# Class 8 Mini project

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It is important to consider scalling your data before analysis such as PCA For example:

#### colMeans(mtcars)

```
cyl
                            disp
                                                   drat
      mpg
                                         hp
                                                                 wt
                                                                          qsec
            6.187500 230.721875 146.687500
20.090625
                                               3.596563
                                                          3.217250
                                                                    17.848750
                            gear
                                        carb
                  am
                        3.687500
 0.437500
            0.406250
                                   2.812500
```

#### apply(mtcars, 2, sd)

```
drat
                   cyl
                               disp
                                             hp
                                                                       wt
6.0269481
            1.7859216 123.9386938
                                     68.5628685
                                                   0.5346787
                                                                0.9784574
     qsec
                    ٧s
                                 am
                                           gear
                                                        carb
1.7869432
            0.5040161
                         0.4989909
                                      0.7378041
                                                   1.6152000
```

```
x<- scale(mtcars)
head(x)</pre>
```

```
cyl
                                               disp
                                                                     drat
                         mpg
                   0.1508848 -0.1049878 -0.57061982 -0.5350928
Mazda RX4
Mazda RX4 Wag
                   0.1508848 -0.1049878 -0.57061982 -0.5350928
                                                                0.5675137
Datsun 710
                   0.4495434 -1.2248578 -0.99018209 -0.7830405
                                                                0.4739996
Hornet 4 Drive
                   0.2172534 -0.1049878 0.22009369 -0.5350928 -0.9661175
Hornet Sportabout -0.2307345 1.0148821 1.04308123 0.4129422 -0.8351978
Valiant
                  -0.3302874 -0.1049878 -0.04616698 -0.6080186 -1.5646078
                            wt
                                     qsec
                                                  ٧s
                                                             am
                                                                      gear
                  -0.610399567 -0.7771651 -0.8680278 1.1899014 0.4235542
Mazda RX4
```

```
-0.349785269 -0.4637808 -0.8680278 1.1899014 0.4235542
Mazda RX4 Wag
Datsun 710
                -0.917004624   0.4260068   1.1160357   1.1899014   0.4235542
Hornet 4 Drive -0.002299538 0.8904872 1.1160357 -0.8141431 -0.9318192
Hornet Sportabout 0.227654255 -0.4637808 -0.8680278 -0.8141431 -0.9318192
                0.248094592 1.3269868 1.1160357 -0.8141431 -0.9318192
Valiant
                       carb
Mazda RX4
                 0.7352031
Mazda RX4 Wag
                 0.7352031
Datsun 710
                 -1.1221521
Hornet 4 Drive
                 -1.1221521
Hornet Sportabout -0.5030337
Valiant
                 -1.1221521
```

#### round(colMeans(x), 2)

Key point: It is usually always a good idea to scale your data before to PCA

#### **Breast Cancer Biopsy Analysis**

```
# Save your input data file into your Project directory
fna.data <- "WisconsinCancer.csv"

# Complete the following code to input the data and store as wisc.df
wisc.df <- read.csv(fna.data, row.names=1)</pre>
head(wisc.df)
```

	diagnosis	radius_mean	texture_mean	<pre>perimeter_mean</pre>	area_mean	
842302	M	17.99	10.38	122.80	1001.0	
842517	M	20.57	17.77	132.90	1326.0	
84300903	M	19.69	21.25	130.00	1203.0	
84348301	M	11.42	20.38	77.58	386.1	
84358402	M	20.29	14.34	135.10	1297.0	
843786	M	12.45	15.70	82.57	477.1	

smoothness\_mean compactness\_mean concavity\_mean concave.points\_mean

842302	0.11840	)	0.27760	0.3001	L	0.14710
842517	0.08474	•	0.07864	0.0869	)	0.07017
84300903	0.10960	)	0.15990	0.1974	<u>l</u>	0.12790
84348301	0.14250	)	0.28390	0.2414	<u>l</u>	0.10520
84358402	0.10030	)	0.13280	0.1980	)	0.10430
843786	0.12780	)	0.17000	0.1578	3	0.08089
	symmetry_mean f	ractal_di	mension_mean	radius_se	texture_se p	erimeter_se
842302	0.2419		0.07871	1.0950	0.9053	8.589
842517	0.1812		0.05667	0.5435	0.7339	3.398
84300903	0.2069		0.05999	0.7456	0.7869	4.585
84348301	0.2597		0.09744	0.4956	1.1560	3.445
84358402	0.1809		0.05883	0.7572	0.7813	5.438
843786	0.2087		0.07613	0.3345	0.8902	2.217
	area_se smoothn	ess_se co	mpactness_se	concavity_	se concave.p	oints_se
842302	153.40 0.	006399	0.04904	0.053	373	0.01587
842517	74.08 0.	005225	0.01308	0.018	360	0.01340
84300903	94.03 0.	006150	0.04006	0.038	332	0.02058
84348301	27.23 0.	009110	0.07458	0.056	861	0.01867
84358402	94.44 0.	011490	0.02461	0.056	888	0.01885
843786	27.19 0.	007510	0.03345	0.036	372	0.01137
	symmetry_se fra	ctal_dime	nsion_se rad:	ius_worst t	exture_worst	
842302	0.03003		0.006193	25.38	17.33	j
842517	0.01389		0.003532	24.99	23.41	
84300903	0.02250		0.004571	23.57	25.53	j
84348301	0.05963		0.009208	14.91	26.50	1
84358402	0.01756		0.005115	22.54	16.67	
843786	0.02165		0.005082	15.47	23.75	ı
	perimeter_worst	area_wor	st smoothness	s_worst con	npactness_wor	st
842302	184.60	2019	.0	0.1622	0.66	56
842517	158.80	1956	.0	0.1238	0.18	66
84300903	152.50	1709	.0	0.1444	0.42	45
84348301	98.87	567	.7	0.2098	0.86	63
84358402	152.20	1575	.0	0.1374	0.20	50
843786	103.40	741	.6	0.1791	0.52	49
	concavity_worst	concave.	points_worst	symmetry_v	orst	
842302	0.7119	)	0.2654	0.	4601	
842517	0.2416	;	0.1860	0.	2750	
84300903	0.4504	•	0.2430	0.	3613	
84348301	0.6869	)	0.2575	0.	6638	
84358402	0.4000	)	0.1625	0.	2364	
843786	0.5355	,	0.1741	0.	3985	
	fractal_dimensi	on_worst				
842302		0.11890				

```
8425170.08902843009030.08758843483010.17300843584020.076788437860.12440
```

```
diagnosis <- wisc.df[,1]
table (diagnosis)</pre>
```

diagnosis B M 357 212

Remove this first 'diagnosis' column from the data set as I dont want to pass this to PCA etc. It is essentially the expert "answer" that we will compare our analysis result to

```
# We can use -1 here to remove the first column
wisc.data <- wisc.df[,-1]
head(wisc.data)</pre>
```

	radius_mean tex	ture_mean	perimet	er_mean	area_mean	${\tt smooth}{\tt i}$	ness_mean
842302	17.99	10.38		122.80	1001.0		0.11840
842517	20.57	17.77		132.90	1326.0		0.08474
84300903	19.69	21.25		130.00	1203.0		0.10960
84348301	11.42	20.38		77.58	386.1		0.14250
84358402	20.29	14.34		135.10	1297.0		0.10030
843786	12.45	15.70		82.57	477.1		0.12780
	compactness_mea	n concavit	ty_mean	concave.	points_mea	n symme	etry_mean
842302	0.2776	0	0.3001		0.1471	0	0.2419
842517	0.0786	4	0.0869		0.0701	7	0.1812
84300903	0.1599	0	0.1974		0.1279	0	0.2069
84348301	0.2839	0	0.2414		0.1052	0	0.2597
84358402	0.1328	0	0.1980		0.1043	0	0.1809
843786	0.1700	0	0.1578		0.0808	9	0.2087
	fractal_dimensi	on_mean ra	adius_se	texture	_se perime	ter_se	area_se
842302		0.07871	1.0950	0.9	053	8.589	153.40
842517		0.05667	0.5435	0.7	339	3.398	74.08
84300903		0.05999	0.7456	0.7	869	4.585	94.03
84348301		0.09744	0.4956	1.1	560	3.445	27.23
84358402		0.05883	0.7572	0.7	813	5.438	94.44
843786		0.07613	0.3345	0.8	902	2.217	27.19

	smoothness_se co	ompactness_se	concavity	y_se conc	ave.points_se
842302	0.006399	0.04904	0.0	5373	0.01587
842517	0.005225	0.01308	0.0	1860	0.01340
84300903	0.006150	0.04006	0.03	3832	0.02058
84348301	0.009110	0.07458	0.0	5661	0.01867
84358402	0.011490	0.02461	0.0	5688	0.01885
843786	0.007510	0.03345	0.03	3672	0.01137
	symmetry_se frac	ctal_dimension	_se radi	us_worst 1	texture_worst
842302	0.03003	0.006	3193	25.38	17.33
842517	0.01389	0.003	3532	24.99	23.41
84300903	0.02250	0.004	1571	23.57	25.53
84348301	0.05963	0.009		14.91	26.50
84358402	0.01756	0.005	5115	22.54	16.67
843786	0.02165	0.005		15.47	23.75
	perimeter_worst	area_worst sm	noothness	_worst com	mpactness_worst
842302	184.60	2019.0	(	0.1622	0.6656
842517	158.80	1956.0	(	0.1238	0.1866
84300903		1709.0	(	0.1444	0.4245
84348301	98.87	567.7	(	0.2098	0.8663
84358402	152.20	1575.0	(	0.1374	0.2050
843786	103.40	741.6	(	0.1791	0.5249
	concavity_worst	concave.point		•	
842302	0.7119		0.2654		. 4601
842517	0.2416		0.1860		. 2750
84300903			0.2430		. 3613
84348301	0.6869		0.2575		. 6638
84358402			0.1625		. 2364
843786	0.5355		0.1741	0	. 3985
	fractal_dimension	_			
842302		0.11890			
842517		0.08902			
84300903		0.08758			
84348301		0.17300			
84358402		0.07678			
843786		0.12440			

# Create diagnosis vector for later

diagnosis <- as.factor(wisc.df\$diagnosis)</pre>

#### **Explanatory data Analysis**

Q1. How many observations are in this dataset?

```
# Count the number of observations in the dataset
num_observations <- nrow(wisc.df)
num_observations</pre>
```

- [1] 569
  - Q2. How many of the observations have a malignant diagnosis?

```
# Count the number of malignant diagnosis
num_malignant <- sum(diagnosis =="M")
num_malignant</pre>
```

- [1] 212
  - Q3. How many variables/features in the data are suffixed with \_mean?

