HW1 Decision Tree Algorithm

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Result:

(1) data set 1

Pruned tree for L, K = (85,45), just one example because of 20 trees will be toooo long.

```
XO = 1:
|   XI = 1:
| |   XT = 1:
| | |   XS = 1:
| | | |   XL = 1:
| | | | |   XH = 1: 0
| | | | |   XH=0:
| | | | | |   XD = 1:
| | | | | | |   XB = 1: 0
| | | | | | |   XB=0: 1
| | | | | |   XD=0:
| | | | | | |   XQ = 1:
| | | | | | | |   XB = 1: 1
| | | | | | | |   XB=0: 0
| | | | | | |   XQ=0: 0
| | | |   XL=0:
| | | | |   XD = 1:
| | | | | |   XG = 1: 1
| | | | | |   XG=0: 0
| | | | |   XD=0:
| | | | | |   XU = 1:
| | | | | | |   XF = 1:
| | | | | | | |   XE = 1:
| | | | | | | | |   XC = 1: 0
| | | | | | | | |   XC=0: 1
| | | | | | | |   XE=0: 1
| | | | | | |   XF=0:
| | | | | | | |   XG = 1: 0
| | | | | | | |   XG=0:
| | | | | | | | |   XH = 1: 1
| | | | | | | | |   XH=0: 0
| | | | | |   XU=0: 1
```

```
| | |   XS=0:
| | | |    XQ = 1:
| | | | |    XM = 1: 0
| | | | |    XM=0:
| | | | | |    XN = 1:
| | | | | | |    XP = 1: 1
| | | | | | |    XP=0:
| | | | | | | |    XB = 1: 1
| | | | | | | |    XB=0:
| | | | | | | | |    XF = 1: 1
| | | | | | | | |    XF=0: 0
| | | | | |    XN=0:
| | | | | | |    XU = 1: 0
| | | | | | |    XU=0: 1
| | | |    XQ=0:
| | | | |    XK = 1:
| | | | | |    XD = 1: 0
| | | | | |    XD=0:
| | | | | | |    XF = 1: 1
| | | | | | |    XF=0: 0
| | | | |    XK=0:
| | | | | |    XC = 1: 1
| | | | | |    XC=0:
| | | | | | |    XR = 1:
| | | | | | | |    XB = 1: 0
| | | | | | | |    XB=0:
| | | | | | | | |    XD = 1: 1
| | | | | | | | |    XD=0: 0
| | | | | | |    XR=0:
| | | | | | | |    XH = 1: 1
| | | | | | | |    XH=0:
| | | | | | | | |    XE = 1: 1
| | | | | | | | |    XE=0: 0
| |   XT=0:
| | |    XH = 1:
| | | |    XJ = 1:
| | | | |    XS = 1:
| | | | | |    XG = 1:
| | | | | | |    XC = 1:
| | | | | | | |    XD = 1: 0
| | | | | | | |    XD=0: 1
```

```
| | | | | | |   XC=0: 1
| | | | | |   XG=0:
| | | | | | |   XB = 1:
| | | | | | | |   XD = 1:
| | | | | | | | |   XE = 1: 1
| | | | | | | | |   XE=0: 0
| | | | | | | |   XD=0: 1
| | | | | | |   XB=0: 0
| | | | |   XS=0: 1
| | | |   XJ=0:
| | | | |   XC = 1:
| | | | | |   XM = 1:
| | | | | | |   XF = 1: 1
| | | | | | |   XF=0:
| | | | | | | |   XR = 1: 0
| | | | | | | |   XR=0: 1
| | | | | |   XM=0: 0
| | | | |   XC=0:
| | | | | |   XN = 1:
| | | | | | |   XF = 1: 0
| | | | | | |   XF=0:
| | | | | | | |   XG = 1: 0
| | | | | | | |   XG=0: 1
| | | | | |   XN=0: 1
| | |   XH=0:
| | | |   XP = 1:
| | | | |   XS = 1: 1
| | | | |   XS=0:
| | | | | |   XD = 1:
| | | | | | |   XM = 1: 1
| | | | | | |   XM=0:
