python decisionTree.py training\_set.xlsx test\_set.xlsx validation\_set.xlsx 0.1

Tree before pruning

XO = 0 :

| XM = 0 :

| | XF = 0 :

| | | XB = 0 :

| | | | XG = 0 : 0

| | | | XG = 1 :

| | | | | XD = 0 :

| | | | | | XS = 0 : 0

| | | | | | XS = 1 :

| | | | | | | XC = 0 : 1

| | | | | | | XC = 1 :

| | | | | | | | XH = 0 : 0

| | | | | | | | XH = 1 : 1

| | | | | XD = 1 :

| | | | | | XP = 0 :

| | | | | | | XE = 0 : 0

| | | | | | | XE = 1 : 1

| | | | | | XP = 1 : 0

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XN = 0 : 0

| | | | | | XN = 1 : 1

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XF = 0 :

| | | | XG = 0 : 0

| | | | XG = 1 :

| | | | | XD = 0 : 1

| | | | | XD = 1 :

| | | | | | XC = 0 :

| | | | | | | XS = 0 : 0

| | | | | | | XS = 1 :

| | | | | | | | XR = 0 : 1

| | | | | | | | XR = 1 : 0

| | | | | | XC = 1 : 0

| | | XF = 1 :

| | | | XS = 0 :

| | | | | XQ = 0 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 :

| | | | | | | XP = 0 : 0

| | | | | | | XP = 1 : 1

| | | | | XQ = 1 :

| | | | | | XI = 0 : 1

| | | | | | XI = 1 :

| | | | | | | XL = 0 : 1

| | | | | | | XL = 1 :

| | | | | | | | XT = 0 : 0

| | | | | | | | XT = 1 : 1

| | | | XS = 1 :

| | | | | XR = 0 :

| | | | | | XD = 0 : 1

| | | | | | XD = 1 :

| | | | | | | XP = 0 :

| | | | | | | | XT = 0 :

| | | | | | | | | XQ = 0 : 0

| | | | | | | | | XQ = 1 : 1

| | | | | | | | XT = 1 : 1

| | | | | | | XP = 1 : 0

| | | | | XR = 1 :

| | | | | | XI = 0 :

| | | | | | | XU = 0 : 1

| | | | | | | XU = 1 : 0

| | | | | | XI = 1 :

| | | | | | | XG = 0 :

| | | | | | | | XQ = 0 :

| | | | | | | | | XJ = 0 :

| | | | | | | | | | XU = 0 : 1

| | | | | | | | | | XU = 1 : 0

| | | | | | | | | XJ = 1 : 1

| | | | | | | | XQ = 1 : 0

| | | | | | | XG = 1 : 1

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XK = 0 :

| | | | | XD = 0 : 0

| | | | | XD = 1 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XS = 0 :

| | | | | | | | XG = 0 : 1

| | | | | | | | XG = 1 :

| | | | | | | | | XN = 0 : 0

| | | | | | | | | XN = 1 : 1

| | | | | | | XS = 1 : 0

| | | | XK = 1 : 0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XS = 0 : 0

| | | | | | XS = 1 :

| | | | | | | XP = 0 : 0

| | | | | | | XP = 1 : 1

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 0 :

| | | | | XN = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XU = 0 : 0

| | | | | | | XU = 1 :

| | | | | | | | XF = 0 : 0

| | | | | | | | XF = 1 : 1

| | | | | XN = 1 : 0

| | | | XJ = 1 :

| | | | | XL = 0 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

| | | | | | | XU = 0 : 1

| | | | | | | XU = 1 :

| | | | | | | | XK = 0 : 0

| | | | | | | | XK = 1 : 1

| | | | | XL = 1 : 1

| | XM = 1 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XL = 0 :

| | | | | | XC = 0 : 1

| | | | | | XC = 1 :

| | | | | | | XH = 0 : 1

| | | | | | | XH = 1 :

| | | | | | | | XU = 0 :

| | | | | | | | | XR = 0 :

| | | | | | | | | | XT = 0 : 0

| | | | | | | | | | XT = 1 : 1

| | | | | | | | | XR = 1 : 0

| | | | | | | | XU = 1 : 1

| | | | | XL = 1 :

