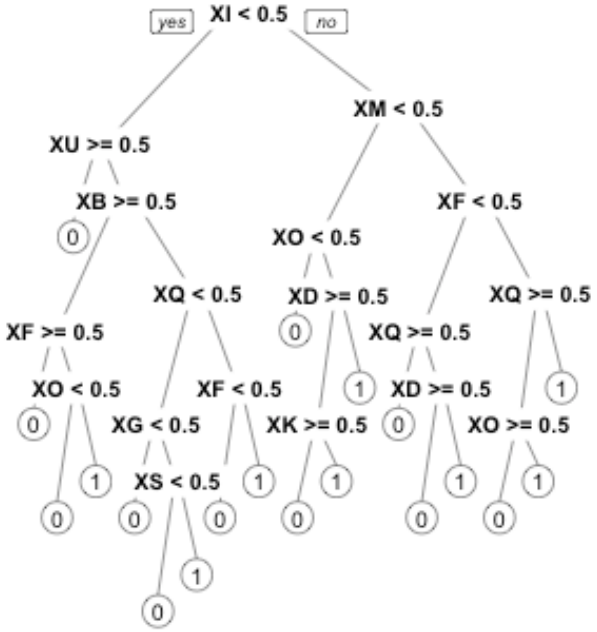
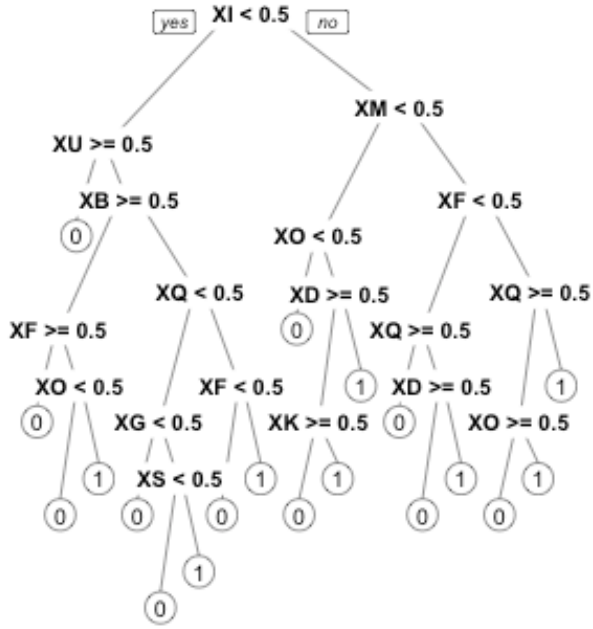
DATASET 1- Decision tree before pruning