#### colnames(wisc.data)

```
[1] "radius_mean"
                                "texture_mean"
 [3] "perimeter_mean"
                                "area_mean"
 [5] "smoothness_mean"
                                "compactness_mean"
 [7] "concavity_mean"
                                "concave.points_mean"
 [9] "symmetry_mean"
                                "fractal_dimension_mean"
[11] "radius_se"
                                "texture_se"
[13] "perimeter_se"
                                "area_se"
[15] "smoothness_se"
                                "compactness_se"
[17] "concavity_se"
                                "concave.points_se"
[19] "symmetry_se"
                                "fractal_dimension_se"
[21] "radius worst"
                                "texture worst"
[23] "perimeter_worst"
                                "area_worst"
[25] "smoothness_worst"
                                "compactness_worst"
[27] "concavity_worst"
                                "concave.points_worst"
[29] "symmetry_worst"
                                "fractal_dimension_worst"
length(grep("_mean", colnames(wisc.data)))
```

[1] 10

#### **Principle Component Analysis**

```
wisc.pr <- prcomp( wisc.data, scale= T )</pre>
summary(wisc.pr)
```

# Importance of components:

```
PC1
                                 PC2
                                         PC3
                                                 PC4
                                                          PC5
                                                                  PC6
                                                                          PC7
Standard deviation
                       3.6444 2.3857 1.67867 1.40735 1.28403 1.09880 0.82172
Proportion of Variance 0.4427 0.1897 0.09393 0.06602 0.05496 0.04025 0.02251
Cumulative Proportion 0.4427 0.6324 0.72636 0.79239 0.84734 0.88759 0.91010
                           PC8
                                  PC9
                                         PC10
                                                PC11
                                                        PC12
                                                                PC13
                                                                         PC14
Standard deviation
                       0.69037 0.6457 0.59219 0.5421 0.51104 0.49128 0.39624
Proportion of Variance 0.01589 0.0139 0.01169 0.0098 0.00871 0.00805 0.00523
Cumulative Proportion 0.92598 0.9399 0.95157 0.9614 0.97007 0.97812 0.98335
                                                  PC18
                                                          PC19
                          PC15
                                  PC16
                                          PC17
                                                                  PC20
                                                                          PC21
Standard deviation
                       0.30681 0.28260 0.24372 0.22939 0.22244 0.17652 0.1731
Proportion of Variance 0.00314 0.00266 0.00198 0.00175 0.00165 0.00104 0.0010
Cumulative Proportion
                       0.98649 0.98915 0.99113 0.99288 0.99453 0.99557 0.9966
                          PC22
                                  PC23
                                         PC24
                                                 PC25
                                                          PC26
                                                                  PC27
                                                                          PC28
Standard deviation
                       0.16565 0.15602 0.1344 0.12442 0.09043 0.08307 0.03987
Proportion of Variance 0.00091 0.00081 0.0006 0.00052 0.00027 0.00023 0.00005
Cumulative Proportion 0.99749 0.99830 0.9989 0.99942 0.99969 0.99992 0.99997
                          PC29
                                  PC30
Standard deviation
                       0.02736 0.01153
Proportion of Variance 0.00002 0.00000
```

Cumulative Proportion 1.00000 1.00000

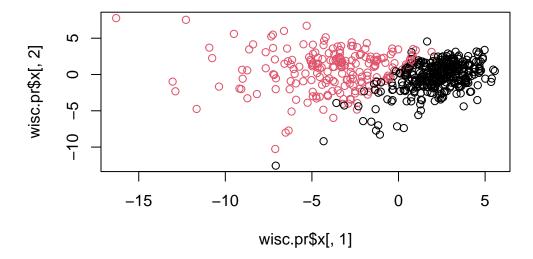
Main "PC score plot", "PC1 vs PC2 plot"

See what is in our PCA result object:

```
attributes(wisc.pr)
```

```
$names
[1] "sdev"
                "rotation" "center"
                                        "scale"
                                                    "x"
$class
[1] "prcomp"
```

```
PC1
                        PC2
                                   PC3
                                            PC4
                                                      PC5
                                                                  PC6
                  -1.946870 -1.1221788 3.6305364
                                                1.1940595
842302
        -9.184755
                                                           1.41018364
842517
        -2.385703
                   3.764859 -0.5288274 1.1172808 -0.6212284
                                                          0.02863116
84300903 -5.728855
                   1.074229 -0.5512625 0.9112808 0.1769302 0.54097615
84348301 -7.116691 -10.266556 -3.2299475 0.1524129 2.9582754 3.05073750
84358402 -3.931842
                   1.946359 1.3885450 2.9380542 -0.5462667 -1.22541641
        -2.378155 -3.946456 -2.9322967 0.9402096 1.0551135 -0.45064213
843786
                PC7
                           PC8
                                      PC9
                                                PC10
                                                          PC11
                                                                     PC12
842302
         2.15747152  0.39805698  -0.15698023  -0.8766305  -0.2627243  -0.8582593
         0.01334635 -0.24077660 -0.71127897 1.1060218 -0.8124048 0.1577838
842517
84300903 -0.66757908 -0.09728813 0.02404449 0.4538760 0.6050715 0.1242777
        1.42865363 -1.05863376 -1.40420412 -1.1159933 1.1505012
84358402 -0.93538950 -0.63581661 -0.26357355 0.3773724 -0.6507870 -0.1104183
843786
         PC13
                           PC14
                                       PC15
                                                   PC16
                                                              PC17
842302
         0.10329677 -0.690196797 0.601264078 0.74446075 -0.26523740
842517
        -0.94269981 -0.652900844 -0.008966977 -0.64823831 -0.01719707
84300903 -0.41026561 0.016665095 -0.482994760 0.32482472 0.19075064
84348301 -0.93245070 -0.486988399 0.168699395 0.05132509 0.48220960
84358402 0.38760691 -0.538706543 -0.310046684 -0.15247165 0.13302526
843786
        -0.02625135 0.003133944 -0.178447576 -0.01270566 0.19671335
               PC18
                         PC19
                                    PC20
                                                 PC21
                                                            PC22
842302
        842517
         0.31801756 -0.2473470 -0.11403274 -0.077259494 0.09449530
84300903 -0.08789759 -0.3922812 -0.20435242 0.310793246
                                                      0.06025601
84348301 -0.03584323 -0.0267241 -0.46432511 0.433811661
                                                      0.20308706
84358402 -0.01869779 0.4610302 0.06543782 -0.116442469
                                                      0.01763433
843786
        -0.29727706 -0.1297265 -0.07117453 -0.002400178
                                                      0.10108043
               PC23
                           PC24
                                       PC25
                                                    PC26
842302
         0.08444429 0.175102213 0.150887294 -0.201326305 -0.25236294
842517
        -0.21752666 -0.011280193 0.170360355 -0.041092627 0.18111081
84300903 -0.07422581 -0.102671419 -0.171007656 0.004731249
                                                         0.04952586
84348301 -0.12399554 -0.153294780 -0.077427574 -0.274982822 0.18330078
84358402 0.13933105 0.005327110 -0.003059371 0.039219780
                                                        0.03213957
843786
         0.03344819 - 0.002837749 - 0.122282765 - 0.030272333 - 0.08438081
                 PC28
                             PC29
                                          PC30
        -0.0338846387 0.045607590 0.0471277407
842302
842517
         0.0325955021 -0.005682424 0.0018662342
84300903 0.0469844833 0.003143131 -0.0007498749
84348301 0.0424469831 -0.069233868 0.0199198881
```



Q4. From your results, what proportion of the original variance is captured by the first principal components (PC1)?

```
# Perform PCA on the data (assuming wisc.data is already prepared)
pca_result <- prcomp(wisc.data, scale. = TRUE)

# Calculate the proportion of variance captured by PC1
proportion_pc1 <- (pca_result$sdev[1]^2/sum(pca_result$sdev^2))

# Print the proportion
proportion_pc1</pre>
```

#### [1] 0.4427203

Q5. How many principal components (PCs) are required to describe at least 70% of the original variance in the data?

```
# Perform PCA and calculate the number of PCs needed to explain at least 70% of the variance
num_pcs_70 <- which(cumsum((pca_result <- prcomp(wisc.data, scale. = TRUE))$sdev^2 / sum(pca_
# Print the number of PCs required
num_pcs_70</pre>
```

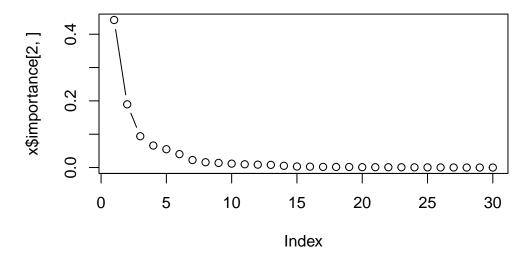
#### [1] 3

Q6. How many principal components (PCs) are required to describe at least 90% of the original variance in the data?

```
# Perform PCA and calculate the number of PCs needed to explain at least 90% of the variance
num_pcs_90 <- which(cumsum((pca_result <- prcomp(wisc.data, scale. = TRUE))$sdev^2 / sum(pca_
# Print the number of PCs required
num_pcs_90</pre>
```

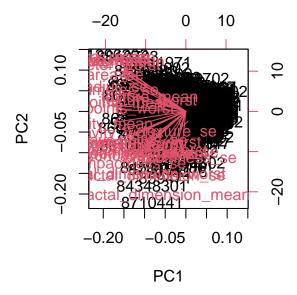
#### [1] 7

```
x <- summary(wisc.pr)
plot(x$importance[2,], type="b")</pre>
```

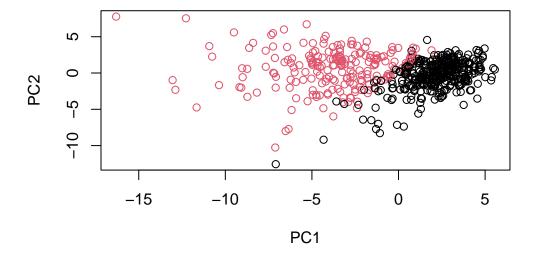


Q7. What stands out to you about this plot? Is it easy or difficult to understand? Why?