| | | | | | XP = 0 : 0

| | | | | | XP = 1 :

| | | | | | | XT = 0 : 1

| | | | | | | XT = 1 :

| | | | | | | | XJ = 0 : 1

| | | | | | | | XJ = 1 : 0

| | | | XF = 1 : 0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 :

| | | | XP = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XR = 0 :

| | | | | | | XL = 0 :

| | | | | | | | XU = 0 : 0

| | | | | | | | XU = 1 : 1

| | | | | | | XL = 1 : 1

| | | | | | XR = 1 :

| | | | | | | XQ = 0 : 1

| | | | | | | XQ = 1 : 0

| | | | XP = 1 :

| | | | | XS = 0 :

| | | | | | XD = 0 :

| | | | | | | XC = 0 :

| | | | | | | | XU = 0 :

| | | | | | | | | XQ = 0 : 1

| | | | | | | | | XQ = 1 : 0

| | | | | | | | XU = 1 :

| | | | | | | | | XG = 0 : 1

| | | | | | | | | XG = 1 : 0

| | | | | | | XC = 1 : 0

| | | | | | XD = 1 :

| | | | | | | XM = 0 :

| | | | | | | | XJ = 0 : 0

| | | | | | | | XJ = 1 : 1

| | | | | | | XM = 1 : 1

| | | | | XS = 1 : 1

| | | XH = 1 :

| | | | XJ = 0 :

| | | | | XC = 0 :

| | | | | | XN = 0 : 1

| | | | | | XN = 1 :

| | | | | | | XG = 0 :

| | | | | | | | XF = 0 : 1

| | | | | | | | XF = 1 : 0

| | | | | | | XG = 1 : 0

| | | | | XC = 1 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XS = 0 :

| | | | | | | | XR = 0 : 1

| | | | | | | | XR = 1 : 0

| | | | | | | XS = 1 : 1

| | | | XJ = 1 :

| | | | | XS = 0 : 1

| | | | | XS = 1 :

| | | | | | XG = 0 :

| | | | | | | XB = 0 : 0

| | | | | | | XB = 1 :

| | | | | | | | XN = 0 : 1

| | | | | | | | XN = 1 :

| | | | | | | | | XU = 0 : 1

| | | | | | | | | XU = 1 : 0

| | | | | | XG = 1 :

| | | | | | | XQ = 0 : 1

| | | | | | | XQ = 1 :

| | | | | | | | XU = 0 : 1

| | | | | | | | XU = 1 : 0

| | XT = 1 :

| | | XS = 0 :

| | | | XQ = 0 :

| | | | | XK = 0 :

| | | | | | XC = 0 :

| | | | | | | XR = 0 :

| | | | | | | | XH = 0 :

| | | | | | | | | XE = 0 : 0

| | | | | | | | | XE = 1 : 1

| | | | | | | | XH = 1 : 1

| | | | | | | XR = 1 :

| | | | | | | | XU = 0 : 0

| | | | | | | | XU = 1 :

| | | | | | | | | XL = 0 : 0

| | | | | | | | | XL = 1 : 1

| | | | | | XC = 1 : 1

| | | | | XK = 1 :

| | | | | | XD = 0 :

| | | | | | | XJ = 0 : 0

| | | | | | | XJ = 1 : 1

| | | | | | XD = 1 : 0

| | | | XQ = 1 :

| | | | | XM = 0 :

| | | | | | XN = 0 :

| | | | | | | XU = 0 : 1

| | | | | | | XU = 1 : 0

| | | | | | XN = 1 :

| | | | | | | XR = 0 : 1

| | | | | | | XR = 1 :

| | | | | | | | XL = 0 : 1

| | | | | | | | XL = 1 : 0

| | | | | XM = 1 : 0

| | | XS = 1 :

| | | | XL = 0 :

| | | | | XD = 0 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XQ = 0 :

| | | | | | | | XG = 0 : 1

| | | | | | | | XG = 1 : 0

| | | | | | | XQ = 1 :

| | | | | | | | XH = 0 : 0

| | | | | | | | XH = 1 : 1

| | | | | XD = 1 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 : 1

| | | | XL = 1 :