DATASET 1- Decision tree after pruning



Summary

```
rpart(formula = Class ~ ., data = new_set1, method = "class",
    parms = list(split = "information"), minsplit = 2, minbucket = 1)
  n= 2600

          CP nsplit rel error    xerror       xstd
1 0.17230769      0 1.0000000 1.0292308 0.01960323
2 0.04230769      1 0.8276923 0.8276923 0.01931829
3 0.01538462      3 0.7430769 0.7530769 0.01900434
4 0.01461538      5 0.7123077 0.6584615 0.01843232
5 0.01384615     10 0.6069231 0.6376923 0.01827917
6 0.01346154     14 0.5515385 0.6238462 0.01817128
7 0.01153846     16 0.5246154 0.5984615 0.01796114
8 0.01000000     18 0.5015385 0.5815385 0.01781194

Variable importance
XO XF XI XQ XG XK XS XU XD XM XB
27 23  9  8  7  6  5  5  4  4  2

Node number 1: 2600 observations,    complexity param=0.1723077
  predicted class=0  expected loss=0.5  P(node) =1
    class counts:  1300  1300
   probabilities: 0.500 0.500
  left son=2 (1106 obs) right son=3 (1494 obs)
  Primary splits:
      XI < 0.5 to the left,  improve=39.697210, (0 missing)
      XM < 0.5 to the left,  improve=20.404880, (0 missing)
      XD < 0.5 to the right, improve=19.803200, (0 missing)
      XO < 0.5 to the left,  improve=18.831870, (0 missing)
      XC < 0.5 to the right, improve= 9.199387, (0 missing)
  Surrogate splits:
      XQ < 0.5 to the right, agree=0.58, adj=0.014, (0 split)

Node number 2: 1106 observations,    complexity param=0.01461538
  predicted class=0  expected loss=0.3987342  P(node) =0.4253846
    class counts:   665   441
   probabilities: 0.601 0.399
  left son=4 (458 obs) right son=5 (648 obs)
  Primary splits:
      XU < 0.5 to the right, improve=23.648080, (0 missing)
      XJ < 0.5 to the left,  improve=16.185110, (0 missing)
      XO < 0.5 to the left,  improve=11.640110, (0 missing)
      XC < 0.5 to the right, improve= 7.128937, (0 missing)
      XN < 0.5 to the right, improve= 6.778894, (0 missing)
  Surrogate splits:
      XG < 0.5 to the left,  agree=0.606, adj=0.048, (0 split)

Node number 3: 1494 observations,    complexity param=0.04230769
  predicted class=1  expected loss=0.4250335  P(node) =0.5746154
    class counts:   635   859
   probabilities: 0.425 0.575
  left son=6 (616 obs) right son=7 (878 obs)
  Primary splits:
      XM < 0.5 to the left,  improve=19.11799, (0 missing)
      XD < 0.5 to the right, improve=17.47853, (0 missing)
      XQ < 0.5 to the right, improve=17.37599, (0 missing)
      XK < 0.5 to the right, improve=16.38358, (0 missing)
      XF < 0.5 to the left,  improve=15.41548, (0 missing)
  Surrogate splits:
      XQ < 0.5 to the right, agree=0.608, adj=0.049, (0 split)

Node number 4: 458 observations
  predicted class=0  expected loss=0.279476  P(node) =0.1761538
    class counts:   330   128
   probabilities: 0.721 0.279

Node number 5: 648 observations,    complexity param=0.01461538
  predicted class=0  expected loss=0.4830247  P(node) =0.2492308
    class counts:   335   313
   probabilities: 0.517 0.483
  left son=10 (264 obs) right son=11 (384 obs)
  Primary splits:
      XB < 0.5 to the right, improve=8.387886, (0 missing)
      XN < 0.5 to the right, improve=5.707373, (0 missing)
      XJ < 0.5 to the left,  improve=5.380890, (0 missing)
      XD < 0.5 to the right, improve=4.680393, (0 missing)
      XF < 0.5 to the right, improve=4.102311, (0 missing)
```

```
  Surrogate splits:
      XQ < 0.5 to the left,  agree=0.622, adj=0.072, (0 split)
      XF < 0.5 to the left,  agree=0.619, adj=0.064, (0 split)
      XG < 0.5 to the left,  agree=0.606, adj=0.034, (0 split)

Node number 6: 616 observations,    complexity param=0.04230769
  predicted class=0  expected loss=0.4805195  P(node) =0.2369231
    class counts:   320   296
   probabilities: 0.519 0.481
  left son=12 (222 obs) right son=13 (394 obs)
  Primary splits:
      XO < 0.5 to the left,  improve=37.488090, (0 missing)
      XH < 0.5 to the left,  improve=10.587840, (0 missing)
      XD < 0.5 to the right, improve= 9.261869, (0 missing)
      XR < 0.5 to the right, improve= 8.074342, (0 missing)
      XB < 0.5 to the right, improve= 7.747214, (0 missing)

Node number 7: 878 observations,    complexity param=0.01538462
  predicted class=1  expected loss=0.3587699  P(node) =0.3376923
    class counts:   315   563
   probabilities: 0.359 0.641
  left son=14 (324 obs) right son=15 (554 obs)
  Primary splits:
      XF < 0.5 to the left,  improve=25.010440, (0 missing)
      XQ < 0.5 to the right, improve=21.601520, (0 missing)
      XD < 0.5 to the right, improve=10.788140, (0 missing)
      XK < 0.5 to the right, improve= 8.861221, (0 missing)
      XT < 0.5 to the right, improve= 4.411446, (0 missing)

Node number 10: 264 observations,    complexity param=0.01461538
  predicted class=0  expected loss=0.3863636  P(node) =0.1015385
    class counts:   162   102
   probabilities: 0.614 0.386
  left son=20 (88 obs) right son=21 (176 obs)
  Primary splits:
      XF < 0.5 to the right, improve=56.355590, (0 missing)