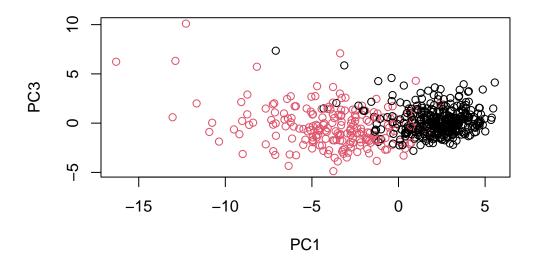
```
pca_result <- prcomp(wisc.data,scale. = TRUE)
biplot(pca_result)</pre>
```



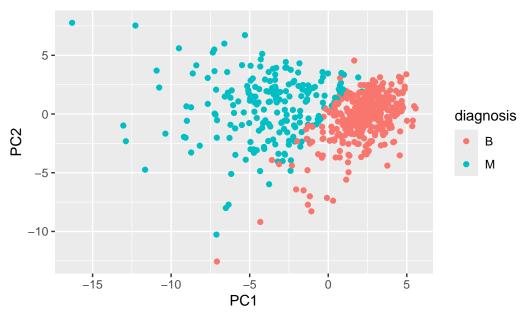
- # The overlapping in the plot stands out. # It can be difficult to interpret due to no visible relationionship.
- # Scatter plot observations by components 1 and 2



Q8. Generate a similar plot for principal components 1 and 3. What do you notice about these plots?

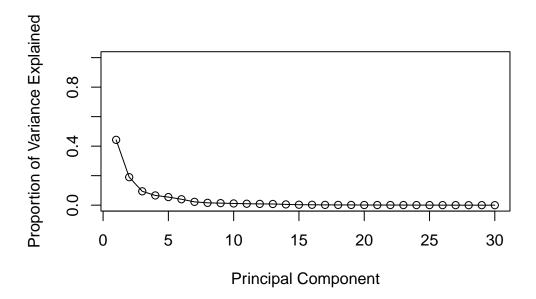


#### PCA Scatter Plot of PC1 vs PC2



```
# Calculate variance of each component
pr.var <- wisc.pr$sdev^2
head(pr.var)</pre>
```

#### [1] 13.281608 5.691355 2.817949 1.980640 1.648731 1.207357



Q9. For the first principal component, what is the component of the loading vector (i.e. wisc.pr\$rotation[,1]) for the feature concave.points\_mean?

```
# Assuming pca_result is the result of the PCA
loading_concave_points_mean <- pca_result$rotation["concave.points_mean", 1]
loading_concave_points_mean</pre>
```

#### [1] -0.2608538

Q10. What is the minimum number of principal components required to explain 80% of the variance of the data?

```
# Calculate the proportion of variance
pve <- pca_result$sdev^2 / sum(pca_result$sdev^2)
# Calculate cumulative variance
cumulative_variance <- cumsum(pve)
# at least 80% of the variance
num_pcs_80 <- which(cumulative_variance >= 0.80)[1]
num_pcs_80
```

[1] 5

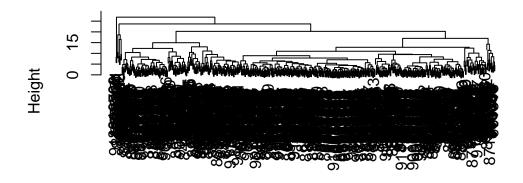
#### **Hierarchical Clustering**

```
# Scale the wisc.data data using the "scale()" function
data.scaled <- scale(wisc.data)
data.dist <- dist(data.scaled)
wisc.hclust <- hclust(data.dist, method = "complete")</pre>
```

Q11. Using the plot() and abline() functions, what is the height at which the clustering model has 4 clusters?

```
d <- dist(scale(wisc.data))
hc.raw <- hclust(d)
plot(hc.raw)</pre>
```

# **Cluster Dendrogram**



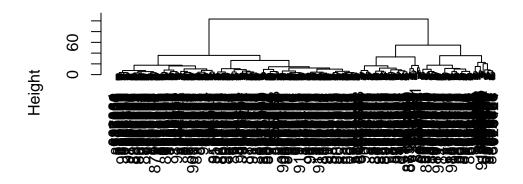
d hclust (\*, "complete")

#### **Combine PCA and Clistering**

Our PCA results were in 'wisc.pr'

```
#distance matrix from PCA result
d <- dist(wisc.pr$x[,1:3])
hc <- hclust(d, method= "ward.D2")
plot(hc)</pre>
```

# **Cluster Dendrogram**

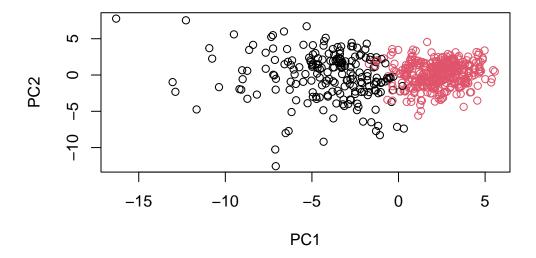


d hclust (\*, "ward.D2")

```
grps <- cutree(hc, k=2)</pre>
```

Cute tree into two groups

```
plot(wisc.pr$x, col=grps)
```



wisc.hclust.clusters <- cutree(wisc.hclust, k=4)
table(wisc.hclust.clusters, diagnosis)</pre>

diagnosis

wisc.hclust.clusters B M
1 12 165
2 2 5
3 343 40
4 0 2

# table(diagnosis, grps)

grps diagnosis 1 2 B 24 333 M 179 33

### table(grps)

grps 1 2 203 366 Q12. Can you find a better cluster vs diagnoses match by cutting into a different number of clusters between 2 and 10?

```
# Initialize results list
results <- lapply(2:10, function(k) {
   clusters <- cutree(wisc.hclust, k)
   table_clusters <- table(clusters, diagnosis)
   accuracy <- sum(apply(table_clusters, 1, max)) / nrow(wisc.data)
   list(clusters = clusters, table = table_clusters, accuracy = accuracy)
})
# Name the results list by cluster count
names(results) <- 2:10
results</pre>
```

#### \$`2` \$`2`\$clusters

862989	863030	863031	863270	86355	864018	864033	86408
1	1	1	1	1	1	1	1
86409	864292	864496	864685	864726	864729	864877	865128
1	1	1	1	1	1	1	1
865137	86517	865423	865432	865468	86561	866083	866203
1	1	1	1	1	1	1	1
866458	866674	866714	8670	86730502	867387	867739	868202
1	1	1	1	1	1	1	1
868223	868682	868826	868871	868999	869104	869218	869224
1	1	1	1	1	1	1	1
869254	869476	869691	86973701	86973702	869931	871001501	871001502
1	1	1	1	1	1	1	1
8710441	87106	8711002	8711003	8711202	8711216	871122	871149
1	1	1	1	1	1	1	1
8711561	8711803	871201	8712064	8712289	8712291	87127	8712729
1	1	1	1	1	1	1	1
8712766	8712853	87139402	87163	87164	871641	871642	872113
1	1	1	1	1	1	1	1
872608	87281702	873357	873586	873592	873593	873701	873843
1	1	1	1	1	1	1	1
873885	874158	874217	874373	874662	874839	874858	875093
1	1	1	1	1	1	1	1
875099	875263	87556202	875878	875938	877159	877486	877500
1	1	1	1	1	1	1	1
877501	877989	878796	87880	87930	879523	879804	879830
1	1	1	1	1	1	1	1
8810158	8810436	881046502	8810528	8810703	881094802	8810955	8810987
1	1	1	1	2	1	1	1
8811523	8811779	8811842	88119002	8812816	8812818	8812844	8812877
1	1	1	1	1	1	1	1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
1	1	1	1	1	1	1	1
88203002	88206102	882488	88249602	88299702	883263	883270	88330202
1	1		1		1		
88350402	883539	883852	88411702	884180	884437	884448	884626
1	1	1	1	1	1	1	1
88466802	884689	884948	88518501	885429	8860702	886226	886452
1	1						1
88649001	886776	887181	88725602	887549	888264	888570	889403
1	1	1	1	1	1	1	1
889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748
1	1	1	1	1	1	1	1
8910988	8910996	8911163	8911164	8911230	8911670	8911800	8911834

1	1	1	1	1	1	1	1
8912049	8912055	89122	8912280	8912284	8912521	8912909	8913
1	1	1	1	1	1	1	1
8913049	89143601	89143602	8915	891670	891703	891716	891923
1	1	1	1	1	1	1	1
891936	892189	892214	892399	892438	892604	89263202	892657
1	1	1	1	1	1	1	1
89296	893061	89344	89346	893526	893548	893783	89382601
1	1	1	1	1	1	1	1
89382602	893988	894047	894089	894090	894326	894329	894335
1	1	1	1		1	1	1
894604	894618	894855	895100	89511501	89511502	89524	895299
1	1	1	1	1	1	1	1
8953902	895633	896839	896864	897132	897137	897374	89742801
1	1	1	1	1	1	1	1
897604	897630	897880	89812	89813	898143	89827	898431
1	1	1	1			1	_
89864002	898677	898678	89869	898690	899147	899187	899667
1	1	1	1	_	1	1	_
899987	9010018	901011	9010258		901028	9010333	901034301
1	1	1	1	_	1	1	_
901034302	901041		9010872			9011494	9011495
1	1	1	1		1	1	_
9011971		9012315					901303
1	1	1		1		1	_
901315	9013579	9013594		901549			90251
1	1	1	1	1	1	1	_
902727	90291	902975	902976			90317302	
1	1	1	1			1	_
903507	903516			90401601			
1	1	1	1	1	1	1	_
90439701	904647			904969			
-	-	-	-	1	-	-	-
	_						905686
1							
				906539			
							1
				90769601			907915
1		1					1
				908916			
1		1		1			
					_	_	9110944
1	1	1	1	1	1	1	1

