Training on Fold 1

2024-04-19 11:18:07.815623: I tensorflow/core/platform/cpu\_feature\_guard.cc:182] This TensorFlow binary is optimized to use available CPU instructions in performance-critical operations.

To enable the following instructions: SSE SSE2 SSE3 SSE4.1 SSE4.2 AVX AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.

Epoch 1/25

1282/1282 [==============================] - ETA: 0s - loss: 19.3757 - accuracy: 0.51522024-04-19 11:39:42.894297: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 21018624000 exceeds 10% of free system memory.

2024-04-19 11:40:46.320469: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 2705326080 exceeds 10% of free system memory.

2024-04-19 11:40:47.664961: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 2463498240 exceeds 10% of free system memory.

2024-04-19 11:40:48.795771: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 2463498240 exceeds 10% of free system memory.

1282/1282 [==============================] - 1362s 1s/step - loss: 19.3757 - accuracy: 0.5152 - val\_loss: 14.6088 - val\_accuracy: 0.5582 - lr: 1.0000e-05

Epoch 2/25

1282/1282 [==============================] - ETA: 0s - loss: 10.9919 - accuracy: 0.57602024-04-19 12:01:55.056032: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 21018624000 exceeds 10% of free system memory.

1282/1282 [==============================] - 1279s 997ms/step - loss: 10.9919 - accuracy: 0.5760 - val\_loss: 7.8728 - val\_accuracy: 0.6315 - lr: 1.0000e-05

Epoch 3/25

1282/1282 [==============================] - 1268s 989ms/step - loss: 5.7548 - accuracy: 0.6593 - val\_loss: 4.0276 - val\_accuracy: 0.6555 - lr: 1.0000e-05

Epoch 4/25

1282/1282 [==============================] - 1232s 961ms/step - loss: 2.8829 - accuracy: 0.7134 - val\_loss: 2.0584 - val\_accuracy: 0.6677 - lr: 1.0000e-05

Epoch 5/25

1282/1282 [==============================] - 1250s 975ms/step - loss: 1.4552 - accuracy: 0.7678 - val\_loss: 1.1979 - val\_accuracy: 0.6746 - lr: 1.0000e-05

Epoch 6/25

1282/1282 [==============================] - 1258s 981ms/step - loss: 0.8027 - accuracy: 0.8167 - val\_loss: 0.8516 - val\_accuracy: 0.6839 - lr: 1.0000e-05

Epoch 7/25

1282/1282 [==============================] - 1283s 1s/step - loss: 0.5074 - accuracy: 0.8560 - val\_loss: 0.7511 - val\_accuracy: 0.6878 - lr: 1.0000e-05

Epoch 8/25

1282/1282 [==============================] - 1300s 1s/step - loss: 0.3563 - accuracy: 0.8890 - val\_loss: 0.7746 - val\_accuracy: 0.6862 - lr: 1.0000e-05

Epoch 9/25

1282/1282 [==============================] - 1229s 959ms/step - loss: 0.2650 - accuracy: 0.9180 - val\_loss: 0.8153 - val\_accuracy: 0.6860 - lr: 1.0000e-05

Epoch 10/25

1282/1282 [==============================] - 1253s 977ms/step - loss: 0.2017 - accuracy: 0.9394 - val\_loss: 0.8586 - val\_accuracy: 0.6911 - lr: 1.0000e-05

Epoch 11/25

1282/1282 [==============================] - 1228s 957ms/step - loss: 0.1551 - accuracy: 0.9555 - val\_loss: 0.9728 - val\_accuracy: 0.6867 - lr: 1.0000e-05

Epoch 12/25

1282/1282 [==============================] - ETA: 0s - loss: 0.1187 - accuracy: 0.9682

Epoch 12: ReduceLROnPlateau reducing learning rate to 5.999999848427251e-06.