      XO < 0.5 to the left,  improve=50.474370, (0 missing)
      XQ < 0.5 to the right, improve= 6.647525, (0 missing)
      XG < 0.5 to the right, improve= 6.179847, (0 missing)
      XC < 0.5 to the right, improve= 3.934129, (0 missing)
  Surrogate splits:
      XO < 0.5 to the left,  agree=0.67, adj=0.011, (0 split)

Node number 11: 384 observations,    complexity param=0.01461538
  predicted class=1  expected loss=0.4505208  P(node) =0.1476923
    class counts:   173   211
   probabilities: 0.451 0.549
  left son=22 (139 obs) right son=23 (245 obs)
  Primary splits:
      XQ < 0.5 to the left,  improve=11.451820, (0 missing)
      XG < 0.5 to the left,  improve= 9.879883, (0 missing)
      XO < 0.5 to the right, improve= 5.078030, (0 missing)
      XJ < 0.5 to the left,  improve= 4.597293, (0 missing)
      XD < 0.5 to the right, improve= 3.316791, (0 missing)
  Surrogate splits:
      XF < 0.5 to the left,  agree=0.724, adj=0.237, (0 split)

Node number 12: 222 observations
  predicted class=0  expected loss=0.2522523  P(node) =0.08538462
    class counts:   166    56
   probabilities: 0.748 0.252

Node number 13: 394 observations,    complexity param=0.01346154
  predicted class=1  expected loss=0.3908629  P(node) =0.1515385
    class counts:   154   240
   probabilities: 0.391 0.609
  left son=26 (129 obs) right son=27 (265 obs)
  Primary splits:
      XD < 0.5 to the right, improve=11.154840, (0 missing)
      XJ < 0.5 to the left,  improve= 6.692245, (0 missing)
      XB < 0.5 to the right, improve= 5.663963, (0 missing)
      XH < 0.5 to the left,  improve= 5.388084, (0 missing)
      XK < 0.5 to the right, improve= 3.018307, (0 missing)

Node number 14: 324 observations,    complexity param=0.01538462
  predicted class=0  expected loss=0.4907407  P(node) =0.1246154
    class counts:   165   159
   probabilities: 0.509 0.491
  left son=28 (108 obs) right son=29 (216 obs)
  Primary splits:
      XQ < 0.5 to the right, improve=10.218330, (0 missing)
      XS < 0.5 to the left,  improve= 6.641690, (0 missing)
      XK < 0.5 to the right, improve= 6.632423, (0 missing)
      XL < 0.5 to the right, improve= 4.925723, (0 missing)
      XB < 0.5 to the left,  improve= 4.009112, (0 missing)

Node number 15: 554 observations,    complexity param=0.01384615
  predicted class=1  expected loss=0.2707581  P(node) =0.2130769
    class counts:   150   404
   probabilities: 0.271 0.729
  left son=30 (171 obs) right son=31 (383 obs)
  Primary splits:
      XQ < 0.5 to the right, improve=11.565470, (0 missing)
      XS < 0.5 to the right, improve=10.392110, (0 missing)
      XD < 0.5 to the right, improve= 6.087514, (0 missing)
      XT < 0.5 to the right, improve= 3.822925, (0 missing)
      XK < 0.5 to the right, improve= 3.306320, (0 missing)

Node number 20: 88 observations
  predicted class=0  expected loss=0  P(node) =0.03384615
    class counts:    88     0
   probabilities: 1.000 0.000

Node number 21: 176 observations,    complexity param=0.01461538
  predicted class=1  expected loss=0.4204545  P(node) =0.06769231
    class counts:    74   102
   probabilities: 0.420 0.580
  left son=42 (40 obs) right son=43 (136 obs)
  Primary splits:
      XO < 0.5 to the left,  improve=43.279560, (0 missing)
      XG < 0.5 to the right, improve= 3.214085, (0 missing)
      XQ < 0.5 to the right, improve= 3.120412, (0 missing)
      XP < 0.5 to the left,  improve= 3.079718, (0 missing)
      XT < 0.5 to the right, improve= 1.908335, (0 missing)

Node number 22: 139 observations,    complexity param=0.01384615
  predicted class=0  expected loss=0.3884892  P(node) =0.05346154
    class counts:    85    54
   probabilities: 0.612 0.388
  left son=44 (45 obs) right son=45 (94 obs)
  Primary splits:
      XG < 0.5 to the left,  improve=28.751990, (0 missing)
      XF < 0.5 to the right, improve=27.071220, (0 missing)
      XS < 0.5 to the left,  improve=26.251160, (0 missing)
      XD < 0.5 to the right, improve= 7.109140, (0 missing)
      XM < 0.5 to the left,  improve= 3.269867, (0 missing)
  Surrogate splits:
      XF < 0.5 to the right, agree=0.698, adj=0.067, (0 split)

Node number 23: 245 observations,    complexity param=0.01153846
  predicted class=1  expected loss=0.3591837  P(node) =0.09423077
    class counts:    88   157
   probabilities: 0.359 0.641
  left son=46 (63 obs) right son=47 (182 obs)
  Primary splits:
      XF < 0.5 to the left,  improve=12.093150, (0 missing)
      XS < 0.5 to the right, improve= 3.479784, (0 missing)
      XJ < 0.5 to the left,  improve= 3.435691, (0 missing)
      XL < 0.5 to the left,  improve= 3.053445, (0 missing)
      XO < 0.5 to the right, improve= 3.053445, (0 missing)

Node number 26: 129 observations,    complexity param=0.01346154
  predicted class=0  expected loss=0.4418605  P(node) =0.04961538
    class counts:    72    57
   probabilities: 0.558 0.442
  left son=52 (35 obs) right son=53 (94 obs)
  Primary splits:
      XK < 0.5 to the right, improve=25.530090, (0 missing)
```

