Report of ID3 Decision tree

**Net Id : kxk152430**

**Assignment – 1**

**Output with DataSet 1 and DataSet 2 & Combinations of L , K**

**DataSet 1:**

Information Gain:

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ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.85%

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 :

| | | | | | XE = 0 : 0

| | | | | | XE = 1 :

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

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

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XG = 0 : 1

| | | | | | XG = 1 : 0

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XD = 0 :

| | | | XG = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XN = 1 :

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

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

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

| | | | | | | | XE = 1 : 0

| | | | | | XJ = 1 :

| | | | | | | XC = 0 :

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

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

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

| | | | | | | | | | | XI = 0 : 0

| | | | | | | | | | | XI = 1 : 1

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

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

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

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

| | | | XG = 1 :

| | | | | XU = 0 : 1

| | | | | XU = 1 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 : 1

| | | XD = 1 :

| | | | XC = 0 :

| | | | | XF = 0 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | XF = 1 :

| | | | | | XJ = 0 : 1

| | | | | | XJ = 1 :

| | | | | | | XE = 0 :

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

| | | | | | | | | XI = 0 : 1

| | | | | | | | | XI = 1 : 0

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

| | | | | | | XE = 1 :

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

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

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

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

| | | | XC = 1 : 0

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XC = 0 :

| | | | | XK = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XS = 0 :

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

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

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

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

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

| | | | | XK = 1 : 0

| | | | XC = 1 : 0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 0 :

| | | | | XN = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XB = 0 :

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

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

| | | | | | | XB = 1 : 0

| | | | | XN = 1 : 0

| | | | XJ = 1 :

| | | | | XL = 0 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

| | | | | | | XK = 0 :

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

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

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

| | | | | | | | | | XD = 0 : 1

| | | | | | | | | | XD = 1 : 0

| | | | | | | | | XB = 1 : 0

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

| | | | | XL = 1 :

| | | | | | XC = 0 :

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

| | | | | | | XB = 1 :

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

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

| | | | | | XC = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 :

| | | | XP = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 :

| | | | | | | XK = 0 : 1

| | | | | | | XK = 1 :

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

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

| | | | | | XQ = 1 :

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

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

| | | | XP = 1 :

| | | | | XS = 0 :

| | | | | | XD = 0 :

| | | | | | | XC = 0 :

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

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

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

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

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

| | | | | | | | | XB = 1 :

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

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

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

| | | | | | XD = 1 :

| | | | | | | XM = 0 :

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

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

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

| | | | | XS = 1 : 1

| | | XH = 1 :

| | | | XJ = 0 :

| | | | | XC = 0 :

| | | | | | XN = 0 : 1

| | | | | | XN = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | | XC = 1 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | XJ = 1 :

| | | | | XS = 0 : 1

| | | | | XS = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XB = 1 :

| | | | | | | | XD = 0 : 1

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

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

| | | | | | XG = 1 :

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

| | | | | | | XC = 1 :

| | | | | | | | XD = 0 : 1

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| | 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 :

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

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

| | | | | | | | | XD = 1 : 1

| | | | | | | | XB = 1 : 0

| | | | | | XC = 1 : 1

| | | | | XK = 1 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | XQ = 1 :

| | | | | XM = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | | | XM = 1 : 0

| | | XS = 1 :

| | | | XL = 0 :

| | | | | XD = 0 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XB = 0 :

| | | | | | | | XE = 0 : 1

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

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

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

| | | | | | | XB = 1 :

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

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

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

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

| | | | | XD = 1 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 : 1

| | | | XL = 1 :

| | | | | XH = 0 :

| | | | | | XD = 0 :

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

| | | | | | | XQ = 1 :

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

| | | | | | | | XB = 1 : 1

| | | | | | XD = 1 :

| | | | | | | XB = 0 : 1

| | | | | | | XB = 1 : 0

| | | | | XH = 1 : 0

Impurity Variance:

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ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=76.65%

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 :

| | | | | | XE = 0 : 0

| | | | | | XE = 1 :

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

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

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XG = 0 : 1

| | | | | | XG = 1 : 0

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XD = 0 :

| | | | XG = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XN = 1 :

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

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

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

| | | | | | | | XE = 1 : 0

| | | | | | XJ = 1 :

| | | | | | | XC = 0 :

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

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

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

| | | | | | | | | | | XI = 0 : 0

| | | | | | | | | | | XI = 1 : 1

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

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

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

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

| | | | XG = 1 :

| | | | | XU = 0 : 1

| | | | | XU = 1 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 : 1

| | | XD = 1 :

| | | | XC = 0 :

| | | | | XF = 0 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | XF = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XP = 1 :

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

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

| | | | | | XG = 1 :

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

| | | | | | | XQ = 1 :