| | | | | | | |   XC = 1: 0
| | | | | | | |   XC=0: 1
| | | | | |   XD=0:
| | | | | | |   XC = 1: 0
| | | | | | |   XC=0:
| | | | | | | |   XJ = 1:
| | | | | | | | |   XG = 1: 0
| | | | | | | | |   XG=0:
| | | | | | | | | |   XB = 1: 1
| | | | | | | | | |   XB=0: 0
```

```
| | | | | | | |   XJ=0:
| | | | | | | | | |   XN = 1: 1
| | | | | | | | | |   XN=0: 0
| | | |   XP=0:
| | | | |   XF = 1:
| | | | | |   XQ = 1:
| | | | | | |   XK = 1: 1
| | | | | | |   XK=0: 0
| | | | | |   XQ=0:
| | | | | | |   XK = 1:
| | | | | | | |   XC = 1: 1
| | | | | | | |   XC=0: 0
| | | | | | |   XK=0: 1
| | | | |   XF=0: 0
|   XI=0:
| |   XM = 1:
| | |   XQ = 1: 0
| | |   XQ=0:
| | | |   XF = 1: 0
| | | |   XF=0:
| | | | |   XL = 1:
| | | | | |   XC = 1: 1
| | | | | |   XC=0:
| | | | | | |   XB = 1:
| | | | | | | |   XP = 1: 1
| | | | | | | |   XP=0: 0
| | | | | | |   XB=0: 0
| | | | |   XL=0:
| | | | | |   XC = 1:
| | | | | | |   XH = 1:
| | | | | | | |   XU = 1: 1
| | | | | | | |   XU=0:
| | | | | | | | |   XB = 1: 0
| | | | | | | | |   XB=0:
| | | | | | | | | |   XD = 1: 0
| | | | | | | | | |   XD=0: 1
| | | | | | |   XH=0: 1
| | | | | |   XC=0: 1
| |   XM=0:
| | |   XQ = 1:
| | | |   XJ = 1:
```

```
| | | | |   XL = 1: 1
| | | | |   XL=0:
| | | | | |   XH = 1:
| | | | | | |   XK = 1: 1
| | | | | | |   XK=0:
| | | | | | | |   XU = 1: 0
| | | | | | | |   XU=0: 1
| | | | | |   XH=0: 0
| | | |   XJ=0:
| | | | |   XN = 1: 0
| | | | |   XN=0:
| | | | | |   XP = 1:
| | | | | | |   XB = 1: 0
| | | | | | |   XB=0:
| | | | | | | |   XF = 1: 1
| | | | | | | |   XF=0: 0
| | | | | |   XP=0: 1
| | |   XQ=0:
| | | |   XF = 1: 0
| | | |   XF=0:
| | | | |   XH = 1: 1
| | | | |   XH=0:
| | | | | |   XB = 1:
| | | | | | |   XC = 1: 0
| | | | | | |   XC=0: 1
| | | | | |   XB=0: 0
 XO=0:
|   XM = 1:
| |   XB = 1:
| | |   XI = 1:
| | | |   XC = 1: 0
| | | |   XC=0:
| | | | |   XK = 1: 0
| | | | |   XK=0:
| | | | | |   XP = 1:
| | | | | | |   XS = 1: 0
| | | | | | |   XS=0:
| | | | | | | |   XG = 1:
| | | | | | | | |   XF = 1: 1
| | | | | | | | |   XF=0: 0
| | | | | | | |   XG=0: 1
```

```
| | | | | |   XP=0: 1
| | |   XI=0: 0
| |   XB=0:
| | |   XF = 1:
| | | |   XS = 1:
| | | | |   XR = 1:
| | | | | |   XI = 1:
| | | | | | |   XG = 1: 1
| | | | | | |   XG=0:
| | | | | | | |   XQ = 1: 0
| | | | | | | |   XQ=0:
| | | | | | | | |   XJ = 1: 1
| | | | | | | | |   XJ=0:
| | | | | | | | | |   XD = 1: 1
| | | | | | | | | |   XD=0: 0
| | | | | |   XI=0:
| | | | | | |   XU = 1: 0
| | | | | | |   XU=0: 1
| | | | |   XR=0:
| | | | | |   XD = 1:
| | | | | | |   XK = 1: 1
| | | | | | |   XK=0:
| | | | | | | |   XE = 1:
| | | | | | | | |   XG = 1: 0