1282/1282 [==============================] - 1197s 934ms/step - loss: 0.1187 - accuracy: 0.9682 - val\_loss: 1.0039 - val\_accuracy: 0.6933 - lr: 1.0000e-05

Training on Fold 2

Epoch 1/25

1282/1282 [==============================] - 1284s 999ms/step - loss: 19.4128 - accuracy: 0.5095 - val\_loss: 14.6530 - val\_accuracy: 0.5744 - lr: 1.0000e-05

Epoch 2/25

1282/1282 [==============================] - 1277s 996ms/step - loss: 11.0325 - accuracy: 0.5656 - val\_loss: 7.9021 - val\_accuracy: 0.6260 - lr: 1.0000e-05

Epoch 3/25

1282/1282 [==============================] - 1211s 945ms/step - loss: 5.7875 - accuracy: 0.6545 - val\_loss: 4.0571 - val\_accuracy: 0.6576 - lr: 1.0000e-05

Epoch 4/25

1282/1282 [==============================] - 1248s 973ms/step - loss: 2.9148 - accuracy: 0.7093 - val\_loss: 2.0871 - val\_accuracy: 0.6657 - lr: 1.0000e-05

Epoch 5/25

1282/1282 [==============================] - 1239s 966ms/step - loss: 1.4768 - accuracy: 0.7629 - val\_loss: 1.1929 - val\_accuracy: 0.6781 - lr: 1.0000e-05

Epoch 6/25

1282/1282 [==============================] - 1230s 959ms/step - loss: 0.8160 - accuracy: 0.8114 - val\_loss: 0.8487 - val\_accuracy: 0.6845 - lr: 1.0000e-05

Epoch 7/25

1282/1282 [==============================] - 1245s 971ms/step - loss: 0.5141 - accuracy: 0.8522 - val\_loss: 0.7685 - val\_accuracy: 0.6839 - lr: 1.0000e-05

Epoch 8/25

1282/1282 [==============================] - 1251s 976ms/step - loss: 0.3613 - accuracy: 0.8866 - val\_loss: 0.7335 - val\_accuracy: 0.6913 - lr: 1.0000e-05

Epoch 9/25

1282/1282 [==============================] - 1246s 972ms/step - loss: 0.2695 - accuracy: 0.9147 - val\_loss: 0.7922 - val\_accuracy: 0.6904 - lr: 1.0000e-05

Epoch 10/25

1282/1282 [==============================] - 1212s 945ms/step - loss: 0.2056 - accuracy: 0.9377 - val\_loss: 0.8386 - val\_accuracy: 0.6969 - lr: 1.0000e-05

Epoch 11/25

1282/1282 [==============================] - 1214s 946ms/step - loss: 0.1573 - accuracy: 0.9546 - val\_loss: 0.9579 - val\_accuracy: 0.6892 - lr: 1.0000e-05

Epoch 12/25

1282/1282 [==============================] - 1208s 942ms/step - loss: 0.1213 - accuracy: 0.9672 - val\_loss: 1.0293 - val\_accuracy: 0.6908 - lr: 1.0000e-05

Epoch 13/25

1282/1282 [==============================] - ETA: 0s - loss: 0.0934 - accuracy: 0.9766

Epoch 13: ReduceLROnPlateau reducing learning rate to 5.999999848427251e-06.

1282/1282 [==============================] - 1293s 1s/step - loss: 0.0934 - accuracy: 0.9766 - val\_loss: 1.1205 - val\_accuracy: 0.6903 - lr: 1.0000e-05

Training on Fold 3

Epoch 1/25

1282/1282 [==============================] - 1311s 1s/step - loss: 19.4244 - accuracy: 0.5123 - val\_loss: 14.6654 - val\_accuracy: 0.5498 - lr: 1.0000e-05

Epoch 2/25

1282/1282 [==============================] - 1221s 952ms/step - loss: 11.0545 - accuracy: 0.5575 - val\_loss: 7.9273 - val\_accuracy: 0.6201 - lr: 1.0000e-05

