406/1406 [==============================] - 32s 23ms/step - loss: 0.2942 - accuracy:
0.9044 - val_loss: 0.4232 - val_accuracy: 0.8688
Epoch 27/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2847 - accuracy:
0.9071 - val_loss: 0.4275 - val_accuracy: 0.8838
Epoch 28/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2764 - accuracy:
0.9093 - val_loss: 0.3979 - val_accuracy: 0.8750
Epoch 29/30
1406/1406 [==============================] - 33s 24ms/step - loss: 0.2674 - accuracy:
0.9121 - val_loss: 0.3971 - val_accuracy: 0.8774
Epoch 30/30
1406/1406 [==============================] - 33s 23ms/step - loss: 0.2650 - accuracy:
0.9143 - val_loss: 0.4674 - val_accuracy: 0.8670
157/157 [==============================] - 1s 4ms/step - loss: 0.4674 - accuracy:
0.8670
        Fold 10/10 Validation Accuracy: 86.700
```