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| RFE Estimator | | |
| SVC | RandomForest (RFE runtime = 53m 50.2s) | XGBoost |
| **SVM Results**  ( { 'accuracy': 0.8393700787401575,  'balanced\_accuracy': 0.7690640803343922,  'bcc\_f1': 0.8180924287118978,  'bcc\_precision': 0.8015414258188824,  'bcc\_roc\_auc': 0.8509608381713382,  'bcc\_sensitivity': 0.8353413654618473,  'bcc\_specificity': 0.866580310880829,  'best\_params': {'C': 10, 'gamma': 0.01, 'kernel': 'rbf'},  'kappa': 0.7131138464536761,  'mel\_f1': 0.8932330827067668,  'mel\_precision': 0.911042944785276,  'mel\_roc\_auc': 0.8890666108586462,  'mel\_sensitivity': 0.8761061946902655,  'mel\_specificity': 0.902027027027027,  'model': SVC(C=10, class\_weight='balanced', gamma=0.01),  'scc\_f1': 0.5803108808290155,  'scc\_precision': 0.5656565656565656,  'scc\_roc\_auc': 0.7795900275003619,  'scc\_sensitivity': 0.5957446808510638,  'scc\_specificity': 0.9634353741496599,  'weighted\_f1': 0.8406073089540477},)  ( array([[594, 74, 10],  [ 49, 416, 33],  [ 9, 29, 56]], dtype=int64),) | **SVM Results**  ( { 'accuracy': 0.8409448818897638,  'balanced\_accuracy': 0.7824428952866634,  'bcc\_f1': 0.8257425742574257,  'bcc\_precision': 0.814453125,  'bcc\_roc\_auc': 0.8571462013858543,  'bcc\_sensitivity': 0.8373493975903614,  'bcc\_specificity': 0.8769430051813472,  'best\_params': {'C': 10, 'gamma': 0.01, 'kernel': 'rbf'},  'kappa': 0.7189871531976795,  'mel\_f1': 0.8968133535660091,  'mel\_precision': 0.9234375,  'mel\_roc\_auc': 0.8944555728294667,  'mel\_sensitivity': 0.8716814159292036,  'mel\_specificity': 0.9172297297297297,  'model': SVC(C=10, class\_weight='balanced', gamma=0.01),  'scc\_f1': 0.5660377358490567,  'scc\_precision': 0.5084745762711864,  'scc\_roc\_auc': 0.7944890722246346,  'scc\_sensitivity': 0.6382978723404256,  'scc\_specificity': 0.9506802721088435,  'weighted\_f1': 0.8444620495021761},)  ( array([[591, 71, 16],  [ 39, 417, 42],  [ 10, 24, 60]], dtype=int64),) |  |
| **Random Forest Result**  ( { 'accuracy': 0.7377952755905511,  'balanced\_accuracy': 0.6657129994905877,  'bcc\_f1': 0.7148760330578512,  'bcc\_precision': 0.7361702127659574,  'bcc\_roc\_auc': 0.7670786774039161,  'bcc\_sensitivity': 0.6947791164658634,  'bcc\_specificity': 0.8393782383419689,  'best\_params': { 'max\_depth': 9,  'min\_samples\_leaf': 1,  'min\_samples\_split': 2,  'n\_estimators': 200},  'kappa': 0.5494438762464843,  'mel\_f1': 0.8349961627014582,  'mel\_precision': 0.8704,  'mel\_roc\_auc': 0.8327677788407876,  'mel\_sensitivity': 0.8023598820058997,  'mel\_specificity': 0.8631756756756757,  'model': RandomForestClassifier(class\_weight='balanced', max\_depth=9, n\_estimators=200),  'scc\_f1': 0.34944237918215615,  'scc\_precision': 0.26857142857142857,  'scc\_roc\_auc': 0.6955782312925171,  'scc\_sensitivity': 0.5,  'scc\_specificity': 0.891156462585034,  'weighted\_f1': 0.7519553121397804},)  ( array([[544, 91, 43],  [ 67, 346, 85],  [ 14, 33, 47]], dtype=int64),) | **Random Forest Result**  ( { 'accuracy': 0.7275590551181103,  'balanced\_accuracy': 0.664364355054058,  'bcc\_f1': 0.7039337474120082,  'bcc\_precision': 0.7264957264957265,  'bcc\_roc\_auc': 0.7584639074432444,  'bcc\_sensitivity': 0.6827309236947792,  'bcc\_specificity': 0.8341968911917098,  'best\_params': { 'max\_depth': 9,  'min\_samples\_leaf': 1,  'min\_samples\_split': 