911150	911157302	9111596	9111805	9111843	911201	911202	9112085
1	1	1	1	1	1	1	1
9112366	9112367	9112594	9112712	911296201	911296202	9113156	911320501
1	1	1	1	1	2	1	1
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
1	1	1	1	1	1	1	1
911384	9113846	911391	911408	911654	911673	911685	911916
1	1	1	1	1	1	1	1
912193	91227	912519	912558	912600	913063	913102	913505
1	1	1	1	1	1	1	1
913512	913535	91376701	91376702	914062	914101	914102	914333
1	1	1	1	1	1	1	1
914366	914580	914769	91485	914862	91504	91505	915143
1	1	1	1	1	1	1	1
915186	915276	91544001	91544002	915452	915460	91550	915664
1	1	1	1	1	1	1	1
915691	915940	91594602	916221	916799	916838	917062	917080
1	1	1	1	1	1	1	1
917092	91762702	91789	917896	917897	91805	91813701	91813702
1	1	1	1	1	1	1	1
918192	918465	91858	91903901	91903902	91930402	919537	919555
1	1	1	1	1	1	1	1
91979701	919812	921092	921362	921385	921386	921644	922296
1	1	1	1	1	1	1	1
922297	922576	922577	922840	923169	923465	923748	923780
1	_	_	1		=	_	1
924084	924342	924632	924934		925236	925277	925291
1	1	1	1	1	1	1	1
925292	925311	925622			926682		927241
1	1	1	1	1	1	1	1
92751							
1							

\$`2`\$table

diagnosis clusters B M 1 357 210 2 0 2

\$`2`\$accuracy [1] 0.6309315

\$`3`

1	1	1	1	1	1	1	1
8712766	8712853	87139402	87163	87164	871641	871642	872113
1	1	1	1	1	1	1	1
872608	87281702	873357	873586	873592	873593	873701	873843
1	1	1	1	1	1	1	1
873885	874158	874217	874373	874662	874839	874858	875093
1	1	1	1	1	1	2	1
875099	875263	87556202	875878	875938	877159	877486	877500
1	1	1	1	1	1	1	1
877501	877989	878796			879523	879804	879830
1	1	1	1	1	1	1	1
8810158	8810436	881046502	8810528	8810703	881094802	8810955	8810987
1	1	1	1	3	1	1	1
8811523	8811779	8811842	88119002	8812816	8812818	8812844	8812877
1	1						1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
1	1		1	1	_		1
88203002	88206102				883263	883270	88330202
1	1			1			1
88350402	883539	883852	88411702	884180	884437	884448	884626
1	1			1		_	1
88466802	884689	884948	88518501	885429	8860702	886226	886452
1	1			1	1	1	1
88649001	886776	887181				888570	889403
1	1		1		_		1
889719	88995002				8910720	8910721	8910748
1	1	_	_		_	_	1
8910988	8910996		8911164	8911230	8911670	8911800	8911834
1	1	_		1	_		1
8912049	8912055				8912521		8913
1	1	_		1	_	_	1
		89143602					
_	_	1	_	_	_	_	_
		892214					
1		1			1		
		89344					
1		1					
		894047					
1	1				1		
		894855					
1	1		1			1	
		896839					_
1	1	1	1	1	1	1	1

007604	007600	007000	00040	00040	0004.40	00007	000404
897604				89813			898431
1	_	1	1			_	_
89864002		898678		898690			899667
1	1	1	1		1	1	_
899987	9010018	901011	9010258				901034301
1	1	1	1	_		_	_
901034302		9010598	_				9011495
1	1	1	1				
9011971		9012315					901303
1	_	1	1				_
901315	9013579	9013594		901549			90251
1	1	1	1	_	_	1	_
902727	90291	902975	902976			90317302	903483
1	1	1	1			_	
903507		903554	903811	90401601	90401602	904302	904357
1	1	1	1	1	1	1	1
90439701	904647	904689			904971	905189	905190
1	1	1	1	1	1	1	1
90524101	905501	905502	905520	905539	905557	905680	905686
1	1	1	1	1	1	1	1
905978	90602302	906024	906290	906539	906564	906616	906878
1	1	1	1	1	1	1	1
907145	907367	907409	90745	90769601	90769602	907914	907915
1	1	1	1	1	1	1	1
908194	908445	908469	908489	908916	909220	909231	909410
1	1	1	1	1	1	1	1
909411	909445	90944601	909777	9110127	9110720	9110732	9110944
1	1	1	1	1	1	1	1
911150	911157302	9111596	9111805	9111843	911201	911202	9112085
1	1	1	1	1	1	1	1
9112366	9112367	9112594	9112712	911296201	911296202	9113156	911320501
1	1	1	1	1	3	1	1
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
1	1	1	1	1	1	1	1
911384	9113846	911391	911408	911654	911673	911685	911916
1					1		
912193	91227						913505
1			1				
	913535						914333
1			1			1	
	914580						
1							
	915276						
212190	313210	31044001	31044002	910402	919400	91000	910004

1	1	1	1	1	1	1	1
915691	915940	91594602	916221	916799	916838	917062	917080
1	1	1	1	1	1	1	1
917092	91762702	91789	917896	917897	91805	91813701	91813702
1	1	1	1	1	1	1	1
918192	918465	91858	91903901	91903902	91930402	919537	919555
1	1	1	1	1	1	1	1
91979701	919812	921092	921362	921385	921386	921644	922296
1	1	1	1	1	1	1	1
922297	922576	922577	922840	923169	923465	923748	923780
1	1	1	1	1	1	1	1
924084	924342	924632	924934	924964	925236	925277	925291
1	1	1	1	1	1	1	1
925292	925311	925622	926125	926424	926682	926954	927241
1	1	1	1	1	1	1	1
92751							
1							

#### **\$**`3`\$table

diagnosis

clusters B M

1 355 205

2 2 5

3 0 2

# \$`3`\$accuracy

[1] 0.6362039

#### \$`4`

### \$`4`\$clusters

842302	842517	84300903	84348301	84358402	843786	844359	84458202
1	1	1	2	1	1	1	1
844981	84501001	845636	84610002	846226	846381	84667401	84799002
1	2	3	1	1	3	1	1
848406	84862001	849014	8510426	8510653	8510824	8511133	851509
3	1	1	3	3	3	1	1
852552	852631	852763	852781	852973	853201	853401	853612
1	1	1	1	1	3	1	1
85382601	854002	854039	854253	854268	854941	855133	855138
1	1	1	1	1	3	3	1
855167	855563	855625	856106	85638502	857010	85713702	85715
3	1	1	1	1	1	3	1

85759902	857438	857392	857374	857373	857343	857156	857155
3	3	1	3	3	3	3	3
859196	858986	858981	858970	858477	857810	857793	857637
3	1	3	3	3	3	1	1
859711	859575	859487	859471	859465	859464	859283	85922302
3	1	3	2	3	3	1	1
8610908	8610862	8610637	8610629	8610404	8610175	859983	859717
3	2	1	3	3	3	1	1
86135502	86135501	8612399	8612080	8611792	8611555	8611161	861103
1	3	1	3	1	1	1	3
86208	862028	862009	861853	861799	861648	861598	861597
1	1	3	3	3	3	1	3
862980	862965	862722	862717	862548	862485	862261	86211
3	3	3	3	3	3	3	3
86408	864033	864018	86355	863270	863031	863030	862989
3	3	3	1	3	1	1	3
865128	864877	864729	864726	864685	864496	864292	86409
3	1	1	3	3	3	3	3
866203	866083	86561	865468	865432	865423	86517	865137
3	1	3	3	3	2	1	3
868202	867739	867387	86730502	8670	866714	866674	866458
3	1	3	1	1	3	1	1
869224	869218	869104	868999	868871	868826	868682	868223
3	3	3	3	3	1	3	3
871001502	871001501	869931	86973702	86973701	869691	869476	869254
3	3	3	3	3	1	3	3
871149	871122	8711216	8711202	8711003	8711002	87106	8710441
3	3	3	1	3	3	3	2
8712729	87127	8712291	8712289	8712064	871201	8711803	8711561
3	3	3	1	3	1	1	3
872113	871642	871641	87164	87163	87139402	8712853	8712766
3	3	3	1	3	3	3	1
873843	873701	873593	873592	873586	873357	87281702	872608
3	1	1	1	3	3	1	3
875093	874858	874839	874662	874373	874217	874158	873885
			3			3	1
877500	877486	877159	875938	875878	87556202	875263	875099
					1		3
879830	879804	879523	87930	87880	878796	877989	877501
3					1		3
					881046502		8810158
1							1
					8811842	8811779	8811523

3	3	1	1	3	3	3	1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
3	3	3	3	3	1	1	3
88203002	88206102	882488	88249602	88299702	883263	883270	88330202
3	1	3	3	1	1	3	1
88350402	883539	883852	88411702	884180	884437	884448	884626
3	3	3	3	1	3	3	3
88466802	884689	884948	88518501	885429	8860702	886226	886452
3	3	1				1	_
88649001			88725602			888570	
1	1	1	1			1	3
889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748
1		3					3
8910988	8910996	8911163	8911164	8911230	8911670	8911800	
1	3	3	3		3	3	
8912049	8912055	89122					8913
1		1		3	3	_	
8913049	89143601						
3	3	3	3		3	3	_
891936	892189		892399				892657
3	3	3	3				
89296			89346				
3	3	3	3		3	3	
89382602		894047			894326		
3	3		3		1	_	
894604			895100				
3	3	3	1		3	3	_
8953902			896864				
1	1	1	1	_	3	3	_
897604			89812				
3	1	3	1	_	3	3	_
89864002			89869				899667
3	· ·	· ·	ū	ū	•	•	1
							901034301
	1						3
901034302							
3			3				
							901303
1			3				3
							90251
3	3		1				
							903483
3	3	3	3	3	1	3	3