XS < 0.5 to the right, improve= 6.462305, (0 missing)
XC < 0.5 to the right, improve= 3.360907, (0 missing)
XU < 0.5 to the right, improve= 1.419095, (0 missing)
XB < 0.5 to the right, improve= 1.215538, (0 missing)

Node number 27: 265 observations
predicted class=1 expected loss=0.309434 P(node) =0.1019231
class counts: 82 183
probabilities: 0.309 0.691

Node number 28: 108 observations
predicted class=0 expected loss=0.3148148 P(node) =0.04153846
class counts: 74 34
probabilities: 0.685 0.315

Node number 29: 216 observations, complexity param=0.01153846
predicted class=1 expected loss=0.4212963 P(node) =0.08307692
class counts: 91 125
probabilities: 0.421 0.579
left son=58 (85 obs) right son=59 (131 obs)
Primary splits:
XD < 0.5 to the right, improve=8.034155, (0 missing)
XP < 0.5 to the left, improve=5.812532, (0 missing)
XO < 0.5 to the left, improve=5.186877, (0 missing)
XB < 0.5 to the left, improve=4.542463, (0 missing)
XS < 0.5 to the left, improve=4.326626, (0 missing)
Surrogate splits:
XP < 0.5 to the left, agree=0.620, adj=0.035, (0 split)
XC < 0.5 to the left, agree=0.616, adj=0.024, (0 split)
XS < 0.5 to the left, agree=0.611, adj=0.012, (0 split)

Node number 30: 171 observations, complexity param=0.01384615
predicted class=1 expected loss=0.4093567 P(node) =0.06576923
class counts: 70 101
probabilities: 0.409 0.591
left son=60 (36 obs) right son=61 (135 obs)
Primary splits:
XO < 0.5 to the right, improve=39.513960, (0 missing)
XS < 0.5 to the right, improve=11.725850, (0 missing)
XB < 0.5 to the right, improve= 4.394599, (0 missing)
XK < 0.5 to the right, improve= 2.902832, (0 missing)
XC < 0.5 to the right, improve= 2.287081, (0 missing)

Node number 31: 383 observations
predicted class=1 expected loss=0.2088773 P(node) =0.1473077
class counts: 80 303
probabilities: 0.209 0.791

Node number 42: 40 observations
predicted class=0 expected loss=0 P(node) =0.01538462
class counts: 40 0
probabilities: 1.000 0.000

Node number 43: 136 observations
predicted class=1 expected loss=0.25 P(node) =0.05230769
class counts: 34 102
probabilities: 0.250 0.750

Node number 44: 45 observations
predicted class=0 expected loss=0 P(node) =0.01730769
class counts: 45 0
probabilities: 1.000 0.000

Node number 45: 94 observations, complexity param=0.01384615
predicted class=1 expected loss=0.4255319 P(node) =0.03615385
class counts: 40 54
probabilities: 0.426 0.574
left son=90 (22 obs) right son=91 (72 obs)
Primary splits:
XS < 0.5 to the left, improve=23.621260, (0 missing)
XF < 0.5 to the right, improve=20.928360, (0 missing)
XD < 0.5 to the right, improve= 4.511851, (0 missing)
XN < 0.5 to the right, improve= 3.172552, (0 missing)
XM < 0.5 to the left, improve= 1.931430, (0 missing)
Surrogate splits:
XF < 0.5 to the right, agree=0.787, adj=0.091, (0 split)

Node number 46: 63 observations
predicted class=0 expected loss=0.3809524 P(node) =0.02423077
class counts: 39 24
probabilities: 0.619 0.381

Node number 47: 182 observations
predicted class=1 expected loss=0.2692308 P(node) =0.07
class counts: 49 133
probabilities: 0.269 0.731

Node number 52: 35 observations
predicted class=0 expected loss=0 P(node) =0.01346154
class counts: 35 0
probabilities: 1.000 0.000

Node number 53: 94 observations
predicted class=1 expected loss=0.393617 P(node) =0.03615385
class counts: 37 57
probabilities: 0.394 0.606

Node number 58: 85 observations
predicted class=0 expected loss=0.4117647 P(node) =0.03269231
class counts: 50 35
probabilities: 0.588 0.412

Node number 59: 131 observations
predicted class=1 expected loss=0.3129771 P(node) =0.05038462
class counts: 41 90
probabilities: 0.313 0.687