| | | | | | | | |   XG=0: 1
| | | | | | | |   XE=0: 0
| | | | | |   XD=0: 1
| | | |   XS=0:
| | | | |   XQ = 1:
| | | | | |   XI = 1:
| | | | | | |   XL = 1:
| | | | | | | |   XD = 1: 1
| | | | | | | |   XD=0: 0
| | | | | | |   XL=0: 1
| | | | | |   XI=0: 1
| | | | |   XQ=0:
| | | | | |   XI = 1:
| | | | | | |   XP = 1: 1
| | | | | | |   XP=0: 0
| | | | | |   XI=0: 0
| | |   XF=0:
```

```
| | | |   XG = 1:
| | | | |   XD = 1:
| | | | | | |   XC = 1: 0
| | | | | | |   XC=0:
| | | | | | | | |   XP = 1: 0
| | | | | | | | |   XP=0:
| | | | | | | | | | |   XS = 1: 1
| | | | | | | | | | |   XS=0: 0
| | | | | |   XD=0: 1
| | | |   XG=0: 0
|   XM=0:
| |   XF = 1: 0
| |   XF=0:
| | |   XB = 1:
| | | |   XD = 1:
| | | | |   XI = 1:
| | | | | | |   XG = 1: 0
| | | | | | |   XG=0: 1
| | | | |   XI=0: 0
| | | |   XD=0: 0
| | |   XB=0:
| | | |   XG = 1:
| | | | |   XD = 1:
| | | | | |   XP = 1: 0
| | | | | |   XP=0:
| | | | | | |   XE = 1: 1
| | | | | | |   XE=0: 0
| | | | |   XD=0:
| | | | | |   XS = 1:
| | | | | | |   XC = 1:
| | | | | | | |   XH = 1: 1
| | | | | | | |   XH=0: 0
| | | | | | |   XC=0: 1
| | | | | |   XS=0: 0
| | | |   XG=0: 0

 XO = 1:
|   XI = 1:
| |   XT = 1:
| | |   XS = 1:
| | | |   XL = 1:
```

```
| | | | |   XH = 1: 0
| | | | |   XH=0:
| | | | | |   XD = 1:
| | | | | | |   XB = 1: 0
| | | | | | |   XB=0: 1
| | | | | |   XD=0:
| | | | | | |   XQ = 1:
| | | | | | | |   XB = 1: 1
| | | | | | | |   XB=0: 0
| | | | | | |   XQ=0: 0
| | | |   XL=0:
| | | | |   XD = 1:
| | | | | |   XG = 1: 1
| | | | | |   XG=0: 0
| | | | |   XD=0:
| | | | | |   XU = 1:
| | | | | | |   XF = 1:
| | | | | | | |   XE = 1:
| | | | | | | | |   XC = 1: 0
| | | | | | | | |   XC=0: 1
| | | | | | | |   XE=0: 1
| | | | | | |   XF=0:
| | | | | | | |   XG = 1: 0
| | | | | | | |   XG=0:
| | | | | | | | |   XH = 1: 1
| | | | | | | | |   XH=0: 0
| | | | | |   XU=0: 1
| | |   XS=0:
| | | |   XQ = 1:
| | | | |   XM = 1: 0
| | | | |   XM=0:
| | | | | |   XN = 1:
| | | | | | |   XP = 1: 1
| | | | | | |   XP=0:
| | | | | | | |   XB = 1: 1
| | | | | | | |   XB=0:
| | | | | | | | |   XF = 1: 1
| | | | | | | | |   XF=0: 0
| | | | | |   XN=0:
| | | | | | |   XU = 1: 0
| | | | | | |   XU=0: 1
```

```
| | | |   XQ=0:
| | | | |   XK = 1:
| | | | | |   XD = 1: 0
| | | | | |   XD=0:
| | | | | | |   XF = 1: 1
| | | | | | |   XF=0: 0
| | | | |   XK=0:
| | | | | |   XC = 1: 1
| | | | | |   XC=0:
| | | | | | |   XR = 1:
| | | | | | | |   XB = 1: 0
| | | | | | | |   XB=0:
| | | | | | | | |   XD = 1: 1
| | | | | | | | |   XD=0: 0
| | | | | | |   XR=0:
| | | | | | | |   XH = 1: 1
| | | | | | | |   XH=0:
| | | | | | | | |   XE = 1: 1