5,  'n\_estimators': 200},  'kappa': 0.5354339699240489,  'mel\_f1': 0.8281733746130031,  'mel\_precision': 0.8713355048859935,  'mel\_roc\_auc': 0.827819799888384,  'mel\_sensitivity': 0.7890855457227138,  'mel\_specificity': 0.8665540540540541,  'model': RandomForestClassifier(class\_weight='balanced', max\_depth=9,  min\_samples\_split=5, n\_estimators=200),  'scc\_f1': 0.34751773049645396,  'scc\_precision': 0.26063829787234044,  'scc\_roc\_auc': 0.7015396584165582,  'scc\_sensitivity': 0.5212765957446809,  'scc\_specificity': 0.8818027210884354,  'weighted\_f1': 0.7438797014688684},)  ( array([[535, 97, 46],  [ 65, 340, 93],  [ 14, 31, 49]], dtype=int64),) |  |
| **XGBoost Result**  ( { 'accuracy': 0.8173228346456692,  'balanced\_accuracy': 0.7236873181548135,  'bcc\_f1': 0.803921568627451,  'bcc\_precision': 0.7854406130268199,  'bcc\_roc\_auc': 0.8391077262417546,  'bcc\_sensitivity': 0.8232931726907631,  'bcc\_specificity': 0.8549222797927462,  'best\_params': { 'colsample\_bytree': 1.0,  'learning\_rate': 0.1,  'max\_depth': 5,  'n\_estimators': 300,  'subsample': 0.7},  'kappa': 0.6760261079150613,  'mel\_f1': 0.8838268792710706,  'mel\_precision': 0.9107981220657277,  'mel\_roc\_auc': 0.881061647931117,  'mel\_sensitivity': 0.8584070796460177,  'mel\_specificity': 0.9037162162162162,  'model': XGBClassifier(base\_score=None, booster=None, callbacks=None,  colsample\_bylevel=None, colsample\_bynode=None,  colsample\_bytree=1.0, device=None, early\_stopping\_rounds=None,  enable\_categorical=False, eval\_metric=None, feature\_types=None,  gamma=None, grow\_policy=None, importance\_type=None,  interaction\_constraints=None, learning\_rate=0.1, max\_bin=None,  max\_cat\_threshold=None, max\_cat\_to\_onehot=None,  ...  'weighted\_f1': 0.8206209059401034},)  ( array([[582, 76, 20],  [ 45, 410, 43],  [ 12, 36, 46]], dtype=int64),) | **XGBoost Result**  ( { 'accuracy': 0.8267716535433071,  'balanced\_accuracy': 0.7250774263816075,  'bcc\_f1': 0.815968841285297,  'bcc\_precision': 0.7920604914933838,  'bcc\_roc\_auc': 0.8494392076076326,  'bcc\_sensitivity': 0.8413654618473896,  'bcc\_specificity': 0.8575129533678757,  'best\_params': { 'colsample\_bytree': 1.0,  'learning\_rate': 0.1,  'max\_depth': 5,  'n\_estimators': 300,  'subsample': 0.7},  'kappa': 0.6882100085256819,  'mel\_f1': 0.8794007490636705,  'mel\_precision': 0.893455098934551,  'mel\_roc\_auc': 0.8737692338356057,  'mel\_sensitivity': 0.8657817109144543,  'mel\_specificity': 0.8817567567567568,  'model': XGBClassifier(base\_score=None, booster=None, callbacks=None,  colsample\_bylevel=None, colsample\_bynode=None,  colsample\_bytree=1.0, device=None, early\_stopping\_rounds=None,  enable\_categorical=False, eval\_metric=None, feature\_types=None,  gamma=None, grow\_policy=None, importance\_type=None,  interaction\_constraints=None, learning\_rate=0.1, max\_bin=None,  max\_cat\_threshold=None, max\_cat\_to\_onehot=None,  ...  'weighted\_f1': 0.8260300007382726},)  ( array([[587, 75, 16],  [ 55, 419, 24],  [ 15, 35, 44]], dtype=int64),) |  |