904357	904302	90401602	90401601	903811	903554	903516	903507
3	3	3	3	3	3	1	1
905190	905189	904971	904969	9047	904689	904647	90439701
3	3	3	3	3	3	3	1
905686	905680	905557	905539	905520	905502	905501	90524101
3	3	3	3	3	3	3	1
906878	906616	906564	906539	906290	906024	90602302	905978
					3		3
907915	907914	90769602	90769601	90745	907409	907367	907145
3	1	3	3	3	3	3	3
909410	909231	909220	908916	908489	908469	908445	908194
3	3	3	3	1	3	1	1
9110944	9110732	9110720	9110127	909777	90944601	909445	909411
3	1	3	3	3	3	3	3
9112085	911202	911201	9111843	9111805	9111596	911157302	911150
3	3	3	3	1	3	1	3
911320501	9113156	911296202	911296201	9112712	9112594	9112367	9112366
3	3	4	1	3	3	3	3
9113816	9113778	911366	9113538	9113514	9113455	9113239	911320502
3	3	1	1	3	3	3	3
911916	911685	911673	911654	911408	911391	9113846	911384
1	3	3	3	3	3	3	3
913505	913102	913063	912600	912558	912519	91227	912193
1	3	3	3	3	3	3	3
914333	914102	914101	914062	91376702	91376701	913535	913512
3	3	3	1	3	3	3	3
915143	91505	91504	914862	91485	914769	914580	914366
1	3	1	3	1	1	3	1
915664	91550	915460	915452	91544002	91544001	915276	915186
3	3	1	3	3	3	3	3
917080	917062	916838	916799	916221	91594602	915940	915691
3	3	1	1	3	3	3	1
91813702	91813701	91805	917897	917896	91789	91762702	917092
3	1	3	3	3	3	1	3
919555	919537	91930402	91903902	91903901	91858	918465	918192
1	3	1	3	3	3	3	3
922296	921644	921386	921385	921362	921092	919812	91979701
3	3	1	3	3	3	1	3
923780	923748	923465	923169	922840	922577	922576	922297
3	3	3	3	3	3	3	3
925291	925277	925236	924964	924934	924632	924342	924084
3	3	3	3	3	3	3	3
927241	926954	926682	926424	926125	925622	925311	925292

3 3 1 1 1 1 1 3 1 92751 3

**\$`4`\$**table

diagnosis

clusters B M 1 12 165

2 2 5

2 2 3

3 343 40 4 0 2

\$`4`\$accuracy

[1] 0.9050967

\$`5`

\$`5`\$clusters

842302	842517	84300903	84348301	84358402	843786	844359	84458202
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844981	84501001	845636	84610002	846226	846381	84667401	84799002
1	2	3	1	1	3	1	1
848406	84862001	849014	8510426	8510653	8510824	8511133	851509
3	1	1	3	3	3	1	1
852552	852631	852763	852781	852973	853201	853401	853612
1	1	1	1	1	3	1	1
85382601	854002	854039	854253	854268	854941	855133	855138
1	1	1	1	1	3	3	1
855167	855563	855625	856106	85638502	857010	85713702	85715
3	1	1	1	1	1	3	1
857155	857156	857343	857373	857374	857392	857438	85759902
3	3	3	3	3	1	3	3
857637	857793	857810	858477	858970	858981	858986	859196
1	1	3	3	3	3	1	3
85922302	859283	859464	859465	859471	859487	859575	859711
1	1	3	3	4	3	1	3
859717	859983	8610175	8610404	8610629	8610637	8610862	8610908
1	1	3	3	3	1	2	3
861103	8611161	8611555	8611792	8612080	8612399	86135501	86135502
3	1	1	1	3	1	3	1
861597	861598	861648	861799	861853	862009	862028	86208
3	1	3	3	3	3	1	1
86211	862261	862485	862548	862717	862722	862965	862980

3	3	3	3	3	3	3	3
862989	863030	863031	863270	86355	864018	864033	86408
3	1	1	3	1	3	3	3
86409	864292	864496	864685	864726	864729	864877	865128
3	3	3	3	3	1	1	3
865137	86517	865423	865432	865468	86561	866083	866203
3	1	2	3	3	3	1	3
866458	866674	866714	8670	86730502	867387	867739	868202
1	1	3	1	1	3	1	3
868223	868682	868826	868871	868999	869104	869218	869224
3	3	1	3	3	3	3	3
869254	869476	869691	86973701	86973702	869931	871001501	871001502
3	3	1	3	3	3	3	3
8710441	87106	8711002	8711003	8711202	8711216	871122	871149
4	3	3	3	1	3	3	3
8711561	8711803	871201	8712064	8712289	8712291	87127	8712729
3	1	1	3	1	3	3	3
8712766	8712853	87139402	87163	87164	871641	871642	872113
1	3	3	3	1	3	3	3
872608	87281702	873357	873586	873592	873593	873701	873843
3	1	3	3	1	1	1	3
873885	874158	874217	874373	874662	874839	874858	875093
1	3	3	3	3	3	2	3
875099	875263	87556202	875878	875938	877159	877486	877500
3	1	1	3	1	3	1	1
877501	877989	878796	87880	87930	879523	879804	
3	3	1	1	3	3	3	3
8810158	8810436	881046502	8810528	8810703	881094802	8810955	8810987
1	3	1	3	5	3	1	1
8811523	8811779	8811842	88119002	8812816	8812818	8812844	8812877
3	3	1	1	3	3	3	1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
3	3	3	3	3	1	1	3
88203002	88206102	882488	88249602	88299702	883263		
3	1		3				
88350402		883852					
3		3					
88466802		884948					
3		1					3
88649001		887181	88725602	887549			889403
1	1		1				
889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748
1	1	3	3	3	3	3	3

8910988	8910996	8911163	8911164	8911230	8911670	8911800	8911834
1	3	3	3	3	3	3	3
8912049	8912055	89122		8912284	8912521	8912909	8913
1	3	1	1	3	3	3	3
8913049	89143601	89143602	8915	891670	891703	891716	891923
3	3	3	3	3	3	3	3
891936	892189	892214		892438	892604	89263202	892657
3	3	3	3	1	3	1	3
89296	893061	89344	89346	893526	893548	893783	89382601
3	3	3	3	3	3	3	3
89382602	893988	894047	894089	894090	894326	894329	894335
3	3	3	3	3	1	3	3
894604	894618	894855	895100	89511501	89511502	89524	895299
3	3	3	1		3		3
8953902	895633	896839	896864	897132	897137	897374	89742801
1	1	1	1	3	3	3	1
897604	897630	897880	89812	89813	898143	89827	898431
3	1	3	1	3	3	3	1
89864002	898677	898678	89869	898690	899147	899187	899667
3	3	3	3	3	3	3	1
899987	9010018	901011	9010258	9010259	901028	9010333	901034301
1	1	3	3	3	3	3	3
901034302	901041	9010598	9010872	9010877	901088	9011494	9011495
3	3	3	3	3	1	1	3
9011971	9012000	9012315	9012568	9012795	901288	9013005	901303
1	1	1	3	1	1	3	3
901315	9013579	9013594	9013838	901549	901836	90250	90251
3	3	3	1	3	3	3	3
902727	90291	902975	902976	903011	90312	90317302	903483
3	3	3	3	3	1	3	3
903507	903516	903554	903811	90401601	90401602	904302	904357
1	1	3	3	3	3	3	3
90439701	904647	904689	9047	904969	904971	905189	905190
1	3	3	3	3	3	3	3
90524101	905501	905502	905520	905539	905557	905680	905686
1	3	3	3	3	3	3	3
905978	90602302	906024	906290	906539	906564	906616	906878
3	1	3	3	3	1	3	3
907145	907367	907409	90745	90769601	90769602	907914	907915
3	3	3	3	3	3	1	3
908194	908445	908469	908489	908916	909220	909231	909410
1	1			_			
909411	909445	90944601	909777	9110127	9110720	9110732	9110944

3	3	3	3	3	3	1	3
	911157302	_			911201	_	•
3			1				3
9112366	9112367				911296202		911320501
3		3	3				
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
3	3	3	3	1	1	3	3
911384	9113846	911391	911408	911654	911673	911685	911916
3	3	3	3	3	3	3	1
912193	91227	912519	912558	912600	913063	913102	913505
3	3	3	3	3	3	3	1
913512	913535	91376701	91376702	914062	914101	914102	914333
3	3	3	3	1	3	3	3
914366	914580	914769	91485	914862	91504	91505	915143
1	3	1	1	3	1	3	1
915186	915276	91544001	91544002		915460	91550	915664
3	3	3	3	3	1	3	3
915691	915940	91594602	916221	916799	916838	917062	917080
1	3	3	3	1	1	3	3
917092	91762702	91789	917896	917897	91805		
3	1	3	3	3	3	1	3
918192	918465		91903901	91903902	91930402	919537	919555
3	3	3	3	3	1	3	1
91979701	919812	921092	921362	921385	921386	921644	922296
3	1	3	3	3	1	3	3
922297	922576		922840	923169	923465	923748	923780
3	3	3	3	3	3	3	3
924084	924342	924632	924934			925277	925291
3	3	3	3	3	3	3	_
925292	925311	925622	926125	926424	926682	926954	927241
3	3	1	1	1	1	3	1
92751							
3							