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

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

| | | | XC = 1 : 0

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XC = 0 :

| | | | | XK = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XS = 0 :

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

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

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

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

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

| | | | | XK = 1 : 0

| | | | XC = 1 : 0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 0 :

| | | | | XN = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XB = 0 :

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

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

| | | | | | | XB = 1 : 0

| | | | | XN = 1 : 0

| | | | XJ = 1 :

| | | | | XH = 0 :

| | | | | | XL = 0 : 0

| | | | | | XL = 1 : 1

| | | | | XH = 1 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 : 0

| | XM = 1 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XL = 0 :

| | | | | | XC = 0 : 1

| | | | | | XC = 1 :

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

| | | | | | | XH = 1 :

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

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

| | | | | | | | | | XD = 0 : 1

| | | | | | | | | | XD = 1 : 0

| | | | | | | | | XB = 1 : 0

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

| | | | | XL = 1 :

| | | | | | XC = 0 :

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

| | | | | | | XB = 1 :

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

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

| | | | | | XC = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 :

| | | | XP = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 :

| | | | | | | XK = 0 : 1

| | | | | | | XK = 1 :

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

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

| | | | | | XQ = 1 :

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

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

| | | | XP = 1 :

| | | | | XS = 0 :

| | | | | | XD = 0 :

| | | | | | | XC = 0 :

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

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

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

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

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

| | | | | | | | | XB = 1 :

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

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

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

| | | | | | XD = 1 :

| | | | | | | XK = 0 :

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

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

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

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

| | | | | | | XK = 1 : 0

| | | | | XS = 1 : 1

| | | XH = 1 :

| | | | XJ = 0 :

| | | | | XC = 0 :

| | | | | | XN = 0 : 1

| | | | | | XN = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | | XC = 1 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | XJ = 1 :

| | | | | XS = 0 : 1

| | | | | XS = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XB = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 1 :

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

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

| | | | | | XG = 1 :

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

| | | | | | | XC = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 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 :

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

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

| | | | | | | | | XD = 1 : 1

| | | | | | | | XB = 1 : 0

| | | | | | XC = 1 : 1

| | | | | XK = 1 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | XQ = 1 :

| | | | | XM = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | | | XM = 1 : 0

| | | XS = 1 :

| | | | XL = 0 :

| | | | | XD = 0 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XB = 0 :

| | | | | | | | XE = 0 : 1

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

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

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

| | | | | | | XB = 1 :

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

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

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

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

| | | | | XD = 1 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 : 1

| | | | XL = 1 :

| | | | | XE = 0 :

| | | | | | XK = 0 :

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

| | | | | | | XG = 1 :

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

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

| | | | | | XK = 1 : 0

| | | | | XE = 1 :

| | | | | | XM = 0 :

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

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

| | | | | | XM = 1 : 0

**L=900 K=20**

Information Gain:

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ID3 decision tree with training set

Accuracy of decision tree on validation set after pruning =75.85%

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 :

| | | | | | XE = 0 : 0

| | | | | | XE = 1 :

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

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

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XG = 0 : 1

| | | | | | XG = 1 : 0

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XD = 0 :

| | | | XG = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XN = 1 :

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

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

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

| | | | | | | | XE = 1 : 0

| | | | | | XJ = 1 :

| | | | | | | XC = 0 :

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

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

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

| | | | | | | | | | | XI = 0 : 0

| | | | | | | | | | | XI = 1 : 1

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

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

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

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

| | | | XG = 1 :

| | | | | XU = 0 : 1

| | | | | XU = 1 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 : 1

| | | XD = 1 :

| | | | XC = 0 :

| | | | | XF = 0 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | XF = 1 :

| | | | | | XJ = 0 : 1

| | | | | | XJ = 1 :

| | | | | | | XE = 0 :

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

| | | | | | | | | XI = 0 : 1

| | | | | | | | | XI = 1 : 0

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

| | | | | | | XE = 1 :

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

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

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

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

| | | | XC = 1 : 0

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XC = 0 :

| | | | | XK = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XS = 0 :

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

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

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

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

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

| | | | | XK = 1 : 0

| | | | XC = 1 : 0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 0 :

| | | | | XN = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XB = 0 :

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

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

| | | | | | | XB = 1 : 0

| | | | | XN = 1 : 0

| | | | XJ = 1 :

| | | | | XL = 0 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

| | | | | | | XK = 0 :

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

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

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

| | | | | | | | | | XD = 0 : 1

| | | | | | | | | | XD = 1 : 0

| | | | | | | | | XB = 1 : 0

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

| | | | | XL = 1 :

| | | | | | XC = 0 :

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

| | | | | | | XB = 1 :

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

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

| | | | | | XC = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 :

| | | | XP = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 :

| | | | | | | XK = 0 : 1

| | | | | | | XK = 1 :