| | | | | | | | |   XE=0: 0
| |   XT=0:
| | |   XH = 1:
| | | |   XJ = 1:
| | | | |   XS = 1:
| | | | | |   XG = 1:
| | | | | | |   XC = 1:
| | | | | | | |   XD = 1: 0
| | | | | | | |   XD=0: 1
| | | | | | |   XC=0: 1
| | | | | |   XG=0:
| | | | | | |   XB = 1:
| | | | | | | |   XD = 1:
| | | | | | | | |   XE = 1: 1
| | | | | | | | |   XE=0: 0
| | | | | | | |   XD=0: 1
| | | | | | |   XB=0: 0
| | | | |   XS=0: 1
| | | |   XJ=0:
| | | | |   XC = 1:
| | | | | |   XM = 1:
| | | | | | |   XF = 1: 1
| | | | | | |   XF=0:
```

```
| | | | | | | | |   XR = 1: 0
| | | | | | | | |   XR=0: 1
| | | | | | |   XM=0: 0
| | | | |   XC=0:
| | | | | |   XN = 1:
| | | | | | | |   XF = 1: 0
| | | | | | | |   XF=0:
| | | | | | | | |   XG = 1: 0
| | | | | | | | |   XG=0: 1
| | | | | | |   XN=0: 1
| | |   XH=0:
| | | |   XP = 1:
| | | | |   XS = 1: 1
| | | | |   XS=0:
| | | | | |   XD = 1:
| | | | | | |   XM = 1: 1
| | | | | | |   XM=0:
| | | | | | | |   XC = 1: 0
| | | | | | | |   XC=0: 1
| | | | | |   XD=0:
| | | | | | |   XC = 1: 0
| | | | | | |   XC=0:
| | | | | | | |   XJ = 1: 1
| | | | | | | |   XJ=0:
| | | | | | | | |   XN = 1: 1
| | | | | | | | |   XN=0: 0
| | | |   XP=0:
| | | | |   XF = 1:
| | | | | |   XQ = 1:
| | | | | | |   XK = 1: 1
| | | | | | |   XK=0: 0
| | | | | |   XQ=0:
| | | | | | |   XK = 1:
| | | | | | | |   XC = 1: 1
| | | | | | | |   XC=0: 0
| | | | | | |   XK=0: 1
| | | | |   XF=0: 0
|   XI=0:
| |   XM = 1:
| | |   XQ = 1: 0
| | |   XQ=0:
```

```
| | | |   XF = 1: 0
| | | |   XF=0:
| | | | |   XL = 1:
| | | | | |   XC = 1: 1
| | | | | |   XC=0:
| | | | | | |   XB = 1:
| | | | | | | |   XP = 1: 1
| | | | | | | |   XP=0: 0
| | | | | | |   XB=0: 0
| | | | |   XL=0:
| | | | | |   XC = 1:
| | | | | | |   XH = 1:
| | | | | | | |   XU = 1: 1
| | | | | | | |   XU=0: 1
| | | | | | |   XH=0: 1
| | | | | |   XC=0: 1
| |   XM=0:
| | |   XQ = 1:
| | | |   XJ = 1:
| | | | |   XL = 1: 1
| | | | |   XL=0:
| | | | | |   XH = 1:
| | | | | | |   XK = 1: 1
| | | | | | |   XK=0:
| | | | | | | |   XU = 1: 0
| | | | | | | |   XU=0: 1
| | | | | |   XH=0: 0
| | | |   XJ=0:
| | | | |   XN = 1: 0
| | | | |   XN=0:
| | | | | |   XP = 1:
| | | | | | |   XB = 1: 0
| | | | | | |   XB=0:
| | | | | | | |   XF = 1: 1
| | | | | | | |   XF=0: 0
| | | | | |   XP=0: 1
| | |   XQ=0:
| | | |   XF = 1: 0
| | | |   XF=0:
| | | | |   XH = 1: 1
| | | | |   XH=0:
```

| | | | | | XB = 1:
| | | | | | | XC = 1: 0
| | | | | | | XC=0: 1
| | | | | | XB=0: 0
 XO=0:
| XM = 1:
| | XB = 1:
| | | XI = 1:
| | | | XC = 1: 0
| | | | XC=0:
| | | | | XK = 1: 0
| | | | | XK=0:
| | | | | | XP = 1:
| | | | | | | XS = 1: 0
| | | | | | | XS=0:
