Department of Informatics, King's College London Data Mining(7CCSMDM1) Answer of Assignment 1

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Part 1 Classification

1.1

Number of instances	48842
Number of missing values	6465
Fraction of missing values over all attribute values	0.95%
Number of instances with missing value	3620
Fraction of instances with missing values over all instances	7.41%

1.2

Attributes	Encoded value
age	[2 3 1 0 4]
workclass	[7 6 4 1 2 0 5 8 3]
education	[9 11 1 12 6 15 7 8 5 10 14 4 0 3 13 2]
education-num	[12 8 6 13 4 9 11 10 3 15 14 2 5 1 0 7]
marital-status	[4 2 0 3 5 1 6]
occupation	[1 4 6 10 8 12 3 14 5 7 13 0 11 2 9]
relationship	[1 0 5 3 4 2]
race	[4 2 1 0 3]
sex	[1 0]
capitalgain	[1 0 4 2 3]
capitalloss	[0 3 1 2 4]
hoursperweek	[2 0 3 4 1]
native-country	[39 5 23 19 0 26 35 33 16 9 2 11 20 30 22 31 4 1 37 7 25 36 14 32 6 8 10 13 3 24 41 29 28 34 38 12 27 40 17 21 18 15]

1.3

Error rate when just ignoring instances with missing values: 17.26%.

1.4

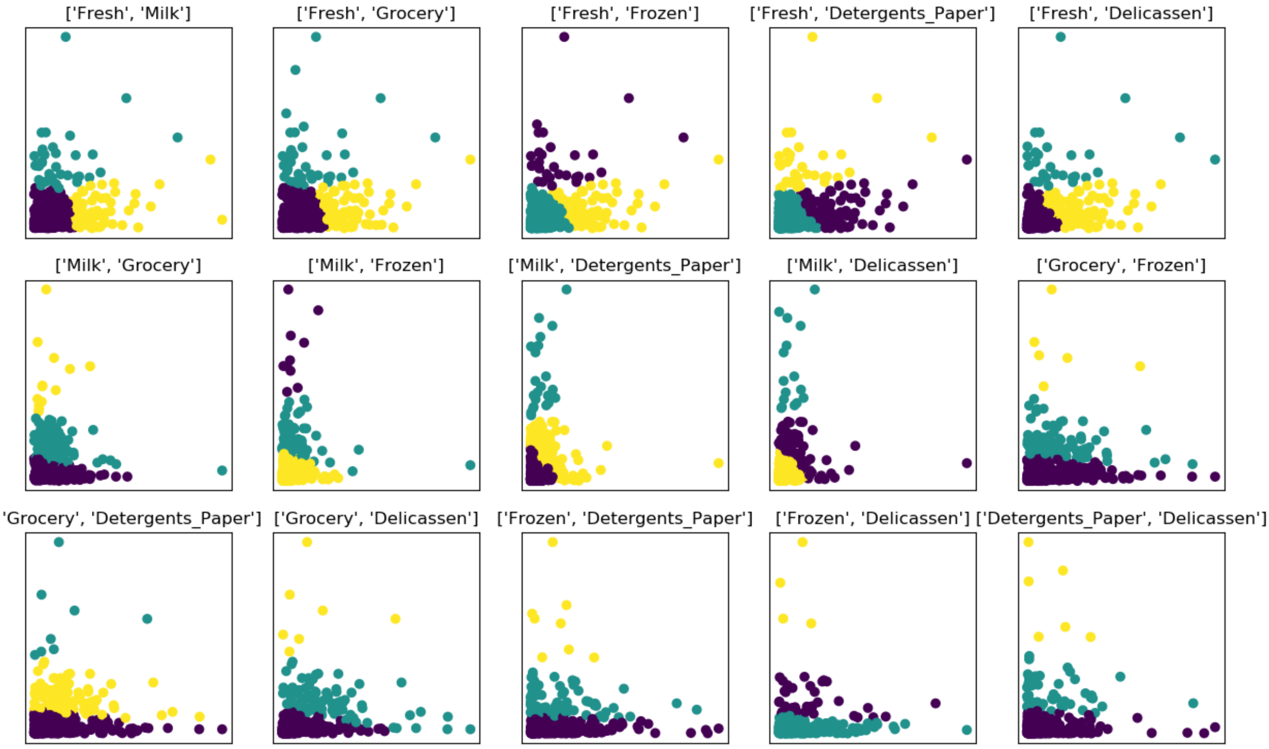
Both decision tree are tested based on the same test set split from D.
Error rate when building decision tree with D1: 18.03%.
Error rate when building decision tree with D2: 8.34%.
It is clear that error rate is lower when building decision tree based on D2. It suggests that filling missing values with most common value performs better than just giving missing value a new value 'missing value'.

Part 2 Clustrering

2.1

j	$\mu = \sum_{i=1}^{m} x_{i,j}$	$[x_{j,min}, x_{j,max}]$
Fresh	12000.30	[3,112151]
Milk	5796.27	[55,73498]
Grocery	7951.28	[3,92780]
Frozen	3071.93	[25,60896]
Detergents_Paper	2881.49	[3,40827]
Delicassen	1524.87	[3,47943]

2.2



2.3

	k=3	k=5	k=10
BC	$3.1820e^{+09}$	$2.7368e^{+10}$	$1.7359e^{+11}$
WC	$8.0333e^{+10}$	$5.3106e^{+10}$	$3.0377e^{+10}$
BC/WC	0.039610	0.515350	5.714309