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

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

| | | | | | XQ = 1 :

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

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

| | | | XP = 1 :

| | | | | XS = 0 :

| | | | | | XD = 0 :

| | | | | | | XC = 0 :

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

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

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

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

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

| | | | | | | | | XB = 1 :

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

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

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

| | | | | | XD = 1 :

| | | | | | | XM = 0 :

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

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

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

| | | | | XS = 1 : 1

| | | XH = 1 :

| | | | XJ = 0 :

| | | | | XC = 0 :

| | | | | | XN = 0 : 1

| | | | | | XN = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | | XC = 1 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | XJ = 1 :

| | | | | XS = 0 : 1

| | | | | XS = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XB = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 1 :

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

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

| | | | | | XG = 1 :

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

| | | | | | | XC = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 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 :

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

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

| | | | | | | | | XD = 1 : 1

| | | | | | | | XB = 1 : 0

| | | | | | XC = 1 : 1

| | | | | XK = 1 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | XQ = 1 :

| | | | | XM = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | | | XM = 1 : 0

| | | XS = 1 :

| | | | XL = 0 :

| | | | | XD = 0 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XB = 0 :

| | | | | | | | XE = 0 : 1

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

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

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

| | | | | | | XB = 1 :

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

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

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

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

| | | | | XD = 1 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 : 1

| | | | XL = 1 :

| | | | | XH = 0 :

| | | | | | XD = 0 :

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

| | | | | | | XQ = 1 :

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

| | | | | | | | XB = 1 : 1

| | | | | | XD = 1 :

| | | | | | | XB = 0 : 1

| | | | | | | XB = 1 : 0

| | | | | XH = 1 : 0

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of decision tree on validation set after pruning =76.35%

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 :

| | | | | | XE = 0 : 0

| | | | | | XE = 1 :

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

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

| | | XB = 1 :

| | | | XD = 0 : 0

| | | | XD = 1 :

| | | | | XI = 0 : 0

| | | | | XI = 1 :

| | | | | | XG = 0 : 1

| | | | | | XG = 1 : 0

| | XF = 1 : 0

| XM = 1 :

| | XB = 0 :

| | | XD = 0 :

| | | | XG = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XN = 1 :

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

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

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

| | | | | | | | XE = 1 : 0

| | | | | | XJ = 1 :

| | | | | | | XC = 0 :

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

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

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

| | | | | | | | | | | XI = 0 : 0

| | | | | | | | | | | XI = 1 : 1

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

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

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

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

| | | | XG = 1 :

| | | | | XU = 0 : 1

| | | | | XU = 1 :

| | | | | | XI = 0 : 0

| | | | | | XI = 1 : 1

| | | XD = 1 :

| | | | XC = 0 :

| | | | | XF = 0 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | XF = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XP = 1 :

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

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

| | | | | | XG = 1 :

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

| | | | | | | XQ = 1 :

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

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

| | | | XC = 1 : 0

| | XB = 1 :

| | | XI = 0 : 0

| | | XI = 1 :

| | | | XC = 0 :

| | | | | XK = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XS = 0 :

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

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

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

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

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

| | | | | XK = 1 : 0

| | | | XC = 1 : 0

XO = 1 :

| XI = 0 :

| | XM = 0 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XH = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XH = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 :

| | | | XJ = 0 :

| | | | | XN = 0 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

| | | | | | | XB = 0 :

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

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

| | | | | | | XB = 1 : 0

| | | | | XN = 1 : 0

| | | | XJ = 1 :

| | | | | XH = 0 :

| | | | | | XL = 0 : 0

| | | | | | XL = 1 : 1

| | | | | XH = 1 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 : 0

| | XM = 1 :

| | | XQ = 0 :

| | | | XF = 0 :

| | | | | XL = 0 :

| | | | | | XC = 0 : 1

| | | | | | XC = 1 :

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

| | | | | | | XH = 1 :

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

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

| | | | | | | | | | XD = 0 : 1

| | | | | | | | | | XD = 1 : 0

| | | | | | | | | XB = 1 : 0

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

| | | | | XL = 1 :

| | | | | | XC = 0 :

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

| | | | | | | XB = 1 :

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

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

| | | | | | XC = 1 : 1

| | | | XF = 1 : 0

| | | XQ = 1 : 0

| XI = 1 :

| | XT = 0 :

| | | XH = 0 :

| | | | XP = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 :

| | | | | | | XK = 0 : 1

| | | | | | | XK = 1 :

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

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

| | | | | | XQ = 1 :

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

| | | | XP = 1 :

| | | | | XS = 0 :

| | | | | | XD = 0 :

| | | | | | | XC = 0 :

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

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

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

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

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

| | | | | | | | | XB = 1 :

