Part1 – Cost sensitive logistic regression

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| Value | Cross validation | Test set |
| 1 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 1.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1126  NUMUANDS 0.0245  TOTOTORS 0.0018  TOTOPANDS -0.0109  VG -0.1026  NLOGIC 0.1274  LOC 0.0013  ELOC 0.0593  Intercept -6.7852  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1192  NUMUANDS 1.0248  TOTOTORS 1.0018  TOTOPANDS 0.9891  VG 0.9025  NLOGIC 1.1359  LOC 1.0013  ELOC 1.0611  Cost Matrix  0 1  1 0  Time taken to build model: 0.06 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 167 86.5285 %  Incorrectly Classified Instances 26 13.4715 %  Kappa statistic 0.663  Mean absolute error 0.1619  Root mean squared error 0.311  Relative absolute error 38.4177 %  Root relative squared error 67.8195 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.690 0.059 0.833 0.690 0.755 0.669 0.940 0.880 fp  0.941 0.310 0.876 0.941 0.907 0.669 0.940 0.973 nfp  Weighted Avg. 0.865 0.235 0.863 0.865 0.861 0.669 0.940 0.945  === Confusion Matrix ===  a b <-- classified as  40 18 | a = fp  8 127 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 1.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1126  NUMUANDS 0.0245  TOTOTORS 0.0018  TOTOPANDS -0.0109  VG -0.1026  NLOGIC 0.1274  LOC 0.0013  ELOC 0.0593  Intercept -6.7852  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1192  NUMUANDS 1.0248  TOTOTORS 1.0018  TOTOPANDS 0.9891  VG 0.9025  NLOGIC 1.1359  LOC 1.0013  ELOC 1.0611  Cost Matrix  0 1  1 0  Time taken to build model: 0.01 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0.01 seconds  === Summary ===  Correctly Classified Instances 82 84.5361 %  Incorrectly Classified Instances 15 15.4639 %  Kappa statistic 0.6347  Mean absolute error 0.1784  Root mean squared error 0.3374  Relative absolute error 42.0136 %  Root relative squared error 72.9856 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.733 0.104 0.759 0.733 0.746 0.635 0.890 0.853 fp  0.896 0.267 0.882 0.896 0.889 0.635 0.890 0.931 nfp  Weighted Avg. 0.845 0.217 0.844 0.845 0.845 0.635 0.890 0.907  === Confusion Matrix ===  a b <-- classified as  22 8 | a = fp  7 60 | b = nfp |
| 1.5 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 1.5; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1219  NUMUANDS 0.0257  TOTOTORS 0.0004  TOTOPANDS -0.0104  VG -0.1108  NLOGIC 0.1629  LOC 0.0013  ELOC 0.0662  Intercept -6.7398  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1296  NUMUANDS 1.0261  TOTOTORS 1.0004  TOTOPANDS 0.9896  VG 0.8951  NLOGIC 1.1769  LOC 1.0013  ELOC 1.0684  Cost Matrix  0 1.5  1 0  Time taken to build model: 0.01 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 170 88.0829 %  Incorrectly Classified Instances 23 11.9171 %  Kappa statistic 0.7151  Mean absolute error 0.1646  Root mean squared error 0.3048  Relative absolute error 39.0585 %  Root relative squared error 66.4753 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.793 0.081 0.807 0.793 0.800 0.715 0.944 0.884 fp  0.919 0.207 0.912 0.919 0.915 0.715 0.944 0.975 nfp  Weighted Avg. 0.881 0.169 0.880 0.881 0.881 0.715 0.944 0.947  === Confusion Matrix ===  a b <-- classified as  46 12 | a = fp  11 124 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 1.5; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1219  