Epoch 3/25

1282/1282 [==============================] - 1206s 940ms/step - loss: 5.7956 - accuracy: 0.6496 - val\_loss: 4.0550 - val\_accuracy: 0.6555 - lr: 1.0000e-05

Epoch 4/25

1282/1282 [==============================] - 1284s 1s/step - loss: 2.9206 - accuracy: 0.7049 - val\_loss: 2.0887 - val\_accuracy: 0.6642 - lr: 1.0000e-05

Epoch 5/25

1282/1282 [==============================] - 1235s 963ms/step - loss: 1.4879 - accuracy: 0.7580 - val\_loss: 1.2089 - val\_accuracy: 0.6722 - lr: 1.0000e-05

Epoch 6/25

1282/1282 [==============================] - 1305s 1s/step - loss: 0.8254 - accuracy: 0.8075 - val\_loss: 0.8535 - val\_accuracy: 0.6796 - lr: 1.0000e-05

Epoch 7/25

1282/1282 [==============================] - 1253s 977ms/step - loss: 0.5217 - accuracy: 0.8494 - val\_loss: 0.7377 - val\_accuracy: 0.6882 - lr: 1.0000e-05

Epoch 8/25

1282/1282 [==============================] - 1263s 985ms/step - loss: 0.3676 - accuracy: 0.8842 - val\_loss: 0.7398 - val\_accuracy: 0.6891 - lr: 1.0000e-05

Epoch 9/25

1282/1282 [==============================] - 1218s 950ms/step - loss: 0.2740 - accuracy: 0.9129 - val\_loss: 0.7955 - val\_accuracy: 0.6873 - lr: 1.0000e-05

Epoch 10/25

1282/1282 [==============================] - 1229s 958ms/step - loss: 0.2095 - accuracy: 0.9358 - val\_loss: 0.8739 - val\_accuracy: 0.6888 - lr: 1.0000e-05

Epoch 11/25

1282/1282 [==============================] - 1238s 965ms/step - loss: 0.1595 - accuracy: 0.9538 - val\_loss: 0.9741 - val\_accuracy: 0.6849 - lr: 1.0000e-05

Epoch 12/25

1282/1282 [==============================] - ETA: 0s - loss: 0.1222 - accuracy: 0.9667

Epoch 12: ReduceLROnPlateau reducing learning rate to 5.999999848427251e-06.

1282/1282 [==============================] - 1238s 966ms/step - loss: 0.1222 - accuracy: 0.9667 - val\_loss: 1.0789 - val\_accuracy: 0.6789 - lr: 1.0000e-05

3844/3844 [==============================] - 66s 17ms/step

Test Metrics:

Precision: 0.6541

Recall: 0.8122

F1 Score: 0.7247

ROC AUC: 0.8121

PR AUC: 0.8382

MCC: 0.3945

y\_test\_pred = (test\_scores > 0.6).astype(int)

...: y\_test\_true = y\_test.astype(int)

...:

...: # Calculate and display evaluation metrics for the test set

...: precision\_test = precision\_score(y\_test\_true, y\_test\_pred)

...: recall\_test = recall\_score(y\_test\_true, y\_test\_pred)

...: f1\_test = f1\_score(y\_test\_true, y\_test\_pred)

...: roc\_auc\_test = roc\_auc\_score(y\_test\_true, test\_scores)

...: pr\_auc\_test = average\_precision\_score(y\_test\_true, test\_scores)

...: mcc\_test = matthews\_corrcoef(y\_test\_true, y\_test\_pred)

...:

...: print("\nTest Metrics:")

...: print(f'Precision: {precision\_test:.4f}')

...: print(f'Recall: {recall\_test:.4f}')

...: print(f'F1 Score: {f1\_test:.4f}')

...: print(f'ROC AUC: {roc\_auc\_test:.4f}')

...: print(f'PR AUC: {pr\_auc\_test:.4f}')