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

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

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

| | | | | | XD = 1 :

| | | | | | | XK = 0 :

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

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

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

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

| | | | | | | XK = 1 : 0

| | | | | XS = 1 : 1

| | | XH = 1 :

| | | | XJ = 0 :

| | | | | XC = 0 :

| | | | | | XN = 0 : 1

| | | | | | XN = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | | XC = 1 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XF = 0 :

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

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

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

| | | | XJ = 1 :

| | | | | XS = 0 : 1

| | | | | XS = 1 :

| | | | | | XG = 0 :

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

| | | | | | | XB = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 1 :

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

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

| | | | | | XG = 1 :

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

| | | | | | | XC = 1 :

| | | | | | | | XD = 0 : 1

| | | | | | | | XD = 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 :

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

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

| | | | | | | | | XD = 1 : 1

| | | | | | | | XB = 1 : 0

| | | | | | XC = 1 : 1

| | | | | XK = 1 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | XQ = 1 :

| | | | | XM = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 :

| | | | | | | XP = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | | | XM = 1 : 0

| | | XS = 1 :

| | | | XL = 0 :

| | | | | XD = 0 :

| | | | | | XU = 0 : 1

| | | | | | XU = 1 :

| | | | | | | XB = 0 :

| | | | | | | | XE = 0 : 1

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

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

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

| | | | | | | XB = 1 :

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

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

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

| | | | | XD = 1 :

| | | | | | XG = 0 : 0

| | | | | | XG = 1 : 1

| | | | XL = 1 :

| | | | | XE = 0 :

| | | | | | XK = 0 :

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

| | | | | | | XG = 1 :

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

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

| | | | | | XK = 1 : 0

| | | | | XE = 1 :

| | | | | | XM = 0 :

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

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

| | | | | | XM = 1 : 0

**DataSet 2:**

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.33%

XI = 0 :

| XU = 0 :

| | XQ = 0 :

| | | XF = 0 :

| | | | XO = 0 :

| | | | | XB = 0 :

| | | | | | XJ = 0 : 0

| | | | | | XJ = 1 :

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

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

| | | | | XB = 1 : 0

| | | | XO = 1 :

| | | | | XB = 0 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | | XB = 1 :

| | | | | | XH = 0 :

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

| | | | | | | XL = 1 :

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

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

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

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

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

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

| | | | | | XH = 1 : 1

| | | XF = 1 : 0

| | XQ = 1 :

| | | XB = 0 :

| | | | XT = 0 :

| | | | | XL = 0 :

| | | | | | XR = 0 :

| | | | | | | XN = 0 :

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

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

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

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

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

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

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

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

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

| | | | | | XR = 1 : 1

| | | | | XL = 1 :

| | | | | | XF = 0 : 0

| | | | | | XF = 1 :

| | | | | | | XC = 0 :

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

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

| | | | | | | | | XE = 0 : 1

| | | | | | | | | XE = 1 : 0

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XK = 0 : 1

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

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

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

| | | | XT = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XM = 0 :

| | | | | | | XH = 0 :

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

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

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

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

| | | | | | | | | | XD = 1 : 1

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

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

| | | | | | XM = 1 : 0

| | | XB = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XM = 0 :

| | | | | | XF = 0 :

| | | | | | | XP = 0 :

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

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

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

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

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

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

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

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

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

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

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

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

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

| | | | | | | | | | | XE = 1 : 0

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

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

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

| | | | | | XF = 1 : 0

| | | | | XM = 1 : 0

| XU = 1 :

| | XG = 0 :

| | | XS = 0 :

| | | | XB = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 : 0

| | | | | | XQ = 1 :

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

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

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

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

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

| | | | XB = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XC = 1 :

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

| | | | | | | | XD = 1 : 1

| | | | | | XJ = 1 : 1

| | | XS = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XL = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 : 1

| | | | | XL = 1 : 0

| | XG = 1 : 0

XI = 1 :

| XK = 0 :

| | XC = 0 :

| | | XS = 0 :

| | | | XG = 0 :

| | | | | XM = 0 : 1

| | | | | XM = 1 :

| | | | | | XT = 0 : 1

| | | | | | XT = 1 :

| | | | | | | XL = 0 :

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

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

| | | | | | | | | XB = 0 : 1

| | | | | | | | | XB = 1 : 0

| | | | | | | XL = 1 :

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

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

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

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

| | | | | | | | | | XB = 0 : 1

| | | | | | | | | | XB = 1 : 0

| | | | XG = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

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

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

| | | XS = 1 :

| | | | XR = 0 :

| | | | | XN = 0 : 1

| | | | | XN = 1 :

| | | | | | XH = 0 :

| | | | | | | XJ = 0 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

| | | | | | XH = 1 :

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

| | | | | | | XT = 1 :