NUMUANDS 0.0257  TOTOTORS 0.0004  TOTOPANDS -0.0104  VG -0.1108  NLOGIC 0.1629  LOC 0.0013  ELOC 0.0662  Intercept -6.7398  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1296  NUMUANDS 1.0261  TOTOTORS 1.0004  TOTOPANDS 0.9896  VG 0.8951  NLOGIC 1.1769  LOC 1.0013  ELOC 1.0684  Cost Matrix  0 1.5  1 0  Time taken to build model: 0.01 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0.01 seconds  === Summary ===  Correctly Classified Instances 82 84.5361 %  Incorrectly Classified Instances 15 15.4639 %  Kappa statistic 0.6414  Mean absolute error 0.187  Root mean squared error 0.3465  Relative absolute error 44.0307 %  Root relative squared error 74.9646 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.119 0.742 0.767 0.754 0.642 0.888 0.849 fp  0.881 0.233 0.894 0.881 0.887 0.642 0.888 0.930 nfp  Weighted Avg. 0.845 0.198 0.847 0.845 0.846 0.642 0.888 0.905  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  8 59 | b = nfp |
| 2 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 2.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1264  NUMUANDS 0.0271  TOTOTORS 0.0008  TOTOPANDS -0.0113  VG -0.1173  NLOGIC 0.1876  LOC 0.0011  ELOC 0.0705  Intercept -6.6966  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1347  NUMUANDS 1.0275  TOTOTORS 1.0008  TOTOPANDS 0.9887  VG 0.8893  NLOGIC 1.2063  LOC 1.0011  ELOC 1.073  Cost Matrix  0 2  1 0  Time taken to build model: 0.01 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 171 88.601 %  Incorrectly Classified Instances 22 11.399 %  Kappa statistic 0.7289  Mean absolute error 0.1677  Root mean squared error 0.303  Relative absolute error 39.7844 %  Root relative squared error 66.0646 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.810 0.081 0.810 0.810 0.810 0.729 0.945 0.885 fp  0.919 0.190 0.919 0.919 0.919 0.729 0.945 0.975 nfp  Weighted Avg. 0.886 0.157 0.886 0.886 0.886 0.729 0.945 0.948  === Confusion Matrix ===  a b <-- classified as  47 11 | a = fp  11 124 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 2.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1264  NUMUANDS 0.0271  TOTOTORS 0.0008  TOTOPANDS -0.0113  VG -0.1173  NLOGIC 0.1876  LOC 0.0011  ELOC 0.0705  Intercept -6.6966  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1347  NUMUANDS 1.0275  TOTOTORS 1.0008  TOTOPANDS 0.9887  VG 0.8893  NLOGIC 1.2063  LOC 1.0011  ELOC 1.073  Cost Matrix  0 2  1 0  Time taken to build model: 0 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0.03 seconds  === Summary ===  Correctly Classified Instances 81 83.5052 %  Incorrectly Classified Instances 16 16.4948 %  Kappa statistic 0.6209  Mean absolute error 0.1945  Root mean squared error 0.3551  Relative absolute error 45.798 %  Root relative squared error 76.8131 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.134 0.719 0.767 0.742 0.622 0.888 0.850 fp  0.866 0.233 0.892 0.866 0.879 0.622 0.888 0.930 nfp  Weighted Avg. 0.835 0.203 0.839 0.835 0.836 0.622 0.888 0.905  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  9 58 | b = nfp |