| | | | | XH = 0 :

| | | | | | XQ = 0 :

| | | | | | | XD = 0 : 0

| | | | | | | XD = 1 :

| | | | | | | | XR = 0 : 0

| | | | | | | | XR = 1 : 1

| | | | | | XQ = 1 :

| | | | | | | XM = 0 : 1

| | | | | | | XM = 1 : 0

| | | | | XH = 1 : 0

Pre-Pruned Accuracy

-------------------------------------

Number of training instances = 600

Number of training attributes = 21

Total number of nodes in the tree = 265.0

Number of leaf nodes in the tree = 133

Accuracy of the model on the training dataset = 100.0 %

Number of validation instances 2000

Number of validation attributes 21

Accuracy of the model on the validation dataset 74.3 %

Number of testing instances 2000

Number of testing attributes 21

Accuracy of the model on the testing dataset 75.14999999999999 %

Tree after pruning

XO = 0 :

| XM = 0 :

| | XF = 0 :

| | | XB = 0 :

| | | | XG = 0 : 0

| | | | XG = 1 :

| | | | | XD = 0 :

| | | | | | XS = 0 : 0

| | | | | | XS = 1 :

| | | | | | | XC = 0 : 1

| | | | | | | XC = 1 :

| | | | | | | | XH = 0 : 0

| | | | | | | | XH = 1 : 1

| | | | | XD = 1 :

| | | | | | XP = 1 : 0

| | | | | | XP = 0 : 0.0

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XN = 0 : 0

| | | | | | XN = 1 : 1

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XF = 0 :

| | | | XG = 0 : 0

| | | | XG = 1 :

| | | | | XD = 0 : 1

| | | | | XD = 1 :

| | | | | | XC = 0 :

| | | | | | | XS = 0 : 0

| | | | | | | XS = 1 :

| | | | | | | | XR = 0 : 1

| | | | | | | | XR = 1 : 0

| | | | | | XC = 1 : 0

| | | XF = 1 :

| | | | XS = 0 :

| | | | | XQ = 0 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 :

| | | | | | | XP = 0 : 0

| | | | | | | XP = 1 : 1

| | | | | XQ = 1 :

| | | | | | XI = 0 : 1

| | | | | | XI = 1 :

| | | | | | | XL = 0 : 1

| | | | | | | XL = 1 :

| | | | | | | | XT = 0 : 0

| | | | | | | | XT = 1 : 1

| | | | XS = 1 :

| | | | | XR = 0 :

| | | | | | XD = 0 : 1

| | | | | | XD = 1 :

| | | | | | | XP = 0 :

| | | | | | | | XT = 0 :

| | | | | | | | | XQ = 0 : 0

| | | | | | | | | XQ = 1 : 1

| | | | | | | | XT = 1 : 1

| | | | | | | XP = 1 : 0

| | | | | XR = 1 :

| | | | | | XI = 0 :

| | | | | | | XU = 0 : 1

| | | | | | | XU = 1 : 0

| | | | | | XI = 1 : 0.0

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XK = 1 : 0

| | | | XK = 0 : 0.0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XS = 0 : 0

| | | | | | XS = 1 : 1.0

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 1 :

| | | | | XL = 0 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

| | | | | | | XU = 0 : 1

| | | | | | | XU = 1 : 1.0

| | | | | XL = 1 : 1

| | | | XJ = 0 : 0.0

| | XM = 1 :

| | | XQ = 0 :

| | | | XF = 1 : 0

| | | | XF = 0 : 0.0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 : 1.0

| | | XH = 1 : 1.0

| | XT = 1 :

| | | XS = 0 : 0.0

| | | XS = 1 : 0.0

Post-Pruned Accuracy

-------------------------------------

Number of training instances = 600

Number of training attributes = 21

Total number of nodes in the tree = 102.0

Number of leaf nodes in the tree = 52

Accuracy of the model on the training dataset = 77.5 %

Number of validation instances 2000

Number of validation attributes 21

Accuracy of the model on the validation dataset 67.95 %

Number of testing instances 2000

Number of testing attributes 21

Accuracy of the model on the testing dataset 67.60000000000001 %