Math 5365

Data Mining 1

Homework 19

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1. Test whether the k-means clusters for the wdbc data set are statisticaly independent of Diagnosis using a chi-square test with a simulated p-value.

   χ^2 test with simulate.p.value = T

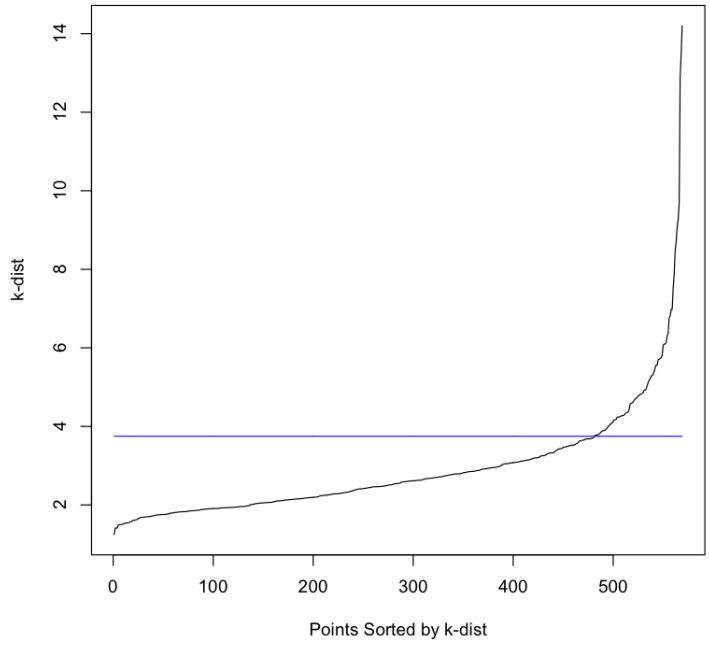
   ```
   Pearson's Chi-squared test with simulated p-value (based on 2000
   replicates)


   data:  wdbc_tab
   X-squared = 279.65, df = NA, p-value = 0.0004998
   ```

   The p-value is significantly smaller than 0.05, so the clusters *are* dependent.

2. In this problem, you will apply the DBSCAN clustering method on the wdbc data.

   (a) Create a plot of sorted k-dist values, where k = 5, and determine the optimal vlaue of Eps.

   The optimal value for Eps is approximated as 3.75, as shown in the graph below.



(b) Perform DBSCAN using this value of Eps and k = 5 The confusion matrix for the DBSCAN model is shown below.

	predicted	
	B	M
B	334	23
M	174	38

(c) How many clusters were identified?

There were only two values for `wdbc_dbscan`, 0 and 1. Therefore there was only 1 cluster.

(d) What percentage of the points in the data were classified as noise?

about 6.326889 %

(e) Test whether the dbscan clusters are statistically independent of Diagnosis using a chi-square test with a simulated p-value.

The output for the χ^2 test is shown below.

```
        Pearson's Chi-squared test with simulated p-value (based on 2000
        replicates)

data:  wdbc_tab
X-squared = 9.3537, df = NA, p-value = 0.002499
```

Note that the p-value is much smaller than 0.05. Thus the cluster is most likely not independent of Diagnosis.

```
#Data Mining hw 19
library(stats)
library(cluster)
library(fields)
library(fpc)

source('~/Dropbox/Tarleton/data_mining/generic_functions/dataset_ops.R')
wdbc <- read.csv('~/Dropbox/Tarleton/data_mining/dfiles/wdbc.data',
                 header=F,sep=',')
wdbc <- wdbc[,-1]
nr <- nrow(wdbc)
nc <- ncol(wdbc)

# 1 Test whether the k-means clusters for the wdbc data set are
#   statisticaly independent of Diagnosis using a chi-square test with
#   a simulated p-value.

wdbc_kmeans <- kmeans_reps(wdbc[2:nc], 2, 1000)
predicted <- rep('',nr)
```

```
predicted[1 * (wdbc_kmeans$cluster == 2) == 1] <- 'B'
predicted[1 * (wdbc_kmeans$cluster == 1) == 1] <- 'M'
wdbc_tab <- table(wdbc$V2, predicted)

chisq.test(wdbc_tab, simulate.p.value = T)
chisq.test(wdbc_tab, simulate.p.value = F)

# 2 In this problem, you will apply the DBSCAN clustering method on the
#   wdbc data.

#  a. Create a plot of sorted k-dist values, where k = 5, and determine
#     the optimal vlaue of Eps.

k = 5
z <- standardize(wdbc, 2:nc)
dmat <- rdist(z[,2:nc])

sort_dmat <- apply(dmat, 2, sort)
kdist <- sort_dmat[k,]
plot(sort(kdist), type='l',
     xlab = 'Points Sorted by k-dist',
     ylab = 'k-dist')
lines(1:length(kdist), rep(3.75, length(kdist)), col='blue')
#lines(1:length(kdist), rep(4.35, length(kdist)), col='blue')

#myEps = 4.35
myEps = 3.75
```

```
#  b. Perform DBSCAN using this value of Eps and k = 5

wdbc_dbscan <- dbscan(z[,2:nc], eps = myEps, MinPts = k)
plot(z[,2], z[,8], col = (wdbc_dbscan$cluster + 1))

predicted <- rep('',nr)
predicted[1 * (wdbc_dbscan$cluster == 1) == 1] <- 'B'
predicted[1 * (wdbc_dbscan$cluster == 0) == 1] <- 'M'
wdbc_tab <- table(wdbc$V2, predicted)

#  c. How many clusters were identified?

#  d. What percentage of the points in the data were classified as noise?

#  e. Test whether the dbscan clusters are statistically independent of
#     Diagnosis using a chi-square test with a simulated p-value.

chisq.test(wdbc_tab, simulate.p.value=T)
```