| 2.5 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 2.5; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1286  NUMUANDS 0.0285  TOTOTORS 0.0019  TOTOPANDS -0.0129  VG -0.1224  NLOGIC 0.2065  LOC 0.001  ELOC 0.0733  Intercept -6.6461  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1373  NUMUANDS 1.0289  TOTOTORS 1.0019  TOTOPANDS 0.9872  VG 0.8848  NLOGIC 1.2294  LOC 1.001  ELOC 1.076  Cost Matrix  0 2.5  1 0  Time taken to build model: 0 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 172 89.1192 %  Incorrectly Classified Instances 21 10.8808 %  Kappa statistic 0.7425  Mean absolute error 0.1709  Root mean squared error 0.3034  Relative absolute error 40.5432 %  Root relative squared error 66.1693 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.828 0.081 0.814 0.828 0.821 0.743 0.945 0.884 fp  0.919 0.172 0.925 0.919 0.922 0.743 0.945 0.975 nfp  Weighted Avg. 0.891 0.145 0.892 0.891 0.891 0.743 0.945 0.948  === Confusion Matrix ===  a b <-- classified as  48 10 | a = fp  11 124 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 2.5; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1286  NUMUANDS 0.0285  TOTOTORS 0.0019  TOTOPANDS -0.0129  VG -0.1224  NLOGIC 0.2065  LOC 0.001  ELOC 0.0733  Intercept -6.6461  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1373  NUMUANDS 1.0289  TOTOTORS 1.0019  TOTOPANDS 0.9872  VG 0.8848  NLOGIC 1.2294  LOC 1.001  ELOC 1.076  Cost Matrix  0 2.5  1 0  Time taken to build model: 0.01 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0 seconds  === Summary ===  Correctly Classified Instances 81 83.5052 %  Incorrectly Classified Instances 16 16.4948 %  Kappa statistic 0.6209  Mean absolute error 0.2012  Root mean squared error 0.3627  Relative absolute error 47.3732 %  Root relative squared error 78.4545 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.134 0.719 0.767 0.742 0.622 0.887 0.849 fp  0.866 0.233 0.892 0.866 0.879 0.622 0.887 0.929 nfp  Weighted Avg. 0.835 0.203 0.839 0.835 0.836 0.622 0.887 0.904  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  9 58 | b = nfp |
| 3 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 3.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1297  NUMUANDS 0.0298  TOTOTORS 0.0034  TOTOPANDS -0.0147  VG -0.1267  NLOGIC 0.2219  LOC 0.0008  ELOC 0.0752  Intercept -6.5921  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1385  NUMUANDS 1.0302  TOTOTORS 1.0034  TOTOPANDS 0.9854  VG 0.881  NLOGIC 1.2485  LOC 1.0008  ELOC 1.0781  Cost Matrix  0 3  1 0  Time taken to build model: 0.01 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 174 90.1554 %  Incorrectly Classified Instances 19 9.8446 %  Kappa statistic 0.7692  Mean absolute error 0.1741  Root mean squared error 0.3053  Relative absolute error 41.3039 %  Root relative squared error 66.5642 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.862 0.081 0.820 0.862 0.840 0.770 0.946 0.885 fp  0.919 0.138 0.939 0.919 0.929 0.770 0.946 0.976 nfp  Weighted Avg. 0.902 0.121 0.903 0.902 0.902 0.770 0.946 0.948  === Confusion Matrix ===  a b <-- classified as  50 8 | a = fp  11 124 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 3.