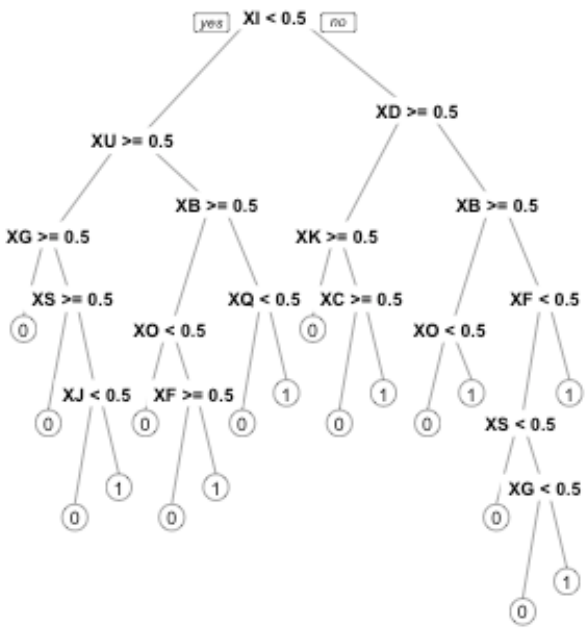
Node number 60: 36 observations
predicted class=0 expected loss=0 P(node) =0.01384615
class counts: 36 0
probabilities: 1.000 0.000

Node number 61: 135 observations
predicted class=1 expected loss=0.2518519 P(node) =0.05192308
class counts: 34 101
probabilities: 0.252 0.748

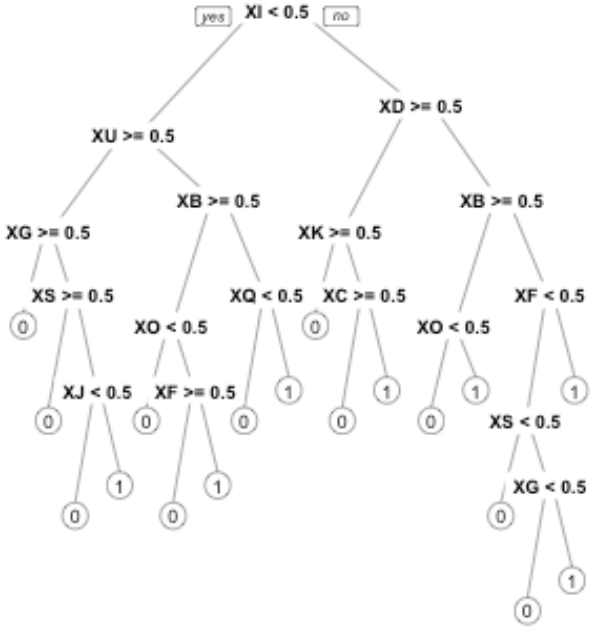
Node number 90: 22 observations
predicted class=0 expected loss=0 P(node) =0.008461538
class counts: 22 0
probabilities: 1.000 0.000

Node number 91: 72 observations
predicted class=1 expected loss=0.25 P(node) =0.02769231
class counts: 18 54
probabilities: 0.250 0.750

DATASET 2- Decision tree before pruning



DATASET 2- Decision tree after pruning



Summary

Call:
rpart(formula = Class ~ ., data = new_set2, method = "class",
parms = list(split = "information"), minsplit = 2, minbucket = 1)
n= 1200

	CP	nsplit	rel error	xerror	xstd
1	0.17000000	0	1.0000000	1.0466667	0.02883606
2	0.05083333	1	0.8300000	0.8566667	0.02856944
3	0.03333333	3	0.7283333	0.7366667	0.02784863
4	0.03166667	4	0.6950000	0.7216667	0.02772680
5	0.03000000	8	0.5683333	0.7016667	0.02755294
6	0.02916667	9	0.5383333	0.6500000	0.02704163
7	0.01666667	11	0.4800000	0.5166667	0.02527167
8	0.01333333	13	0.4466667	0.5000000	0.02500000
9	0.01000000	17	0.3933333	0.4250000	0.02361805

Variable importance
XO XG XK XS XF XU XI XB XQ XC XD XJ
20 15 14 11 9 6 5 5 5 4 4 2

Node number 1: 1200 observations, complexity param=0.17
predicted class=0 expected loss=0.5 P(node) =1
class counts: 600 600
probabilities: 0.500 0.500
left son=2 (556 obs) right son=3 (644 obs)
Primary splits:
XI < 0.5 to the left, improve=17.521070, (0 missing)
XB < 0.5 to the right, improve=13.373480, (0 missing)
XD < 0.5 to the right, improve=10.926420, (0 missing)
XJ < 0.5 to the left, improve= 9.200062, (0 missing)
XK < 0.5 to the right, improve= 6.688134, (0 missing)
Surrogate splits:
XQ < 0.5 to the right, agree=0.606, adj=0.149, (0 split)
XM < 0.5 to the left, agree=0.560, adj=0.050, (0 split)
XD < 0.5 to the right, agree=0.558, adj=0.047, (0 split)
XK < 0.5 to the right, agree=0.549, adj=0.027, (0 split)
XF < 0.5 to the left, agree=0.548, adj=0.023, (0 split)