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

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

| | | | XR = 1 :

| | | | | XG = 0 :

| | | | | | XM = 0 :

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

| | | | | | | XH = 1 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

| | | | | | XM = 1 :

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

| | | | | | | XD = 1 : 1

| | | | | XG = 1 : 0

| | XC = 1 :

| | | XD = 0 :

| | | | XS = 0 :

| | | | | XF = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XF = 1 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

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

| | | | | | | XH = 1 :

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

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

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

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

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

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

| | | | XS = 1 :

| | | | | XJ = 0 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XQ = 0 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

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

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

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

| | | | | XJ = 1 :

| | | | | | XO = 0 :

| | | | | | | XF = 0 :

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

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

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

| | | | | | XO = 1 :

| | | | | | | XR = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | XD = 1 :

| | | | XF = 0 : 0

| | | | XF = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XP = 0 : 0

| | | | | | XP = 1 : 1

| XK = 1 :

| | XD = 0 :

| | | XT = 0 :

| | | | XF = 0 :

| | | | | XB = 0 :

| | | | | | XR = 0 : 0

| | | | | | XR = 1 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

| | | | | XB = 1 :

| | | | | | XO = 0 : 0

| | | | | | XO = 1 : 1

| | | | XF = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 :

| | | | | | | XL = 0 :

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

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

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

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

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

| | | | | | XH = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 :

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

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

| | | XT = 1 :

| | | | XB = 0 :

| | | | | XC = 0 :

| | | | | | XM = 0 : 1

| | | | | | XM = 1 :

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

| | | | | | | XJ = 1 :

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

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

| | | | | XC = 1 :

| | | | | | XH = 0 : 1

| | | | | | XH = 1 :

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

| | | | | | | XL = 1 :

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

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

| | | | XB = 1 : 0

| | XD = 1 : 0

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.5%

XI = 0 :

| XU = 0 :

| | XQ = 0 :

| | | XF = 0 :

| | | | XO = 0 :

| | | | | XB = 0 :

| | | | | | XJ = 0 : 0

| | | | | | XJ = 1 :

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

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

| | | | | XB = 1 : 0

| | | | XO = 1 :

| | | | | XB = 0 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | | XB = 1 :

| | | | | | XH = 0 :

| | | | | | | XS = 0 :

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

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

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

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

| | | | | | | XS = 1 :

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

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

| | | | | | XH = 1 : 1

| | | XF = 1 : 0

| | XQ = 1 :

| | | XB = 0 :

| | | | XF = 0 :

| | | | | XG = 0 : 0

| | | | | XG = 1 :

| | | | | | XL = 0 :

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

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

| | | | | | XL = 1 : 0

| | | | XF = 1 :

| | | | | XT = 0 :

| | | | | | XL = 0 :

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

| | | | | | | XS = 1 :

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

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

| | | | | | XL = 1 :

| | | | | | | XC = 0 :

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

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

| | | | | | | | | XE = 0 : 1

| | | | | | | | | XE = 1 : 0

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XK = 0 : 1

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

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

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

| | | | | XT = 1 :

| | | | | | XH = 0 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

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

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

| | | | | | | | | | XD = 1 : 1

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

| | | | | | XH = 1 : 1

| | | XB = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XM = 0 :

| | | | | | XF = 0 :

| | | | | | | XP = 0 :

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

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

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

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

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

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

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

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

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

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

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

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

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

| | | | | | | | | | | XE = 1 : 0

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

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

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

| | | | | | XF = 1 : 0

| | | | | XM = 1 : 0

| XU = 1 :

| | XG = 0 :

| | | XS = 0 :

| | | | XB = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 : 0

| | | | | | XQ = 1 :

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

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

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

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

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

| | | | XB = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XC = 1 :

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

| | | | | | | | XD = 1 : 1

| | | | | | XJ = 1 : 1

| | | XS = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XL = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 : 1

| | | | | XL = 1 : 0

| | XG = 1 : 0

XI = 1 :

| XK = 0 :

| | XC = 0 :

| | | XS = 0 :

| | | | XG = 0 :

| | | | | XM = 0 : 1

| | | | | XM = 1 :

| | | | | | XT = 0 : 1

| | | | | | XT = 1 :

| | | | | | | XL = 0 :

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

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

| | | | | | | | | XB = 0 : 1

| | | | | | | | | XB = 1 : 0

| | | | | | | XL = 1 :

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

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

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

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

| | | | | | | | | | XB = 0 : 1

| | | | | | | | | | XB = 1 : 0

| | | | XG = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

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

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

| | | XS = 1 :

| | | | XR = 0 :

| | | | | XN = 0 : 1

| | | | | XN = 1 :

| | | | | | XH = 0 :

| | | | | | | XJ = 0 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

| | | | | | XH = 1 :