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1297  NUMUANDS 0.0298  TOTOTORS 0.0034  TOTOPANDS -0.0147  VG -0.1267  NLOGIC 0.2219  LOC 0.0008  ELOC 0.0752  Intercept -6.5921  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1385  NUMUANDS 1.0302  TOTOTORS 1.0034  TOTOPANDS 0.9854  VG 0.881  NLOGIC 1.2485  LOC 1.0008  ELOC 1.0781  Cost Matrix  0 3  1 0  Time taken to build model: 0.01 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0 seconds  === Summary ===  Correctly Classified Instances 81 83.5052 %  Incorrectly Classified Instances 16 16.4948 %  Kappa statistic 0.6209  Mean absolute error 0.2072  Root mean squared error 0.3694  Relative absolute error 48.8002 %  Root relative squared error 79.9175 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.134 0.719 0.767 0.742 0.622 0.886 0.849 fp  0.866 0.233 0.892 0.866 0.879 0.622 0.886 0.928 nfp  Weighted Avg. 0.835 0.203 0.839 0.835 0.836 0.622 0.886 0.904  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  9 58 | b = nfp |
| 4 | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 4.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: 10-fold cross-validation  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1305  NUMUANDS 0.0319  TOTOTORS 0.0067  TOTOPANDS -0.0184  VG -0.1336  NLOGIC 0.2459  LOC 0.0004  ELOC 0.0778  Intercept -6.4866  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1394  NUMUANDS 1.0324  TOTOTORS 1.0067  TOTOPANDS 0.9818  VG 0.875  NLOGIC 1.2788  LOC 1.0004  ELOC 1.0809  Cost Matrix  0 4  1 0  Time taken to build model: 0.01 seconds  === Stratified cross-validation ===  === Summary ===  Correctly Classified Instances 172 89.1192 %  Incorrectly Classified Instances 21 10.8808 %  Kappa statistic 0.7522  Mean absolute error 0.1802  Root mean squared error 0.3108  Relative absolute error 42.7711 %  Root relative squared error 67.7844 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.897 0.111 0.776 0.897 0.832 0.756 0.946 0.884 fp  0.889 0.103 0.952 0.889 0.920 0.756 0.946 0.976 nfp  Weighted Avg. 0.891 0.106 0.899 0.891 0.893 0.756 0.946 0.948  === Confusion Matrix ===  a b <-- classified as  52 6 | a = fp  15 120 | b = nfp | === Run information ===  Scheme: weka.classifiers.meta.CostSensitiveClassifier -cost-matrix "[0.0 4.0; 1.0 0.0]" -S 1 -W weka.classifiers.functions.Logistic -- -R 1.0E-8 -M -1 -num-decimal-places 4  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  CostSensitiveClassifier using reweighted training instances  weka.classifiers.functions.Logistic -R 1.0E-8 -M -1 -num-decimal-places 4  Classifier Model  Logistic Regression with ridge parameter of 1.0E-8  Coefficients...  Class  Variable fp  ====================  NUMUORS 0.1305  NUMUANDS 0.0319  TOTOTORS 0.0067  TOTOPANDS -0.0184  VG -0.1336  NLOGIC 0.2459  LOC 0.0004  ELOC 0.0778  Intercept -6.4866  Odds Ratios...  Class  Variable fp  ====================  NUMUORS 1.1394  NUMUANDS 1.0324  TOTOTORS 1.0067  TOTOPANDS 0.9818  VG 0.875  NLOGIC 1.2788  LOC 1.0004  ELOC 1.0809  Cost Matrix  0 4  1 0  Time taken to build model: 0 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0 seconds  === Summary ===  Correctly Classified Instances 81 83.5052 %  Incorrectly Classified Instances 16 16.4948 %  Kappa statistic 0.6276  Mean absolute error 0.2179  Root mean squared error 0.381  Relative absolute error 51.3089 %  Root relative squared error 82.4315 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.800 0.149 0.706 0.800 0.750 0.630 0.882 0.844 fp  0.851 0.200 0.905 0.851 0.877 0.630 0.882 0.925 nfp  Weighted Avg. 0.835 0.184 0.843 0.835 0.838 0.630 0.882 0.900  === Confusion Matrix ===  a b <-- classified as  24 6 | a = fp  10 57 | b = nfp |

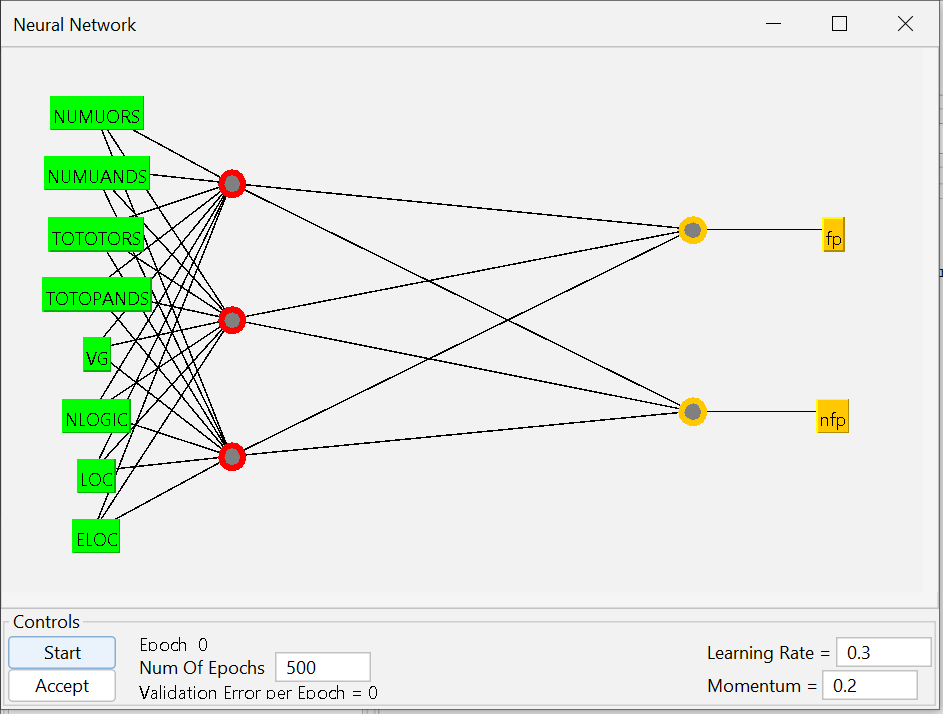
From the confusion matrix and the detailed accuracy, it is observed that for value 3 the optimal cost ratio is achieved.