...: print(f'MCC: {mcc\_test:.4f}')

...:

Test Metrics:

Precision: 0.6724

Recall: 0.7707

F1 Score: 0.7182

ROC AUC: 0.8121

PR AUC: 0.8382

MCC: 0.3995

In [6]: y\_test\_pred = (test\_scores > 0.7).astype(int)

...: y\_test\_true = y\_test.astype(int)

...:

...: # Calculate and display evaluation metrics for the test set

...: precision\_test = precision\_score(y\_test\_true, y\_test\_pred)

...: recall\_test = recall\_score(y\_test\_true, y\_test\_pred)

...: f1\_test = f1\_score(y\_test\_true, y\_test\_pred)

...: roc\_auc\_test = roc\_auc\_score(y\_test\_true, test\_scores)

...: pr\_auc\_test = average\_precision\_score(y\_test\_true, test\_scores)

...: mcc\_test = matthews\_corrcoef(y\_test\_true, y\_test\_pred)

...:

...: print("\nTest Metrics:")

...: print(f'Precision: {precision\_test:.4f}')

...: print(f'Recall: {recall\_test:.4f}')

...: print(f'F1 Score: {f1\_test:.4f}')

...: print(f'ROC AUC: {roc\_auc\_test:.4f}')

...: print(f'PR AUC: {pr\_auc\_test:.4f}')

...: print(f'MCC: {mcc\_test:.4f}')

...:

Test Metrics:

Precision: 0.6944

Recall: 0.7209

F1 Score: 0.7074

ROC AUC: 0.8121

PR AUC: 0.8382

MCC: 0.4039

Εικόνα που περιέχει κείμενο, γράφημα, γραμμή, διάγραμμα

Περιγραφή που δημιουργήθηκε αυτόματα

Εικόνα που περιέχει κείμενο, στιγμιότυπο οθόνης, διάγραμμα, ορθογώνιο παραλληλόγραμμο

Περιγραφή που δημιουργήθηκε αυτόματα

Εικόνα που περιέχει κείμενο, γραμμή, διάγραμμα, γράφημα

Περιγραφή που δημιουργήθηκε αυτόματα

Εικόνα που περιέχει κείμενο, γράφημα, διάγραμμα, γραμμή

Περιγραφή που δημιουργήθηκε αυτόματα

Εικόνα που περιέχει κείμενο, στιγμιότυπο οθόνης, γραμμή, διάγραμμα

Περιγραφή που δημιουργήθηκε αυτόματα

Training on Fold 1

2024-01-30 14:32:00.121447: I tensorflow/core/platform/cpu\_feature\_guard.cc:182] This TensorFlow binary is optimized to use available CPU instructions in performance-critical operations.

To enable the following instructions: SSE SSE2 SSE3 SSE4.1 SSE4.2 AVX AVX2 FMA, in other operations, rebuild TensorFlow with the appropriate compiler flags.

Epoch 1/20

961/961 [==============================] - ETA: 0s - loss: 19.7759 - accuracy: 0.51592024-01-30 14:45:22.614144: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 10509312000 exceeds 10% of free system memory.

2024-01-30 14:45:30.824737: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 2463498240 exceeds 10% of free system memory.

961/961 [==============================] - 812s 836ms/step - loss: 19.7759 - accuracy: 0.5159 - val\_loss: 15.4828 - val\_accuracy: 0.5884 - lr: 1.0000e-05

Epoch 2/20

961/961 [==============================] - ETA: 0s - loss: 12.1955 - accuracy: 0.57952024-01-30 14:58:49.802133: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 10509312000 exceeds 10% of free system memory.

2024-01-30 14:58:57.936289: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 2463498240 exceeds 10% of free system memory.