Node number 2: 556 observations, complexity param=0.03166667
predicted class=0 expected loss=0.4082734 P(node) =0.4633333
class counts: 329 227
probabilities: 0.592 0.408
left son=4 (237 obs) right son=5 (319 obs)
Primary splits:
XU < 0.5 to the right, improve=18.845880, (0 missing)
XJ < 0.5 to the left, improve= 9.001095, (0 missing)
XB < 0.5 to the right, improve= 7.802586, (0 missing)
XS < 0.5 to the right, improve= 6.606840, (0 missing)
XO < 0.5 to the left, improve= 6.358524, (0 missing)

Node number 3: 644 observations, complexity param=0.05083333
predicted class=1 expected loss=0.4208075 P(node) =0.5366667
class counts: 271 373
probabilities: 0.421 0.579
left son=6 (244 obs) right son=7 (400 obs)
Primary splits:
XD < 0.5 to the right, improve=12.421720, (0 missing)
XK < 0.5 to the right, improve= 8.160684, (0 missing)
XB < 0.5 to the right, improve= 5.892777, (0 missing)
XF < 0.5 to the left, improve= 4.144801, (0 missing)
XJ < 0.5 to the left, improve= 3.343087, (0 missing)

Node number 4: 237 observations, complexity param=0.01666667
predicted class=0 expected loss=0.2616034 P(node) =0.1975

```
   class counts:   175    62
  probabilities: 0.738 0.262
 left son=8 (92 obs) right son=9 (145 obs)
 Primary splits:
     XG < 0.5 to the right, improve=37.230090, (0 missing)
     XS < 0.5 to the right, improve=18.125520, (0 missing)
     XJ < 0.5 to the left,  improve= 8.663831, (0 missing)
     XO < 0.5 to the left,  improve= 2.535577, (0 missing)
     XQ < 0.5 to the left,  improve= 2.372500, (0 missing)

Node number 5: 319 observations,    complexity param=0.03166667
 predicted class=1  expected loss=0.4827586  P(node) =0.2658333
   class counts:   154   165
  probabilities: 0.483 0.517
 left son=10 (143 obs) right son=11 (176 obs)
 Primary splits:
     XB < 0.5 to the right, improve=6.509378, (0 missing)
     XN < 0.5 to the right, improve=4.952449, (0 missing)
     XQ < 0.5 to the left,  improve=4.576607, (0 missing)
     XO < 0.5 to the left,  improve=3.015311, (0 missing)
     XP < 0.5 to the left,  improve=2.576585, (0 missing)
 Surrogate splits:
     XF < 0.5 to the left,  agree=0.658, adj=0.238, (0 split)
     XG < 0.5 to the left,  agree=0.633, adj=0.182, (0 split)
     XQ < 0.5 to the left,  agree=0.633, adj=0.182, (0 split)
     XO < 0.5 to the right, agree=0.589, adj=0.084, (0 split)
     XR < 0.5 to the right, agree=0.589, adj=0.084, (0 split)

Node number 6: 244 observations,    complexity param=0.05083333
 predicted class=0  expected loss=0.454918  P(node) =0.2033333
   class counts:   133   111
  probabilities: 0.545 0.455
 left son=12 (61 obs) right son=13 (183 obs)
 Primary splits:
     XK < 0.5 to the right, improve=45.476610, (0 missing)
     XC < 0.5 to the right, improve=21.282490, (0 missing)
     XS < 0.5 to the right, improve= 4.621623, (0 missing)
     XG < 0.5 to the right, improve= 3.698527, (0 missing)
     XQ < 0.5 to the right, improve= 2.228886, (0 missing)

Node number 7: 400 observations,    complexity param=0.03166667
 predicted class=1  expected loss=0.345  P(node) =0.3333333
   class counts:   138   262
  probabilities: 0.345 0.655
 left son=14 (151 obs) right son=15 (249 obs)
 Primary splits:
     XB < 0.5 to the right, improve=9.223044, (0 missing)
     XF < 0.5 to the left,  improve=4.682069, (0 missing)
     XE < 0.5 to the left,  improve=1.998165, (0 missing)
     XO < 0.5 to the left,  improve=1.948817, (0 missing)
     XJ < 0.5 to the left,  improve=1.362015, (0 missing)
 Surrogate splits:
     XF < 0.5 to the left,  agree=0.63, adj=0.02, (0 split)

Node number 8: 92 observations
 predicted class=0  expected loss=0  P(node) =0.07666667
   class counts:    92     0
  probabilities: 1.000 0.000

Node number 9: 145 observations,    complexity param=0.01666667