**Part2/2- Multi Layer Perceptron**

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| --- | --- | --- |
| GUI | Use training set | Test set |
| GUI False | === Run information ===  Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 10 -S 0 -E 20 -H 3  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: evaluate on training data  === Classifier model (full training set) ===  Sigmoid Node 0  Inputs Weights  Threshold 4.551427165588668  Node 2 -4.749458413722877  Node 3 -1.2676229175169882  Node 4 -5.0080725277801745  Sigmoid Node 1  Inputs Weights  Threshold -4.549646962480144  Node 2 4.743506894794498  Node 3 1.3102255159532388  Node 4 4.988335624909869  Sigmoid Node 2  Inputs Weights  Threshold -5.12035267288986  Attrib NUMUORS -1.7024594544055165  Attrib NUMUANDS -2.9846315796790135  Attrib TOTOTORS 0.1574025754059049  Attrib TOTOPANDS 1.9412420037301992  Attrib VG 5.875776352000703  Attrib NLOGIC 1.1426132695665332  Attrib LOC -11.537198700145531  Attrib ELOC -4.2370595390836225  Sigmoid Node 3  Inputs Weights  Threshold -5.015687146613024  Attrib NUMUORS -2.502958914025746  Attrib NUMUANDS -2.2491608723228036  Attrib TOTOTORS 0.3817512742646005  Attrib TOTOPANDS 0.8632933173861495  Attrib VG 3.850198489219828  Attrib NLOGIC -2.3799628670035116  Attrib LOC -2.11950414694784  Attrib ELOC -1.1489233516505857  Sigmoid Node 4  Inputs Weights  Threshold -13.33072866982274  Attrib NUMUORS -8.481238649883114  Attrib NUMUANDS -4.783537243963041  Attrib TOTOTORS 0.435019209457687  Attrib TOTOPANDS 1.700966480279357  Attrib VG 7.557157680264638  Attrib NLOGIC -7.927824158604269  Attrib LOC -3.3862306026259827  Attrib ELOC -2.1134735241053724  Class fp  Input  Node 0  Class nfp  Input  Node 1  Time taken to build model: 0.18 seconds  === Evaluation on training set ===  Time taken to test model on training data: 0.01 seconds  === Summary ===  Correctly Classified Instances 168 87.0466 %  Incorrectly Classified Instances 25 12.9534 %  Kappa statistic 0.6709  Mean absolute error 0.1663  Root mean squared error 0.281  Relative absolute error 39.4782 %  Root relative squared error 61.2957 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.672 0.044 0.867 0.672 0.757 0.681 0.956 0.915 fp  0.956 0.328 0.872 0.956 0.912 0.681 0.956 0.981 nfp  Weighted Avg. 0.870 0.242 0.870 0.870 0.865 0.681 0.956 0.961  === Confusion Matrix ===  a b <-- classified as  39 19 | a = fp  6 129 | b = nfp | === Run information ===  Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 10 -S 0 -E 20 -H 3  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  Sigmoid Node 0  Inputs Weights  Threshold 4.551427165588668  Node 2 -4.749458413722877  Node 3 -1.2676229175169882  Node 4 -5.0080725277801745  Sigmoid Node 1  Inputs Weights  Threshold -4.549646962480144  Node 2 4.743506894794498  Node 3 1.3102255159532388  Node 4 4.988335624909869  Sigmoid Node 2  Inputs Weights  Threshold -5.12035267288986  Attrib NUMUORS -1.7024594544055165  Attrib NUMUANDS -2.9846315796790135  Attrib TOTOTORS 0.1574025754059049  Attrib TOTOPANDS 1.9412420037301992  Attrib VG 5.875776352000703  Attrib NLOGIC 1.1426132695665332  Attrib LOC -11.537198700145531  