#### **\$`5`\$**table

diagnosis
clusters B M
1 12 165
2 0 5
3 343 40
4 2 0
5 0 2

## \$`6`

Ψ Ο							
\$`6`\$clust	ers						
842302	842517	84300903	84348301	84358402	843786	844359	84458202
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1	2	3	1	1	3	1	1
848406	84862001	849014	8510426	8510653	8510824	8511133	851509
3	1	1	3	3	3	1	1
852552	852631	852763	852781	852973	853201	853401	853612
1	1	1	1	1	3	1	1
85382601	854002	854039	854253	854268	854941	855133	855138
1	1	1	1	1	3	3	1
855167	855563	855625	856106	85638502	857010	85713702	85715
3	1	1	1	1	1	3	1
857155	857156	857343	857373	857374	857392	857438	85759902
3	3	3	3	3	1	3	3
857637	857793	857810	858477	858970	858981	858986	859196
1	1	3	3	3	3	1	3
85922302	859283	859464	859465	859471	859487	859575	859711
1	1	3	3	4	3	1	5
859717	859983	8610175	8610404	8610629	8610637	8610862	8610908
1	1	3	3	3	1	2	3
861103	8611161	8611555	8611792	8612080	8612399	86135501	86135502
3	1	1	1	3	1	3	1
861597	861598	861648	861799	861853	862009	862028	86208
3	1	3	3	3	3	1	_
86211	862261	862485	862548	862717	862722	862965	862980
3	3	3	3	3	3	3	3
862989	863030	863031	863270	86355	864018	864033	86408
3	1	1	3	1	3	3	3
86409	864292	864496	864685	864726	864729	864877	865128
5	3	3	3	3	1	1	3
865137	86517	865423	865432	865468	86561	866083	866203
3	1	2	3	3	3	1	3
866458	866674	866714	8670	86730502	867387	867739	868202
1	1	3	1	1	3	1	3
868223	868682	868826		868999	869104	869218	869224
3	3	1	3	3	3	3	3
869254	869476	869691	86973701	86973702	869931	871001501	871001502

3	3	1	3	3	3	3	5
8710441	87106	8711002	8711003	8711202	8711216	871122	871149
4	3	3	3	1	3	3	3
8711561	8711803	871201	8712064	8712289	8712291	87127	8712729
3	1	1	3	1	3	3	3
8712766	8712853	87139402	87163	87164	871641	871642	872113
1	3	_	_		_	_	3
872608	87281702	873357	873586	873592			873843
5	1		3	1			3
873885		874217					
1	3		3		3		3
875099		87556202					
3	1		_		_		1
877501		878796					
3	3	_					3
		881046502					8810987
1	3	_	3		5		1
8811523		8811842					8812877
3	3		1		3		1
8813129		88147101					
3	3	_					3
88203002		882488					
3	1			1			1
		883852					
3	3						3
		884948					
3	3			1			3
88649001		887181					889403
1	1	_		_	_		3
889719		8910251		8910506			
1	1	_	_				3
8910988		8911163					
2012040	3		3				3
		89122 1					
1							3
		89143602					
3		5 892214					
						1	
3	3						
	893061	89344			893548		
		3 894047					
3	3	3	3	3	1	5	3

894604         894618         894855         895100         89511501         89511502         89524         895299           3         3         3         1         3         3         3         3           8953002         895633         896839         896864         897137         897478         897480           897604         897630         897880         89812         89813         898143         89827         898431           8964002         898677         898678         89869         898690         899147         899187         89967           3								
8953902         895633         896839         896844         897132         897137         897374         89742801           1         1         1         1         3         3         1         897604         897630         897880         89812         89813         89813         89827         898431           89864002         898677         898678         89869         898690         899147         899187         899667           3         3         3         3         3         3         3         3         1           89987         901018         901011         9010258         9010259         901028         90103301         3 </td <td>895299</td> <td>89524</td> <td>89511502</td> <td>89511501</td> <td>895100</td> <td></td> <td>894618</td> <td>894604</td>	895299	89524	89511502	89511501	895100		894618	894604
1         1         1         1         3         3         3         1         897800         897880         89812         89813         898143         89827         898431         3         1         3         3         3         3         1         3         3         3         1         8986402         899147         899187         899667         898678         89869         898690         899147         899187         899667         899667         898678         89869         899690         899147         899187         899667         899667         899667         899667         899667         899667         899667         899667         899667         899667         899187         899187         899167         9901021         9910333         3	3	3	3	3	1	3	3	3
897604         897630         897880         89812         89813         898143         89827         898431           8986002         898677         898678         89869         898690         899147         899187         899667           3         3         3         3         3         3         3         3         1           899987         9010018         901011         9010258         9010259         901028         9010333         901034001           1         1         3 <td< td=""><td>89742801</td><td>897374</td><td>897137</td><td>897132</td><td>896864</td><td>896839</td><td>895633</td><td>8953902</td></td<>	89742801	897374	897137	897132	896864	896839	895633	8953902
89664002         898677         898678         898699         899690         899147         899187         899667           3         3         3         3         3         3         3         3         9010333         9010333         901034301           899987         9010018         901011         9010258         9010259         901028         9010333         901034301           901034302         901041         9010598         9010877         901088         9011494         9011495           3         3         3         3         3         1         1         3         3           9011971         9012000         9012315         9012568         9012795         901288         9013055         901303           901315         9012507         901288         9013055         901303         3	1	3	3	3	1	1	1	1
89864002         898677         898678         89869         898690         899147         899187         899667           3         3         3         3         3         3         3         1           89987         9010018         901011         9010258         9010259         901028         9010333         901034301           901034302         901041         9010598         9010872         9010877         901088         9011494         9011495           3         3         3         3         1         1         3         3         1         1         3           9011971         9012000         9012315         9012568         9012795         901288         9013005         901303           901315         9013579         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3	898431	89827	898143	89813	89812	897880	897630	897604
3         3         3         3         3         3         3         1           899987         9010018         9010111         9010258         9010259         901028         9010333         90103401           9010343002         901041         9010898         9010872         9010877         901088         9011494         9011495           3         3         3         3         3         1         1         3           9011971         9012000         9012315         9012568         9012795         901288         901305         901303           1         1         1         3         1         1         3	1	3	3	3	1	3	1	3
3         3         3         3         3         3         3         1           899987         9010018         9010111         9010258         9010259         901028         9010333         90103401           9010343002         901041         9010898         9010872         9010877         901088         9011494         9011495           3         3         3         3         3         1         1         3           9011971         9012000         9012315         9012568         9012795         901288         901305         901303           1         1         1         3         1         1         3	899667	899187	899147	898690	89869	898678	898677	89864002
1         1         3         3         3         3         3         3         3         3         9011495         9010872         9010877         901088         9011494         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         9011495         901303         1         1         1         3         3         1         1         1         3								
901034302         901041         9010598         9010872         9010877         901088         9011494         9011495           9011971         9012000         9012315         9012568         9012795         901288         9013005         901303           1         1         1         3         1         1         3         3           901315         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3         3         3         3         3           902727         90291         902975         902976         903011         90312         90317302         903483           3	901034301	9010333	901028	9010259	9010258	901011	9010018	899987
3         3         3         3         1         1         3           9011971         9012000         9012315         9012568         9012795         901288         9013005         901303           1         1         1         1         3         1         1         3         3           901315         9013579         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3 <t< td=""><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>1</td><td>1</td></t<>	3	3	3	3	3	3	1	1
3         3         3         3         1         1         3           9011971         9012000         9012315         9012568         9012795         901288         9013005         901303           1         1         1         1         3         1         1         3         3           901315         9013579         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3 <t< td=""><td>9011495</td><td>9011494</td><td>901088</td><td>9010877</td><td>9010872</td><td>9010598</td><td>901041</td><td>901034302</td></t<>	9011495	9011494	901088	9010877	9010872	9010598	901041	901034302
1         1         1         3         1         1         3         3           901315         9013579         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3         3         3         3         3           902727         90291         902975         902976         903011         90312         90317302         903483           3         3         3         3         3         1         3         3           903507         903516         903554         903811         90401601         90401602         904302         904357           1         1         3 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>								
901315         9013579         9013594         9013838         901549         901836         90250         90251           5         3         3         1         3         3         3         3           902727         90291         902975         902976         903011         90312         90317302         903483           3         3         3         3         1         3         3         3           903507         903516         903554         903811         90401601         90401602         904302         904357           1         1         3 <t< td=""><td>901303</td><td>9013005</td><td>901288</td><td>9012795</td><td>9012568</td><td>9012315</td><td>9012000</td><td>9011971</td></t<>	901303	9013005	901288	9012795	9012568	9012315	9012000	9011971
5         3         3         1         3	3	3	1	1	3	1	1	1
5         3         3         1         3	90251	90250	901836	901549	9013838	9013594	9013579	901315
3         3         3         3         1         3         3           903507         903516         903554         903811         90401601         90401602         904302         904357           1         1         3         3         3         3         3         3         3           90439701         904647         904689         9047         904969         904971         905189         905190           1         3							3	5
903507         903516         903554         903811         90401601         90401602         904302         904357           1         1         3         3         3         3         3         3         3           90439701         904647         904689         9047         904969         904971         905189         905190           1         3	903483	90317302	90312	903011	902976	902975	90291	902727
1         1         3	3	3	1	3	3	3	3	3
1         1         3	904357	904302	90401602	90401601	903811	903554	903516	903507
1         3							1	1
1         3	905190	905189	904971	904969	9047	904689	904647	90439701
1       3	3	3	3	3	3	3	3	1
1       3	905686	905680	905557	905539	905520	905502	905501	90524101
3       1       3       3       1       3       3         907145       907367       907409       90745       90769601       90769602       907914       907915         3       3       3       3       3       1       3         908194       908445       908469       908489       908916       909220       909231       909410         1       1       3       1       3       3       3       3       3       3         909411       909445       90944601       909777       9110127       9110720       9110732       9110944         3       3       3       3       3       3       1       3         911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3       3       3       3       3       3         9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501         3       3       3       3       1       6       3       3         911320502       9113239 <t< td=""><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td></t<>	3							_
3       1       3       3       1       3       3         907145       907367       907409       90745       90769601       90769602       907914       907915         3       3       3       3       3       1       3         908194       908445       908469       908489       908916       909220       909231       909410         1       1       3       1       3       3       3       3       3       3         909411       909445       90944601       909777       9110127       9110720       9110732       9110944         3       3       3       3       3       3       1       3         911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3       3       3       3       3       3         9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501         3       3       3       3       1       6       3       3         911320502       9113239 <t< td=""><td>906878</td><td>906616</td><td>906564</td><td>906539</td><td>906290</td><td>906024</td><td>90602302</td><td>905978</td></t<>	906878	906616	906564	906539	906290	906024	90602302	905978
907145         907367         907409         90745         90769601         90769602         907914         907915           3         3         3         3         3         1         3           908194         908445         908469         908489         908916         909220         909231         909410           1         1         3         1         3         3         3         3         3           909411         909445         90944601         909777         9110127         9110720         9110732         9110944           3         3         3         3         3         1         3           911150         911157302         9111596         9111805         9111843         911201         911202         9112085           3         1         3         1         3 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>3</td>							1	3
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908194       908445       908469       908489       908916       909220       909231       909410         1       1       3       1       3       3       3       3       3         909411       909445       90944601       909777       9110127       9110720       9110732       9110944         3       3       3       3       3       1       3         911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3       3       3       3       3       3         9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501         3       3       3       3       1       6       3       3         911320502       9113239       9113455       9113514       9113538       911366       9113778       9113816         3       3       3       3       1       1       3       3       3								
1       1       3       1       3       3       3       3       3       3       9110732       9110944       90944601       909777       9110127       9110720       9110732       9110944       3       3       1       3       3       1       3       3       1       3       3       1       3       3       1       3       3       3       1       3	909410	909231	909220	908916	908489		908445	908194
909411       909445       90944601       909777       9110127       9110720       9110732       9110944         3       3       3       3       3       1       3         911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3       3       3       3       3         9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501         3       3       3       1       6       3       3         911320502       9113239       9113455       9113514       9113538       911366       9113778       9113816         3       3       3       1       1       3       3       3								
3       3       3       3       3       3       1       3         911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3		9110732	9110720	9110127	909777	90944601		909411
911150       911157302       9111596       9111805       9111843       911201       911202       9112085         3       1       3       1       3       3       3       3       3         9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       9113778       9113816       911366       911366       9113778       9113816       911366       911366       9113778       9113816       911366       911366       911366       911366       911366       911366       911366       911366       911366       911366       911366       911366       9113							3	3
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9112366       9112367       9112594       9112712       911296201       911296202       9113156       911320501         3       3       3       1       6       3       3         911320502       9113239       9113455       9113514       9113538       911366       9113778       9113816         3       3       3       1       1       3       3					1	3	1	3
3     3     3     1     6     3     3       911320502     9113239     9113455     9113514     9113538     911366     9113778     9113816       3     3     3     1     1     3     3				911296201	9112712			
911320502 9113239 9113455 9113514 9113538 911366 9113778 9113816 3 3 3 3 1 1 3 3								
3 3 3 1 1 3 3								
3 3 3 3 3 1								
912193 91227 912519 912558 912600 913063 913102 913505								
3 3 3 3 5 3 1								
913512 913535 91376701 91376702 914062 914101 914102 914333								