 predicted class=0  expected loss=0.4275862  P(node) =0.1208333
   class counts:    83    62
  probabilities: 0.572 0.428
 left son=18 (55 obs) right son=19 (90 obs)
 Primary splits:
     XS < 0.5 to the right, improve=17.873620, (0 missing)
     XJ < 0.5 to the left,  improve= 9.348176, (0 missing)
     XF < 0.5 to the left,  improve= 3.447514, (0 missing)
     XB < 0.5 to the right, improve= 2.407946, (0 missing)
     XO < 0.5 to the left,  improve= 2.218057, (0 missing)
 Surrogate splits:
     XQ < 0.5 to the left,  agree=0.628, adj=0.018, (0 split)

Node number 10: 143 observations,    complexity param=0.02916667
 predicted class=0  expected loss=0.4055944  P(node) =0.1191667
   class counts:    85    58
  probabilities: 0.594 0.406
 left son=20 (44 obs) right son=21 (99 obs)
 Primary splits:
     XO < 0.5 to the left,  improve=29.401010, (0 missing)
     XF < 0.5 to the right, improve=27.665860, (0 missing)
     XP < 0.5 to the left,  improve= 7.259067, (0 missing)
     XG < 0.5 to the right, improve= 4.646533, (0 missing)
     XN < 0.5 to the right, improve= 2.388752, (0 missing)
 Surrogate splits:
     XF < 0.5 to the right, agree=0.734, adj=0.136, (0 split)

Node number 11: 176 observations,    complexity param=0.03
 predicted class=1  expected loss=0.3920455  P(node) =0.1466667
   class counts:    69   107
  probabilities: 0.392 0.608
 left son=22 (52 obs) right son=23 (124 obs)
 Primary splits:
     XQ < 0.5 to the left,  improve=12.160500, (0 missing)
     XF < 0.5 to the left,  improve= 3.836422, (0 missing)
     XG < 0.5 to the left,  improve= 3.199527, (0 missing)
     XN < 0.5 to the right, improve= 1.761499, (0 missing)
     XC < 0.5 to the right, improve= 1.527226, (0 missing)
 Surrogate splits:
     XF < 0.5 to the left,  agree=0.722, adj=0.058, (0 split)

Node number 12: 61 observations
 predicted class=0  expected loss=0  P(node) =0.05083333
   class counts:    61     0
  probabilities: 1.000 0.000

Node number 13: 183 observations,    complexity param=0.03333333
 predicted class=1  expected loss=0.3934426  P(node) =0.1525
   class counts:    72   111
  probabilities: 0.393 0.607
 left son=26 (52 obs) right son=27 (131 obs)
 Primary splits:
     XC < 0.5 to the right, improve=13.535720, (0 missing)
     XS < 0.5 to the right, improve= 5.577944, (0 missing)
     XH < 0.5 to the left,  improve= 3.548654, (0 missing)
     XU < 0.5 to the left,  improve= 1.574557, (0 missing)
     XB < 0.5 to the left,  improve= 1.220439, (0 missing)

Node number 14: 151 observations,    complexity param=0.03166667
 predicted class=1  expected loss=0.4768212  P(node) =0.1258333
   class counts:    72    79
  probabilities: 0.477 0.523
 left son=28 (38 obs) right son=29 (113 obs)
 Primary splits:
     XO < 0.5 to the left,  improve=35.390730, (0 missing)
     XQ < 0.5 to the right, improve= 3.594328, (0 missing)
     XE < 0.5 to the left,  improve= 2.765384, (0 missing)
     XT < 0.5 to the right, improve= 2.670675, (0 missing)
     XJ < 0.5 to the left,  improve= 1.715787, (0 missing)

Node number 15: 249 observations,    complexity param=0.01333333
 predicted class=1  expected loss=0.2650602  P(node) =0.2075
   class counts:    66   183
  probabilities: 0.265 0.735
 left son=30 (82 obs) right son=31 (167 obs)
 Primary splits:
     XF < 0.5 to the left,  improve=5.7158740, (0 missing)
     XN < 0.5 to the right, improve=2.0077620, (0 missing)
```

XO < 0.5 to the right, improve=0.9476934, (0 missing)
XT < 0.5 to the left, improve=0.5698524, (0 missing)
XG < 0.5 to the left, improve=0.5196678, (0 missing)

Node number 18: 55 observations
predicted class=0 expected loss=0.1272727 P(node) =0.04583333
class counts: 48 7
probabilities: 0.873 0.127