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

| | | | | | | XT = 1 :

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

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

| | | | XR = 1 :

| | | | | XG = 0 :

| | | | | | XM = 0 :

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

| | | | | | | XH = 1 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

| | | | | | XM = 1 :

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

| | | | | | | XD = 1 : 1

| | | | | XG = 1 : 0

| | XC = 1 :

| | | XD = 0 :

| | | | XS = 0 :

| | | | | XF = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XF = 1 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

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

| | | | | | | XH = 1 :

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

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

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

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

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

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

| | | | XS = 1 :

| | | | | XJ = 0 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XQ = 0 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

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

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

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

| | | | | XJ = 1 :

| | | | | | XO = 0 :

| | | | | | | XF = 0 :

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

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

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

| | | | | | XO = 1 :

| | | | | | | XR = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | XD = 1 :

| | | | XF = 0 : 0

| | | | XF = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XP = 0 : 0

| | | | | | XP = 1 : 1

| XK = 1 :

| | XD = 0 :

| | | XT = 0 :

| | | | XF = 0 :

| | | | | XB = 0 :

| | | | | | XR = 0 : 0

| | | | | | XR = 1 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

| | | | | XB = 1 :

| | | | | | XO = 0 : 0

| | | | | | XO = 1 : 1

| | | | XF = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 :

| | | | | | | XL = 0 :

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

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

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

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

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

| | | | | | XH = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 :

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

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

| | | XT = 1 :

| | | | XB = 0 :

| | | | | XC = 0 :

| | | | | | XM = 0 : 1

| | | | | | XM = 1 :

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

| | | | | | | XJ = 1 :

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

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

| | | | | XC = 1 :

| | | | | | XE = 0 :

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

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

| | | | | | XE = 1 :

| | | | | | | XM = 0 :

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

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

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

| | | | XB = 1 : 0

| | XD = 1 : 0

**L=900 K=20**

Information Gain:

===================

ID3 decision tree with training set

Accuracy of decision tree on validation set after pruning =73.0%

XI = 0 :

| XU = 0 :

| | XQ = 0 :

| | | XF = 0 :

| | | | XO = 0 :

| | | | | XB = 0 :

| | | | | | XJ = 0 : 0

| | | | | | XJ = 1 :

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

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

| | | | | XB = 1 : 0

| | | | XO = 1 :

| | | | | XB = 0 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | | XB = 1 :

| | | | | | XH = 0 :

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

| | | | | | | XL = 1 :

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

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

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

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

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

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

| | | | | | XH = 1 : 1

| | | XF = 1 : 0

| | XQ = 1 :

| | | XB = 0 :

| | | | XT = 0 :

| | | | | XL = 0 :

| | | | | | XR = 0 : 1

| | | | | XL = 1 :

| | | | | | XF = 0 : 0

| | | | | | XF = 1 :

| | | | | | | XC = 0 :

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

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

| | | | | | | | | XE = 0 : 1

| | | | | | | | | XE = 1 : 0

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XK = 0 : 1

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

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

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

| | | | XT = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XM = 0 :

| | | | | | | XH = 0 :

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

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

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

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

| | | | | | | | | | XD = 1 : 1

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

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

| | | | | | XM = 1 : 0

| | | XB = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XM = 0 :

| | | | | | XF = 0 :

| | | | | | | XP = 0 :

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

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

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

| | | | | | | | | | XK = 0 : 1

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

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

| | | | | | XF = 1 : 0

| | | | | XM = 1 : 0

| XU = 1 :

| | XG = 0 :

| | | XS = 0 :

| | | | XB = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 : 0

| | | | | | XQ = 1 :

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

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

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

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

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

| | | | XB = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XC = 1 :

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

| | | | | | | | XD = 1 : 1

| | | | | | XJ = 1 : 1

| | | XS = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XL = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 : 1

| | | | | XL = 1 : 0

| | XG = 1 : 0

XI = 1 :

| XK = 0 :

| | XC = 0 :

| | | XS = 0 :

| | | | XG = 0 :

| | | | | XM = 0 : 1

| | | | | XM = 1 :

| | | | | | XT = 0 : 1

| | | | | | XT = 1 :

| | | | | | | XL = 0 :

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

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

| | | | | | | | | XB = 0 : 1

| | | | | | | | | XB = 1 : 0

| | | | | | | XL = 1 :

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

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

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

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

| | | | | | | | | | XB = 0 : 1

| | | | XG = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

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

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

| | | XS = 1 :

| | | | XR = 0 :

| | | | | XN = 0 : 1

| | | | | XN = 1 :

| | | | | | XH = 0 :

| | | | | | | XJ = 0 :

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

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

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

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

| | | | | | XH = 1 :

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

| | | | | | | XT = 1 :