961/961 [==============================] - 807s 840ms/step - loss: 12.1955 - accuracy: 0.5795 - val\_loss: 9.3118 - val\_accuracy: 0.6281 - lr: 1.0000e-05

Epoch 3/20

961/961 [==============================] - ETA: 0s - loss: 7.2314 - accuracy: 0.64522024-01-30 15:12:24.586851: W tensorflow/tsl/framework/cpu\_allocator\_impl.cc:83] Allocation of 10509312000 exceeds 10% of free system memory.

961/961 [==============================] - 815s 849ms/step - loss: 7.2314 - accuracy: 0.6452 - val\_loss: 5.4493 - val\_accuracy: 0.6502 - lr: 1.0000e-05

Epoch 4/20

961/961 [==============================] - 805s 837ms/step - loss: 4.1794 - accuracy: 0.6855 - val\_loss: 3.1481 - val\_accuracy: 0.6589 - lr: 1.0000e-05

Epoch 5/20

961/961 [==============================] - 794s 827ms/step - loss: 2.3941 - accuracy: 0.7244 - val\_loss: 1.8781 - val\_accuracy: 0.6617 - lr: 1.0000e-05

Epoch 6/20

961/961 [==============================] - 776s 807ms/step - loss: 1.4108 - accuracy: 0.7608 - val\_loss: 1.2311 - val\_accuracy: 0.6641 - lr: 1.0000e-05

Epoch 7/20

961/961 [==============================] - 806s 839ms/step - loss: 0.8903 - accuracy: 0.7951 - val\_loss: 0.9222 - val\_accuracy: 0.6693 - lr: 1.0000e-05

Epoch 8/20

961/961 [==============================] - 782s 814ms/step - loss: 0.6130 - accuracy: 0.8253 - val\_loss: 0.7926 - val\_accuracy: 0.6757 - lr: 1.0000e-05

Epoch 9/20

961/961 [==============================] - 808s 841ms/step - loss: 0.4580 - accuracy: 0.8528 - val\_loss: 0.7224 - val\_accuracy: 0.6810 - lr: 1.0000e-05

Epoch 10/20

961/961 [==============================] - 787s 819ms/step - loss: 0.3641 - accuracy: 0.8755 - val\_loss: 0.7357 - val\_accuracy: 0.6803 - lr: 1.0000e-05

Epoch 11/20

961/961 [==============================] - 783s 815ms/step - loss: 0.3001 - accuracy: 0.8961 - val\_loss: 0.7718 - val\_accuracy: 0.6792 - lr: 1.0000e-05

Epoch 12/20

961/961 [==============================] - 784s 816ms/step - loss: 0.2527 - accuracy: 0.9143 - val\_loss: 0.7932 - val\_accuracy: 0.6824 - lr: 1.0000e-05

Epoch 13/20

961/961 [==============================] - 789s 821ms/step - loss: 0.2142 - accuracy: 0.9297 - val\_loss: 0.8565 - val\_accuracy: 0.6828 - lr: 1.0000e-05

Epoch 14/20

961/961 [==============================] - ETA: 0s - loss: 0.1830 - accuracy: 0.9414

Epoch 14: ReduceLROnPlateau reducing learning rate to 5.999999848427251e-06.

961/961 [==============================] - 793s 825ms/step - loss: 0.1830 - accuracy: 0.9414 - val\_loss: 0.8877 - val\_accuracy: 0.6832 - lr: 1.0000e-05

7687/7687 [==============================] - 150s 19ms/step

Validation Metrics:

Precision: 0.6486

Recall: 0.7899

F1 Score: 0.7123

ROC AUC: 0.7996

PR AUC: 0.8283

MCC: 0.3708

Training on Fold 2

Epoch 1/20

961/961 [==============================] - 792s 818ms/step - loss: 19.6919 - accuracy: 0.5173 - val\_loss: 15.3502 - val\_accuracy: 0.5747 - lr: 1.0000e-05

Epoch 2/20

961/961 [==============================] - 777s 809ms/step - loss: 12.0561 - accuracy: 0.5771 - val\_loss: 9.1762 - val\_accuracy: 0.6273 - lr: 1.0000e-05