Node number 19: 90 observations, complexity param=0.01333333
predicted class=1 expected loss=0.3888889 P(node) =0.075
class counts: 35 55
probabilities: 0.389 0.611
left son=38 (36 obs) right son=39 (54 obs)
Primary splits:
XJ < 0.5 to the left, improve=6.281076, (0 missing)
XB < 0.5 to the right, improve=4.235026, (0 missing)
XF < 0.5 to the left, improve=3.506265, (0 missing)
XQ < 0.5 to the left, improve=3.196356, (0 missing)
XP < 0.5 to the left, improve=1.873261, (0 missing)
Surrogate splits:
XB < 0.5 to the right, agree=0.656, adj=0.139, (0 split)
XO < 0.5 to the left, agree=0.611, adj=0.028, (0 split)
XQ < 0.5 to the left, agree=0.611, adj=0.028, (0 split)

Node number 20: 44 observations
predicted class=0 expected loss=0 P(node) =0.03666667
class counts: 44 0
probabilities: 1.000 0.000

Node number 21: 99 observations, complexity param=0.02916667
predicted class=1 expected loss=0.4141414 P(node) =0.0825
class counts: 41 58
probabilities: 0.414 0.586
left son=42 (18 obs) right son=43 (81 obs)
Primary splits:
XF < 0.5 to the right, improve=18.826400, (0 missing)
XP < 0.5 to the left, improve= 5.405415, (0 missing)
XT < 0.5 to the right, improve= 2.323706, (0 missing)
XG < 0.5 to the right, improve= 2.047518, (0 missing)
XQ < 0.5 to the right, improve= 1.489625, (0 missing)

Node number 22: 52 observations
predicted class=0 expected loss=0.3269231 P(node) =0.04333333
class counts: 35 17
probabilities: 0.673 0.327

Node number 23: 124 observations
predicted class=1 expected loss=0.2741935 P(node) =0.1033333
class counts: 34 90
probabilities: 0.274 0.726

Node number 26: 52 observations
predicted class=0 expected loss=0.3076923 P(node) =0.04333333
class counts: 36 16
probabilities: 0.692 0.308

Node number 27: 131 observations
predicted class=1 expected loss=0.2748092 P(node) =0.1091667
class counts: 36 95
probabilities: 0.275 0.725

Node number 28: 38 observations
predicted class=0 expected loss=0 P(node) =0.03166667
class counts: 38 0
probabilities: 1.000 0.000

Node number 29: 113 observations
predicted class=1 expected loss=0.300885 P(node) =0.09416667
class counts: 34 79
probabilities: 0.301 0.699

Node number 30: 82 observations, complexity param=0.01333333
predicted class=1 expected loss=0.402439 P(node) =0.06833333
class counts: 33 49
probabilities: 0.402 0.598
left son=60 (16 obs) right son=61 (66 obs)
Primary splits:
XS < 0.5 to the left, improve=17.613640, (0 missing)
XG < 0.5 to the left, improve=16.278510, (0 missing)
XE < 0.5 to the left, improve= 2.347546, (0 missing)
XM < 0.5 to the right, improve= 1.760320, (0 missing)
XK < 0.5 to the right, improve= 1.569918, (0 missing)

Node number 31: 167 observations
predicted class=1 expected loss=0.1976048 P(node) =0.1391667
class counts: 33 134
probabilities: 0.198 0.802

Node number 38: 36 observations
predicted class=0 expected loss=0.3888889 P(node) =0.03
class counts: 22 14
probabilities: 0.611 0.389

Node number 39: 54 observations
predicted class=1 expected loss=0.2407407 P(node) =0.045
class counts: 13 41
probabilities: 0.241 0.759

Node number 42: 18 observations
predicted class=0 expected loss=0 P(node) =0.015
class counts: 18 0
probabilities: 1.000 0.000

Node number 43: 81 observations
predicted class=1 expected loss=0.2839506 P(node) =0.0675
class counts: 23 58
probabilities: 0.284 0.716

Node number 60: 16 observations
predicted class=0 expected loss=0 P(node) =0.01333333
class counts: 16 0
probabilities: 1.000 0.000

Node number 61: 66 observations, complexity param=0.01333333
predicted class=1 expected loss=0.2575758 P(node) =0.055
class counts: 17 49
probabilities: 0.258 0.742
left son=122 (8 obs) right son=123 (58 obs)
Primary splits:
XG < 0.5 to the left, improve=12.6219100, (0 missing)
XL < 0.5 to the right, improve= 1.7101840, (0 missing)
XC < 0.5 to the left, improve= 1.4562350, (0 missing)
XM < 0.5 to the right, improve= 1.2220450, (0 missing)
XK < 0.5 to the right, improve= 0.8078666, (0 missing)

Node number 122: 8 observations
predicted class=0 expected loss=0 P(node) =0.006666667
class counts: 8 0
probabilities: 1.000 0.000

Node number 123: 58 observations
predicted class=1 expected loss=0.1551724 P(node) =0.04833333
class counts: 9 49
probabilities: 0.155 0.845