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

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

| | | | XR = 1 :

| | | | | XG = 0 :

| | | | | | XM = 0 :

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

| | | | | | | XH = 1 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

| | | | | | XM = 1 :

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

| | | | | | | XD = 1 : 1

| | | | | XG = 1 : 0

| | XC = 1 :

| | | XD = 0 :

| | | | XS = 0 :

| | | | | XF = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XF = 1 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

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

| | | | | | | XH = 1 :

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

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

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

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

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

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

| | | | XS = 1 :

| | | | | XJ = 0 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XQ = 0 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

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

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

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

| | | | | XJ = 1 :

| | | | | | XO = 0 :

| | | | | | | XF = 0 :

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

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

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

| | | | | | XO = 1 :

| | | | | | | XR = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | XD = 1 :

| | | | XF = 0 : 0

| | | | XF = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XP = 0 : 0

| | | | | | XP = 1 : 1

| XK = 1 :

| | XD = 0 :

| | | XT = 0 :

| | | | XF = 0 :

| | | | | XB = 0 :

| | | | | | XR = 0 : 0

| | | | | | XR = 1 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

| | | | | XB = 1 :

| | | | | | XO = 0 : 0

| | | | | | XO = 1 : 1

| | | | XF = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 :

| | | | | | | XL = 0 :

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

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

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

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

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

| | | | | | XH = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 :

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

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

| | | XT = 1 :

| | | | XB = 0 :

| | | | | XC = 0 :

| | | | | | XM = 0 : 1

| | | | | | XM = 1 :

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

| | | | | | | XJ = 1 :

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

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

| | | | | XC = 1 :

| | | | | | XH = 0 : 1

| | | | | | XH = 1 :

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

| | | | | | | XL = 1 :

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

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

| | | | XB = 1 : 0

| | XD = 1 : 0

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of decision tree on validation set after pruning =73.17%

XI = 0 :

| XU = 0 :

| | XQ = 0 :

| | | XF = 0 :

| | | | XO = 0 :

| | | | | XB = 0 :

| | | | | | XJ = 0 : 0

| | | | | | XJ = 1 :

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

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

| | | | | XB = 1 : 0

| | | | XO = 1 :

| | | | | XB = 0 :

| | | | | | XD = 0 :

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

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

| | | | | | XD = 1 : 0

| | | | | XB = 1 :

| | | | | | XH = 0 :

| | | | | | | XS = 0 :

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

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

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

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

| | | | | | | XS = 1 :

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

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

| | | | | | XH = 1 : 1

| | | XF = 1 : 0

| | XQ = 1 :

| | | XB = 0 :

| | | | XF = 0 :

| | | | | XG = 0 : 0

| | | | | XG = 1 :

| | | | | | XL = 0 :

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

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

| | | | | | XL = 1 : 0

| | | | XF = 1 :

| | | | | XT = 0 :

| | | | | | XL = 0 :

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

| | | | | | | XS = 1 :

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

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

| | | | | | XL = 1 :

| | | | | | | XC = 0 :

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

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

| | | | | | | | | XE = 0 : 1

| | | | | | | | | XE = 1 : 0

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XK = 0 : 1

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

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

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

| | | | | XT = 1 :

| | | | | | XH = 0 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

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

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

| | | | | | | | | | XD = 1 : 1

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

| | | | | | XH = 1 : 1

| | | XB = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XM = 0 :

| | | | | | XF = 0 :

| | | | | | | XP = 0 :

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

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

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

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

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

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

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

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

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

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

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

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

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

| | | | | | | | | | | XE = 1 : 0

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

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

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

| | | | | | XF = 1 : 0

| | | | | XM = 1 : 0

| XU = 1 :

| | XG = 0 :

| | | XS = 0 :

| | | | XB = 0 :

| | | | | XF = 0 : 0

| | | | | XF = 1 :

| | | | | | XQ = 0 : 0

| | | | | | XQ = 1 :

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

| | | | | | | XC = 1 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

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

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

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

| | | | XB = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XJ = 0 :

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

| | | | | | | XC = 1 :

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

| | | | | | | | XD = 1 : 1

| | | | | | XJ = 1 : 1

| | | XS = 1 :

| | | | XO = 0 : 0

| | | | XO = 1 :

| | | | | XL = 0 :

| | | | | | XN = 0 :

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

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

| | | | | | XN = 1 : 1

| | | | | XL = 1 : 0

| | XG = 1 : 0

XI = 1 :

| XK = 0 :

| | XC = 0 :

| | | XS = 0 :

| | | | XG = 0 :

| | | | | XM = 0 : 1

| | | | | XM = 1 :

| | | | | | XT = 0 : 1

| | | | | | XT = 1 :

| | | | | | | XL = 0 :