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915691	915940	91594602	916221	916799	916838	917062	917080
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917092	91762702	91789	917896	917897	91805	91813701	91813702
3	1	3	3	3	3	1	3
918192	918465	91858	91903901	91903902	91930402	919537	919555
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91979701	919812	921092	921362	921385	921386	921644	922296
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922297	922576	922577	922840	923169	923465	923748	923780
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924084	924342	924632	924934	924964	925236	925277	925291
3	3	3	3	3	3	3	3
925292	925311	925622	926125	926424	926682	926954	927241
3	3	1	1	1	1	3	1
92751							
3							

## **\$`6`\$**table

diagnosis

clusters B M
1 12 165
2 0 5
3 331 39
4 2 0
5 12 1

6 0 2

## \$`6`\$accuracy

[1] 0.9086116

#### \$`7`

\$`7`\$clusters

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851509	8511133	8510824	8510653	8510426	849014	84862001	848406

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852552	852631	852763	852781	852973			853612
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85382601	854002	854039	854253	854268	854941	855133	855138
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855167	855563	855625	856106	85638502	857010	85713702	85715
3	1	1	1	1	1	3	1
857155	857156	857343	857373	857374	857392	857438	85759902
3	3	3	3	3	1	3	3
857637	857793	857810	858477	858970	858981	858986	859196
1	1	3	3	3	3	1	3
85922302	859283	859464	859465	859471	859487	859575	859711
1	1	3	3	4	3	1	5
859717	859983	8610175	8610404	8610629	8610637	8610862	8610908
1	1	3	3	3	1	6	3
861103	8611161	8611555	8611792	8612080	8612399	86135501	86135502
3	1	1	1	3	1	3	1
861597	861598		861799	861853	862009	862028	86208
3	1	3	3	3	3	1	1
86211	862261	862485		862717	862722	862965	862980
3	3	3	_	3	3	_	_
862989	863030	863031	863270	86355	864018	864033	86408
3	1	1	3	1	3	3	3
86409	864292	864496	864685	864726	864729	864877	865128
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865137	86517				86561		
3	1	6	3	3	3	_	_
866458	866674	866714		86730502			
1	1	3	1	1	3	_	
868223			868871				869224
3	3	1	3	3	3		_
869254			86973701				
3	3	_	3	•	•	•	5
							871149
4							
							8712729
3							3
							872113
	3						3
							873843
5	1			1			3
							875093
1	3	3	3	3	3	2	3

877500	877486	877159	875938	875878	87556202	875263	875099
1		3				1	3
					878796	877989	877501
3						3	3
8810987	8810955	881094802	8810703	8810528	881046502	8810436	8810158
1		5		•	_	3	1
8812877	8812844			88119002	8811842	8811779	8811523
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88199202	881972	881861	88147202	88147102	88147101	88143502	8813129
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884626	884448	884437	884180	88411702	883852	883539	88350402
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886452	886226	8860702	885429	88518501	884948	884689	88466802
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889403	888570	888264	887549	88725602	887181	886776	88649001
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8910748	8910721	8910720	8910506	8910499	8910251	88995002	889719
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8911834	8911800	8911670	8911230	8911164	8911163	8910996	8910988
3	3	3	3	3	3	3	1
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891923	891716	891703	891670	8915	89143602	89143601	8913049
3	3	3	3	3	5	3	3
892657	89263202	892604	892438	892399	892214	892189	891936
3	1	3	1	3	3	3	3
89382601	893783	893548	893526	89346	89344	893061	89296
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894335	894329	894326	894090	894089	894047	893988	89382602
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89742801	897374	897137	897132	896864	896839	895633	8953902
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898431	89827			89812	897880	897630	897604
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899667	899187	899147	898690	89869	898678	898677	89864002
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901034301	9010333	901028	9010259	9010258	901011	9010018	899987
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9011495	9011494	901088	9010877	9010872	9010598	901041	901034302

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9011971	9012000	9012315	9012568	9012795	901288	9013005	901303
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901315	9013579	9013594	9013838	901549	901836	90250	90251
5	3	3	1	3	3	3	3
902727	90291	902975	902976	903011	90312	90317302	903483
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903507	903516	903554	903811	90401601	90401602	904302	904357
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90439701	904647		9047		904971	905189	905190
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90524101	905501		905520	905539	905557	905680	905686
1	3	3	3	3	3	3	3
905978	90602302		906290	906539	906564	906616	906878
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907145	907367	907409	90745	90769601	90769602	907914	907915
3	3	3	3			1	_
908194	908445				909220	909231	909410
1	_	3	1			3	3
909411	909445	90944601	909777	9110127	9110720	9110732	9110944
3	_	3	3			_	_
911150	911157302	9111596	9111805	9111843	911201	911202	9112085
3	1	3	1			_	_
9112366	9112367				911296202	9113156	911320501
3	_	3	3				
911320502					911366		
3		3	3		_	_	
911384	9113846			911654		911685	911916
3	_	3	3			3	_
912193					913063		913505
3	_	3	3			3	
913512					914101		
3				1			
	914580						
1			1				
915186	915276						
5					1		3
915691	915940						
1		3	3	1		3	3
917092					91805		
3					3		
918192					91930402		
3	3	3	3	3	1	3	1

91979701	919812	921092	921362	921385	921386	921644	922296
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3	3	3	3	3	3	3	3
924084	924342	924632	924934	924964	925236	925277	925291
3	3	3	3	3	3	3	3
925292	925311	925622	926125	926424	926682	926954	927241
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## **\$**`7`\$table

## \$`7`\$accuracy [1] 0.9086116

#### \$`8`

### \$`8`\$clusters

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848406	84862001	849014	8510426	8510653	8510824	8511133	851509
4	1	2	4	4	4	1	2
852552	852631	852763	852781	852973	853201	853401	853612
2	1	1	2	1	4	1	1
85382601	854002	854039	854253	854268	854941	855133	855138
1	1	1	1	1	4	4	1
855167	855563	855625	856106	85638502	857010	85713702	85715
4	1	2	1	1	2	4	1
857155	857156	857343	857373	857374	857392	857438	85759902
4	4	4	4	4	2	4	4
857637	857793	857810	858477	858970	858981	858986	859196

2	1	4	4	4	4	1	4
85922302	859283	859464	859465	859471	859487	859575	859711
1	1	4	4	5	4	2	6
859717	859983	8610175	8610404	8610629	8610637	8610862	8610908
1	1	4	4	4	2	7	4
861103	8611161	8611555	8611792	8612080	8612399	86135501	86135502
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861597	861598	861648	861799	861853	862009	862028	86208
4	1		4	4			2
86211		862485					
4	4			4			
862989	863030	863031					
4	1		4		4		
86409	864292						
6	4			4			
865137	86517	865423					
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866458	866674						
1	1			1			
868223		868826					
4	4		4				
869254		869691					
4	4						6
8710441		8711002					
5		4					
		871201					
4	2						
		87139402					872113
2	4		4		4		
		873357					
6	1			2			
		874217					
-	-	4	-	-	-	U	-
		87556202					
4	1		4				
		878796					
4		2					
		881046502					
		2					
		8811842					
4		2					1
		88147101					
4	4	4	4	4	1	1	4