Attrib ELOC -4.2370595390836225  Sigmoid Node 3  Inputs Weights  Threshold -5.015687146613024  Attrib NUMUORS -2.502958914025746  Attrib NUMUANDS -2.2491608723228036  Attrib TOTOTORS 0.3817512742646005  Attrib TOTOPANDS 0.8632933173861495  Attrib VG 3.850198489219828  Attrib NLOGIC -2.3799628670035116  Attrib LOC -2.11950414694784  Attrib ELOC -1.1489233516505857  Sigmoid Node 4  Inputs Weights  Threshold -13.33072866982274  Attrib NUMUORS -8.481238649883114  Attrib NUMUANDS -4.783537243963041  Attrib TOTOTORS 0.435019209457687  Attrib TOTOPANDS 1.700966480279357  Attrib VG 7.557157680264638  Attrib NLOGIC -7.927824158604269  Attrib LOC -3.3862306026259827  Attrib ELOC -2.1134735241053724  Class fp  Input  Node 0  Class nfp  Input  Node 1  Time taken to build model: 0.07 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0 seconds  === Summary ===  Correctly Classified Instances 85 87.6289 %  Incorrectly Classified Instances 12 12.3711 %  Kappa statistic 0.705  Mean absolute error 0.1868  Root mean squared error 0.3147  Relative absolute error 43.9915 %  Root relative squared error 68.0764 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.075 0.821 0.767 0.793 0.706 0.916 0.860 fp  0.925 0.233 0.899 0.925 0.912 0.706 0.916 0.951 nfp  Weighted Avg. 0.876 0.184 0.875 0.876 0.875 0.706 0.916 0.923  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  5 62 | b = nfp |
| GUI True | === Run information ===  Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 10 -S 0 -E 20 -H 3 -G -R  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: evaluate on training data  === Classifier model (full training set) ===  Sigmoid Node 0  Inputs Weights  Threshold 4.551427165588668  Node 2 -4.749458413722877  Node 3 -1.2676229175169882  Node 4 -5.0080725277801745  Sigmoid Node 1  Inputs Weights  Threshold -4.549646962480144  Node 2 4.743506894794498  Node 3 1.3102255159532388  Node 4 4.988335624909869  Sigmoid Node 2  Inputs Weights  Threshold -5.12035267288986  Attrib NUMUORS -1.7024594544055165  Attrib NUMUANDS -2.9846315796790135  Attrib TOTOTORS 0.1574025754059049  Attrib TOTOPANDS 1.9412420037301992  Attrib VG 5.875776352000703  Attrib NLOGIC 1.1426132695665332  Attrib LOC -11.537198700145531  Attrib ELOC -4.2370595390836225  Sigmoid Node 3  Inputs Weights  Threshold -5.015687146613024  Attrib NUMUORS -2.502958914025746  Attrib NUMUANDS -2.2491608723228036  Attrib TOTOTORS 0.3817512742646005  Attrib TOTOPANDS 0.8632933173861495  Attrib VG 3.850198489219828  Attrib NLOGIC -2.3799628670035116  Attrib LOC -2.11950414694784  Attrib ELOC -1.1489233516505857  Sigmoid Node 4  Inputs Weights  Threshold -13.33072866982274  Attrib NUMUORS -8.481238649883114  Attrib NUMUANDS -4.783537243963041  Attrib TOTOTORS 0.435019209457687  Attrib TOTOPANDS 1.700966480279357  Attrib VG 7.557157680264638  Attrib NLOGIC -7.927824158604269  Attrib LOC -3.3862306026259827  Attrib ELOC -2.1134735241053724  Class fp  Input  Node 0  Class nfp  Input  Node 1  Time taken to build model: 39.45 seconds  === Evaluation on training set ===  Time taken to test model on training data: 0 seconds  === Summary ===  Correctly Classified