| | | | | | | | XG = 1:
| | | | | | | | | XF = 1: 1
| | | | | | | | | XF=0: 0
| | | | | | | | XG=0: 1
| | | | | | XP=0: 1
| | | XI=0: 0
| | XB=0:
| | | XF = 1:
| | | | XS = 1:
| | | | | XR = 1:
| | | | | | XI = 1:
| | | | | | | XG = 1: 1
| | | | | | | XG=0:
| | | | | | | | XQ = 1: 0
| | | | | | | | XQ=0:
| | | | | | | | | XJ = 1: 1
| | | | | | | | | XJ=0:
| | | | | | | | | | XD = 1: 1
| | | | | | | | | | XD=0: 0
| | | | | | XI=0:
| | | | | | | XU = 1: 0
| | | | | | | XU=0: 1
| | | | | XR=0:
| | | | | | XD = 1:
| | | | | | | XK = 1: 1
| | | | | | | XK=0:

```
| | | | | | | |   XE = 1:
| | | | | | | | | |   XG = 1: 0
| | | | | | | | | |   XG=0: 1
| | | | | | | | |   XE=0: 0
| | | | | |   XD=0: 1
| | | |   XS=0:
| | | | |   XQ = 1:
| | | | | |   XI = 1:
| | | | | | |   XL = 1:
| | | | | | | |   XD = 1: 1
| | | | | | | |   XD=0: 0
| | | | | | |   XL=0: 1
| | | | | |   XI=0: 1
| | | | |   XQ=0:
| | | | | |   XI = 1:
| | | | | | |   XP = 1: 1
| | | | | | |   XP=0: 0
| | | | | |   XI=0: 0
| | |   XF=0:
| | | |   XG = 1:
| | | | |   XD = 1:
| | | | | |   XC = 1: 0
| | | | | |   XC=0:
| | | | | | |   XP = 1: 0
| | | | | | |   XP=0:
| | | | | | | |   XS = 1: 1
| | | | | | | |   XS=0: 0
| | | | |   XD=0: 1
| | | |   XG=0: 0
|   XM=0:
| |   XF = 1: 0
| |   XF=0:
| | |   XB = 1:
| | | |   XD = 1:
| | | | |   XI = 1:
| | | | | |   XG = 1: 0
| | | | | |   XG=0: 1
| | | | |   XI=0: 0
| | | |   XD=0: 0
| | |   XB=0:
| | | |   XG = 1:
```

```
| | | | |   XD = 1:
| | | | | |   XP = 1: 0
| | | | | |   XP=0:
| | | | | | |   XE = 1: 1
| | | | | | |   XE=0: 0
| | | | |   XD=0:
| | | | | |   XS = 1:
| | | | | | |   XC = 1:
| | | | | | | |   XH = 1: 1
| | | | | | | |   XH=0: 0
| | | | | | |   XC=0: 1
| | | | | |   XS=0: 0
| | | |   XG=0: 0
```

Test data from data set 1:

No.	L	K	Infogain Accuracy		Variance impurity	
			Before Prune(%)	After Prune(%)	Before Prune(%)	After Prune(%)
1	85	45	74.65	75.15	74.65	75.15
2	50	100	74.65	75.15	74.65	75.1
3	100	100	74.65	75.15	74.65	75.15
4	10	20	74.65	74.65	74.65	75.1
5	20	30	74.65	75.15	74.65	75.1
6	10	5	74.65	74.65	74.65	74.65
7	5	5	74.65	74.65	74.65	74.65
8	15	5	74.65	74.7	74.65	74.65
9	15	10	74.65	74.65	74.65	75.0
10	20	200	74.65	75.14	74.65	74.9

Test data from data set 2:

No.	L	K	Infogain Accuracy		Variance impurity	
			Before Prune(%)	After Prune(%)	Before Prune(%)	After Prune(%)
1	85	45	72.5	72.67	72.5	72.67
2	50	100	72.5	73.33	72.5	72.67
3	100	100	72.5	72.67	72.5	72.67
4	10	20	72.5	72.5	72.5	72.5
5	20	30	72.5	72.67	72.5	72.83
6	10	5	72.5	72.5	72.5	72.5
7	5	5	72.5	72.5	72.5	72.5
8	15	5	72.5	72.67	72.5	72.5
9	15	10	72.5	72.5	72.5	72.67
10	20	200	72.5	73.33	72.5	73.33