88203002	88206102	882488	88249602	88299702	883263	883270	88330202
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88350402	883539	883852	88411702	884180	884437	884448	884626
4	4	6	4	2	4	4	4
88466802	884689	884948	88518501	885429	8860702	886226	886452
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88649001	886776	887181	88725602	887549	888264	888570	889403
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889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748
1	2	4	4	4	4	4	4
8910988	8910996	8911163	8911164	8911230	8911670	8911800	8911834
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8912049	8912055	89122	8912280	8912284	8912521	8912909	8913
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8913049	89143601	89143602	8915	891670	891703	891716	891923
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891936	892189	892214	892399	892438	892604	89263202	892657
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89296	893061	89344	89346	893526	893548	893783	89382601
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89382602	893988	894047	894089	894090	894326	894329	894335
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894604	894618	894855	895100	89511501	89511502	89524	895299
4	4	4	1	4	4	4	4
8953902	895633	896839	896864	897132	897137	897374	89742801
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897604	897630	897880	89812	89813	898143	89827	898431
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89864002	898677	898678	89869	898690	899147	899187	899667
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899987	9010018	901011	9010258	9010259	901028	9010333	901034301
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901034302	901041	9010598	9010872	9010877	901088	9011494	9011495
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9011971	9012000	9012315	9012568	9012795	901288	9013005	901303
2	2	1	4	2	2	4	4
901315	9013579	9013594	9013838	901549	901836	90250	90251
6		4					
902727	90291	902975	902976	903011	90312	90317302	903483
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90439701	904647	904689	9047	904969	904971	905189	905190

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	905501						
1		4	4				
	90602302						
4		4			1		
907145	907367	907409	90745	90769601	90769602	907914	907915
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908194	908445	908469	908489	908916	909220	909231	909410
2	2	4	1	4	4	4	4
909411	909445	90944601	909777	9110127	9110720	9110732	9110944
4	4	4	4	4	4	2	4
911150	911157302	9111596	9111805	9111843	911201	911202	9112085
4	2	4	2	4	4	4	4
9112366	9112367	9112594	9112712	911296201	911296202	9113156	911320501
4	4	4	4	2	8	4	4
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
4	4	4	4	2	1	4	4
911384	9113846	911391	911408			911685	911916
4	4	4	4	4	4	4	1
912193	91227	912519	912558	912600	913063	913102	913505
4					6		
913512	913535						
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914366	914580	914769	91485	914862	91504	91505	915143
	4						
915186	915276						
6	6	4	4	4	1	4	4
915691	915940						
1					2		
917092	91762702						
4	_			4		1	
	918465						
_	4	_	_	_	_	_	_
91979701	919812	921092	921362	921385	921386	921644	922296
4	1	4	6	4	1	4	4
	922576						
4					4		
924084	924342						
4					4		
	925311						
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92751							
4							

#### \$`8`\$table

\$`8`\$accuracy

[1] 0.9086116

\$`9`\$clusters

#### \$`9`

842517 84300903 84348301 84358402 844359 84458202 

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862989	863030	863031	863270	86355	864018	864033	86408
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86409	864292	864496	864685	864726	864729	864877	865128
6	4	4	4	4	1	1	4
865137	86517	865423	865432	865468	86561	866083	866203
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866458	866674	866714	8670	86730502	867387	867739	868202
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868223	868682	868826	868871	868999	869104	869218	869224
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869254	869476	869691	86973701	86973702	869931	871001501	871001502
4	4	1	4	4	4	4	6
8710441	87106	8711002	8711003	8711202	8711216	871122	871149
5	4	4	4	2	4	4	4
8711561	8711803	871201	8712064	8712289	8712291	87127	8712729
4	2	1	4	2	4	4	4
8712766	8712853	87139402	87163	87164	871641	871642	872113
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872608	87281702	873357	873586	873592	873593	873701	873843
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875099	875263	87556202	875878	875938	877159	877486	877500
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877501	877989	878796	87880	87930	879523	879804	879830
4	4	2	1	4	4	4	4
8810158	8810436	881046502	8810528	8810703	881094802	8810955	8810987
1	4	2	4	8	9	1	1
8811523	8811779	8811842	88119002	8812816	8812818	8812844	8812877
4	4	2	2	4	4	4	1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
4	4	4	4	4	1	1	4
88203002	88206102	882488	88249602	88299702	883263	883270	88330202
4	2	4	4	2	2	4	2
88350402	883539	883852	88411702	884180	884437	884448	884626
4	4	6	4	2	4	4	4
88466802	884689	884948	88518501	885429	8860702	886226	886452
4	4		4	1			
88649001	886776	887181	88725602	887549	888264	888570	889403
2	1	2	1	2	4	2	4
889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748

1	2	4	4	4	4	4	4
8910988	8910996	8911163	8911164	8911230	8911670	8911800	8911834
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4		4					
89296		89344					
4	4	4					4
89382602		894047					
4		4					
894604		894855					895299
4	4	4					
8953902		896839					
1		1					
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4	2	4					
89864002		898678					
4				4			
		901011					901034301
2	1	4					
901034302				9010877			
4		4					
9011971		9012315					
2	2						
901315		9013594					
6		4					
		902975					
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		903554					
_	_	_	-	-	-	_	4
_							905190
1		4			4		
		905502					905686
1		4					
	90602302			906539			906878
4				4			4
		907409					907915
4		4		4			
		908469					
2	2	4	1	4	4	4	4

909411	909445	90944601	909777	9110127	9110720	9110732	9110944
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911150	911157302	9111596	9111805	9111843	911201	911202	9112085
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4	4	4	4	2	8	4	4
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
4							
911384	9113846	911391	911408	911654	911673	911685	911916
4	4	4	4	4	4	4	1
912193	91227						
4					6		
913512	913535	91376701	91376702				914333
4		4					
914366	914580						
1	=				1		
915186	915276						
6					1		4
915691	915940						
1							
	91762702						
					4		
918192	918465				91930402		
4	=				2		
91979701	919812						
4	_	4					
922297	922576	922577			923465		923780
4	_	4	_		_		_
	924342						
4					4		
925292	925311						
4	4	1	2	2	2	4	2
92751							
4							

## **\$**`9`\$table

diagnosis
clusters B M
1 12 86
2 0 79
3 0 3
4 331 39
5 2 0

6 12 0 7 0 2 8 0 2 9 0 1

\$`9`\$accuracy
[1] 0.9103691

#### \$`10`

\$`10`\$clusters 84300903 84348301 84358402 

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869254	869476	869691					871001502
4	4		4		4		•
8710441	87106	8711002	8711003				871149
6	4			2			
8711561	8711803	871201	8712064	8712289	8712291	87127	8712729
4	2		4		4		4
8712766	8712853	87139402	87163	87164	871641	871642	872113
5	4	4	4	1	4	4	4
872608	87281702	873357	873586	873592	873593	873701	873843
7	1		4		5		
873885	874158	874217	874373	874662	874839	874858	875093
1	4	4	4	4	4	3	4
875099	875263	87556202	875878	875938	877159	877486	877500
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877501	877989	878796	87880	87930	879523	879804	879830
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8810158	8810436	881046502	8810528	8810703	881094802	8810955	8810987
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8811523	8811779	8811842	88119002	8812816	8812818	8812844	8812877
4	4	2	2	4	4	4	1
8813129	88143502	88147101	88147102	88147202	881861	881972	88199202
4	4	4	4	4	1	1	4
88203002	88206102	882488	88249602	88299702	883263	883270	88330202
4	2	4	4	2	2	4	2
88350402	883539	883852	88411702	884180	884437	884448	884626
4	4	7	4	2	4	4	4
88466802	884689	884948	88518501	885429	8860702	886226	886452
4	4	5	4	1	4	2	4
88649001	886776	887181	88725602	887549	888264	888570	889403
5	1	5	1	2	4	2	4
889719	88995002	8910251	8910499	8910506	8910720	8910721	8910748
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8912049	8912055	89122	8912280	8912284	8912521	8912909	8913
	4		1		4		
		89143602					
4		7					
		892214					

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89382602	893988	894047	894089	894090	894326	894329	894335
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894604	894618	894855	895100	89511501	89511502	89524	895299
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8953902	895633	896839	896864	897132	897137	897374	89742801
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897604		897880		89813		89827	898431
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89864002	898677	898678	89869				
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899987					901028		
2		4					
901034302	901041						
4	_				2		4
9011971		9012315			901288		
2		1					
901315					901836		
7	_				4		
	90291				90312 5		
002507		002554					
903507	_			90401601	90401602		904357 4
1	904647						
90439701		904009					
_	905501				905557		
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	90602302					=	
4		4					
_	907367	_	_				
	4						
	908445						
	2						
909411	909445	90944601	909777	9110127	9110720	9110732	9110944
	4						
911150	911157302	9111596	9111805	9111843	911201	911202	9112085
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	9112367						
	4						4
911320502	9113239	9113455	9113514	9113538	911366	9113778	9113816
4	4	4	4	5	1	4	4

911384	9113846	911391	911408	911654	911673	911685	911916
4	4	4	4	4	4	4	1
912193	91227	912519	912558	912600	913063	913102	913505
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913512	913535	91376701	91376702	914062	914101	914102	914333
4	4	4	4	2	4	4	4
914366	914580	914769	91485	914862	91504	91505	915143
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915186	915276	91544001	91544002	915452	915460	91550	915664
7	7	4	4	4	1	4	4
915691	915940	91594602	916221	916799	916838	917062	917080
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917092	91762702	91789	917896	917897	91805	91813701	91813702
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918192	918465	91858	91903901	91903902	91930402	919537	919555
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91979701	919812	921092	921362	921385	921386	921644	922296
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922297	922576	922577	922840	923169	923465	923748	923780
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924084	924342	924632	924934	924964	925236	925277	925291
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4	4	1	5	2	2	4	5
92751							
4							

**\$`10`\$table** 

\$`10`\$accuracy
[1] 0.9103691

Q13. Which method gives your favorite results for the same data.dist dataset? Explain your reasoning.

# ward.d2 method reduces cluster variance and allows for more clarity within clusters