Instances 168 87.0466 %  Incorrectly Classified Instances 25 12.9534 %  Kappa statistic 0.6709  Mean absolute error 0.1663  Root mean squared error 0.281  Relative absolute error 39.4782 %  Root relative squared error 61.2957 %  Total Number of Instances 193  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.672 0.044 0.867 0.672 0.757 0.681 0.956 0.915 fp  0.956 0.328 0.872 0.956 0.912 0.681 0.956 0.981 nfp  Weighted Avg. 0.870 0.242 0.870 0.870 0.865 0.681 0.956 0.961  === Confusion Matrix ===  a b <-- classified as  39 19 | a = fp  6 129 | b = nfp | === Run information ===  Scheme: weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 10 -S 0 -E 20 -H 3 -G -R  Relation: FitClassification  Instances: 193  Attributes: 9  NUMUORS  NUMUANDS  TOTOTORS  TOTOPANDS  VG  NLOGIC  LOC  ELOC  class  Test mode: user supplied test set: size unknown (reading incrementally)  === Classifier model (full training set) ===  Sigmoid Node 0  Inputs Weights  Threshold 4.551427165588668  Node 2 -4.749458413722877  Node 3 -1.2676229175169882  Node 4 -5.0080725277801745  Sigmoid Node 1  Inputs Weights  Threshold -4.549646962480144  Node 2 4.743506894794498  Node 3 1.3102255159532388  Node 4 4.988335624909869  Sigmoid Node 2  Inputs Weights  Threshold -5.12035267288986  Attrib NUMUORS -1.7024594544055165  Attrib NUMUANDS -2.9846315796790135  Attrib TOTOTORS 0.1574025754059049  Attrib TOTOPANDS 1.9412420037301992  Attrib VG 5.875776352000703  Attrib NLOGIC 1.1426132695665332  Attrib LOC -11.537198700145531  Attrib ELOC -4.2370595390836225  Sigmoid Node 3  Inputs Weights  Threshold -5.015687146613024  Attrib NUMUORS -2.502958914025746  Attrib NUMUANDS -2.2491608723228036  Attrib TOTOTORS 0.3817512742646005  Attrib TOTOPANDS 0.8632933173861495  Attrib VG 3.850198489219828  Attrib NLOGIC -2.3799628670035116  Attrib LOC -2.11950414694784  Attrib ELOC -1.1489233516505857  Sigmoid Node 4  Inputs Weights  Threshold -13.33072866982274  Attrib NUMUORS -8.481238649883114  Attrib NUMUANDS -4.783537243963041  Attrib TOTOTORS 0.435019209457687  Attrib TOTOPANDS 1.700966480279357  Attrib VG 7.557157680264638  Attrib NLOGIC -7.927824158604269  Attrib LOC -3.3862306026259827  Attrib ELOC -2.1134735241053724  Class fp  Input  Node 0  Class nfp  Input  Node 1  Time taken to build model: 30.65 seconds  === Evaluation on test set ===  Time taken to test model on supplied test set: 0 seconds  === Summary ===  Correctly Classified Instances 85 87.6289 %  Incorrectly Classified Instances 12 12.3711 %  Kappa statistic 0.705  Mean absolute error 0.1868  Root mean squared error 0.3147  Relative absolute error 43.9915 %  Root relative squared error 68.0764 %  Total Number of Instances 97  === Detailed Accuracy By Class ===  TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class  0.767 0.075 0.821 0.767 0.793 0.706 0.916 0.860 fp  0.925 0.233 0.899 0.925 0.912 0.706 0.916 0.951 nfp  Weighted Avg. 0.876 0.184 0.875 0.876 0.875 0.706 0.916 0.923  === Confusion Matrix ===  a b <-- classified as  23 7 | a = fp  5 62 | b = nfp |

The performance is same but the neural network GUI can be seen when GUI is set to true

For Fit data-



For test data-