Epoch 3/20

961/961 [==============================] - 767s 798ms/step - loss: 7.1126 - accuracy: 0.6486 - val\_loss: 5.3593 - val\_accuracy: 0.6494 - lr: 1.0000e-05

Epoch 4/20

961/961 [==============================] - 512s 532ms/step - loss: 4.1006 - accuracy: 0.6927 - val\_loss: 3.1081 - val\_accuracy: 0.6555 - lr: 1.0000e-05

Epoch 5/20

961/961 [==============================] - 491s 511ms/step - loss: 2.3468 - accuracy: 0.7328 - val\_loss: 1.8515 - val\_accuracy: 0.6679 - lr: 1.0000e-05

Epoch 6/20

961/961 [==============================] - 491s 511ms/step - loss: 1.3835 - accuracy: 0.7690 - val\_loss: 1.2161 - val\_accuracy: 0.6713 - lr: 1.0000e-05

Epoch 7/20

961/961 [==============================] - 491s 511ms/step - loss: 0.8731 - accuracy: 0.8017 - val\_loss: 0.9148 - val\_accuracy: 0.6761 - lr: 1.0000e-05

Epoch 8/20

961/961 [==============================] - 490s 510ms/step - loss: 0.6009 - accuracy: 0.8317 - val\_loss: 0.8070 - val\_accuracy: 0.6724 - lr: 1.0000e-05

Epoch 9/20

961/961 [==============================] - 487s 507ms/step - loss: 0.4477 - accuracy: 0.8584 - val\_loss: 0.7572 - val\_accuracy: 0.6809 - lr: 1.0000e-05

Epoch 10/20

961/961 [==============================] - 485s 505ms/step - loss: 0.3541 - accuracy: 0.8820 - val\_loss: 0.7489 - val\_accuracy: 0.6816 - lr: 1.0000e-05

Epoch 11/20

961/961 [==============================] - 484s 504ms/step - loss: 0.2907 - accuracy: 0.9024 - val\_loss: 0.7930 - val\_accuracy: 0.6823 - lr: 1.0000e-05

Epoch 12/20

961/961 [==============================] - 484s 504ms/step - loss: 0.2447 - accuracy: 0.9184 - val\_loss: 0.7980 - val\_accuracy: 0.6866 - lr: 1.0000e-05

Epoch 13/20

961/961 [==============================] - 484s 503ms/step - loss: 0.2062 - accuracy: 0.9330 - val\_loss: 0.8511 - val\_accuracy: 0.6868 - lr: 1.0000e-05

Epoch 14/20

961/961 [==============================] - 484s 504ms/step - loss: 0.1758 - accuracy: 0.9446 - val\_loss: 0.9058 - val\_accuracy: 0.6859 - lr: 1.0000e-05

Epoch 15/20

961/961 [==============================] - ETA: 0s - loss: 0.1491 - accuracy: 0.9547

Epoch 15: ReduceLROnPlateau reducing learning rate to 5.999999848427251e-06.

961/961 [==============================] - 485s 504ms/step - loss: 0.1491 - accuracy: 0.9547 - val\_loss: 0.9256 - val\_accuracy: 0.6910 - lr: 1.0000e-05

7687/7687 [==============================] - 83s 11ms/step

Validation Metrics:

Precision: 0.6409

Recall: 0.8262

F1 Score: 0.7218

ROC AUC: 0.8046

PR AUC: 0.8328

MCC: 0.3794

3844/3844 [==============================] - 43s 11ms/step

Test Metrics:

**Precision: 0.6413**

**Recall: 0.8261**

**F1 Score: 0.7221**

**ROC AUC: 0.8047**

**PR AUC: 0.8335**

**MCC: 0.3802**

Εικόνα που περιέχει κείμενο, διάγραμμα, γράφημα, γραμμή

Περιγραφή που δημιουργήθηκε αυτόματα