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

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

| | | | | | | | | XB = 0 : 1

| | | | | | | | | XB = 1 : 0

| | | | | | | XL = 1 :

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

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

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

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

| | | | | | | | | | XB = 0 : 1

| | | | | | | | | | XB = 1 : 0

| | | | XG = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 : 0

| | | | | | XH = 1 :

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

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

| | | XS = 1 :

| | | | XR = 0 :

| | | | | XN = 0 : 1

| | | | | XN = 1 :

| | | | | | XH = 0 :

| | | | | | | XJ = 0 :

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

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

| | | | | | | | | XD = 1 : 1

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

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

| | | | | | XH = 1 :

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

| | | | | | | XT = 1 :

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

| | | | XR = 1 :

| | | | | XG = 0 :

| | | | | | XM = 0 :

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

| | | | | | | XH = 1 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

| | | | | | XM = 1 :

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

| | | | | | | XD = 1 : 1

| | | | | XG = 1 : 0

| | XC = 1 :

| | | XD = 0 :

| | | | XS = 0 :

| | | | | XF = 0 :

| | | | | | XB = 0 : 0

| | | | | | XB = 1 :

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

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

| | | | | XF = 1 :

| | | | | | XP = 0 : 1

| | | | | | XP = 1 :

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

| | | | | | | XH = 1 :

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

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

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

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

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

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

| | | | XS = 1 :

| | | | | XJ = 0 :

| | | | | | XM = 0 : 0

| | | | | | XM = 1 :

| | | | | | | XQ = 0 :

| | | | | | | | XB = 0 : 1

| | | | | | | | XB = 1 :

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

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

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

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

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

| | | | | XJ = 1 :

| | | | | | XO = 0 :

| | | | | | | XF = 0 :

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

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

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

| | | | | | XO = 1 :

| | | | | | | XR = 0 :

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

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

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

| | | | | | | | XB = 1 : 1

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

| | | XD = 1 :

| | | | XF = 0 : 0

| | | | XF = 1 :

| | | | | XO = 0 : 0

| | | | | XO = 1 :

| | | | | | XP = 0 : 0

| | | | | | XP = 1 : 1

| XK = 1 :

| | XD = 0 :

| | | XT = 0 :

| | | | XF = 0 :

| | | | | XB = 0 :

| | | | | | XR = 0 : 0

| | | | | | XR = 1 :

| | | | | | | XO = 0 : 1

| | | | | | | XO = 1 :

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

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

| | | | | XB = 1 :

| | | | | | XO = 0 : 0

| | | | | | XO = 1 : 1

| | | | XF = 1 :

| | | | | XO = 0 : 1

| | | | | XO = 1 :

| | | | | | XH = 0 :

| | | | | | | XL = 0 :

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

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

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

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

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

| | | | | | XH = 1 :

| | | | | | | XE = 0 : 1

| | | | | | | XE = 1 :

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

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

| | | XT = 1 :

| | | | XB = 0 :

| | | | | XC = 0 :

| | | | | | XM = 0 : 1

| | | | | | XM = 1 :

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

| | | | | | | XJ = 1 :

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

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

| | | | | XC = 1 :

| | | | | | XE = 0 :

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

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

| | | | | | XE = 1 :

| | | | | | | XM = 0 :

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

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

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

| | | | XB = 1 : 0

| | XD = 1 : 0

3. L=1000 K=40

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.33%

Accuracy of decision tree on validation set after pruning =72.83%

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=71.5%

Accuracy of decision tree on validation set after pruning =71.33%

4. L=800 K=100

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.85%

Accuracy of decision tree on validation set after pruning =75.85%

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=76.65%

Accuracy of decision tree on validation set after pruning =76.85%

**5. L=800 K=100**

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.85%

Accuracy of decision tree on validation set after pruning =75.85%

**Impurity Variance:**

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=76.65%

Accuracy of decision tree on validation set after pruning =76.25%

**6. L=1100 K=300**

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.33%

Accuracy of decision tree on validation set after pruning =72.53%

**Impurity Variance:**

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.5%

Accuracy of decision tree on validation set after pruning =72.7%

7. L=1000 K=600

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.33%

Accuracy of decision tree on validation set after pruning =72.33%

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=72.5%

Accuracy of decision tree on validation set after pruning =72.5%

8. L=300 K=4

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.85%

Accuracy of decision tree on validation set after pruning =76.0%

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=76.65%

Accuracy of decision tree on validation set after pruning =76.75%

10. L=500 K=90

Impurity Variance:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.65%

Accuracy of decision tree on validation set after pruning =75.85%

Information Gain:

===================

ID3 decision tree with training set

Accuracy of ID3 decision tree using test set before pruning=75.85%

Accuracy of decision tree on validation set after pruning =76.65%