| **Logistic Result**  ( { 'accuracy': 0.7330708661417323,  'balanced\_accuracy': 0.6847109772170966,  'bcc\_f1': 0.7147470398277718,  'bcc\_precision': 0.7703016241299304,  'bcc\_roc\_auc': 0.7692141623488773,  'bcc\_sensitivity': 0.6666666666666666,  'bcc\_specificity': 0.8717616580310881,  'best\_params': {'C': 0.1, 'penalty': None, 'solver': 'newton-cholesky'},  'kappa': 0.5532716292776061,  'mel\_f1': 0.8453768453768454,  'mel\_precision': 0.8932676518883416,  'mel\_roc\_auc': 0.8462812923543013,  'mel\_sensitivity': 0.8023598820058997,  'mel\_specificity': 0.8902027027027027,  'model': LogisticRegression(C=0.1, class\_weight='balanced', multi\_class='ovr',  penalty=None, solver='newton-cholesky'),  'scc\_f1': 0.3395061728395062,  'scc\_precision': 0.2391304347826087,  'scc\_roc\_auc': 0.7181484295845998,  'scc\_sensitivity': 0.5851063829787234,  'scc\_specificity': 0.8511904761904762,  'weighted\_f1': 0.7567111080682245},)  ( array([[544, 72, 62],  [ 53, 332, 113],  [ 12, 27, 55]], dtype=int64),) | **Logistic Result**  ( { 'accuracy': 0.7181102362204724,  'balanced\_accuracy': 0.6655291220741876,  'bcc\_f1': 0.6865342163355408,  'bcc\_precision': 0.7622549019607843,  'bcc\_roc\_auc': 0.7494251617870445,  'bcc\_sensitivity': 0.6244979919678715,  'bcc\_specificity': 0.8743523316062176,  'best\_params': {'C': 0.1, 'penalty': None, 'solver': 'newton-cholesky'},  'kappa': 0.5302012035843005,  'mel\_f1': 0.845679012345679,  'mel\_precision': 0.8867313915857605,  'mel\_roc\_auc': 0.8450081718887029,  'mel\_sensitivity': 0.8082595870206489,  'mel\_specificity': 0.8817567567567568,  'model': LogisticRegression(C=0.1, class\_weight='balanced', multi\_class='ovr',  penalty=None, solver='newton-cholesky'),  'scc\_f1': 0.3136094674556213,  'scc\_precision': 0.21721311475409835,  'scc\_roc\_auc': 0.7007074106238239,  'scc\_sensitivity': 0.5638297872340425,  'scc\_specificity': 0.8375850340136054,  'weighted\_f1': 0.7438926772018095},)  ( array([[548, 70, 60],  [ 56, 311, 131],  [ 14, 27, 53]], dtype=int64),) |  |
| **Ensemble Result**  ( { 'accuracy': 0.8456692913385827,  'balanced\_accuracy': 0.7523268244004702,  'bcc\_f1': 0.8235294117647061,  'bcc\_precision': 0.8045977011494253,  'bcc\_roc\_auc': 0.8556245708221487,  'bcc\_sensitivity': 0.8433734939759037,  'bcc\_specificity': 0.8678756476683938,  'kappa': 0.721468790002775,  'mel\_f1': 0.900297619047619,  'mel\_precision': 0.9084084084084084,  'mel\_roc\_auc': 0.8946449214701426,  'mel\_sensitivity': 0.8923303834808259,  'mel\_specificity': 0.8969594594594594,  'scc\_f1': 0.5568181818181819,  'scc\_precision': 0.5975609756097561,  'scc\_roc\_auc': 0.7466076856274426,  'scc\_sensitivity': 0.5212765957446809,  'scc\_specificity': 0.9719387755102041,  'weighted\_f1': 0.8447719227275734},)  ( array([[605, 66, 7],  [ 52, 420, 26],  [ 9, 36, 49]], dtype=int64),) | **Ensemble Result**  ( { 'accuracy': 0.8433070866141732,  'balanced\_accuracy': 0.7483305468153918,  'bcc\_f1': 0.8302257114818449,  'bcc\_precision': 0.8119001919385797,  'bcc\_roc\_auc': 0.8612272925900493,  'bcc\_sensitivity': 0.8493975903614458,  'bcc\_specificity': 0.8730569948186528,  'kappa': 0.7175178500373319,  'mel\_f1': 0.8935219657483247,  'mel\_precision': 0.9022556390977443,  'mel\_roc\_auc': 0.8875792274575461,  'mel\_sensitivity': 0.8849557522123894,  'mel\_specificity': 0.8902027027027027,  'scc\_f1': 0.5393258426966292,  'scc\_precision': 0.5714285714285714,  'scc\_roc\_auc': 0.7400130264871905,  'scc\_sensitivity': 0.5106382978723404,  'scc\_specificity': 0.9693877551020408,  'weighted\_f1': 0.8424857687470914},)  ( array([[600, 64, 14],  [ 53, 423, 22],  [ 12, 34, 48]], dtype=int64),) |  |