Experiment-3.1

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Branch: CSE   **Section**: 905/A
Semester: 6   **Date of Performance**: 26/04/2023
Subject Name: Data Mining Lab   **Subject Code**: 20CSP-376

1)   Aim:

To perform the hierarchical clustering using R pro.

2)   Objective:

Performing the hierarchical clustering using R pro on a pre dataset 'mtcars'.

3)   Code:

library(dplyr)

head(mtcars)

distance_mat <- dist(mtcars, method = 'euclidean')

distance_mat

set.seed(240) # Setting seed

Hierar_cl <- hclust(distance_mat, method = "average")

Hierar_cl

plot(Hierar_cl)

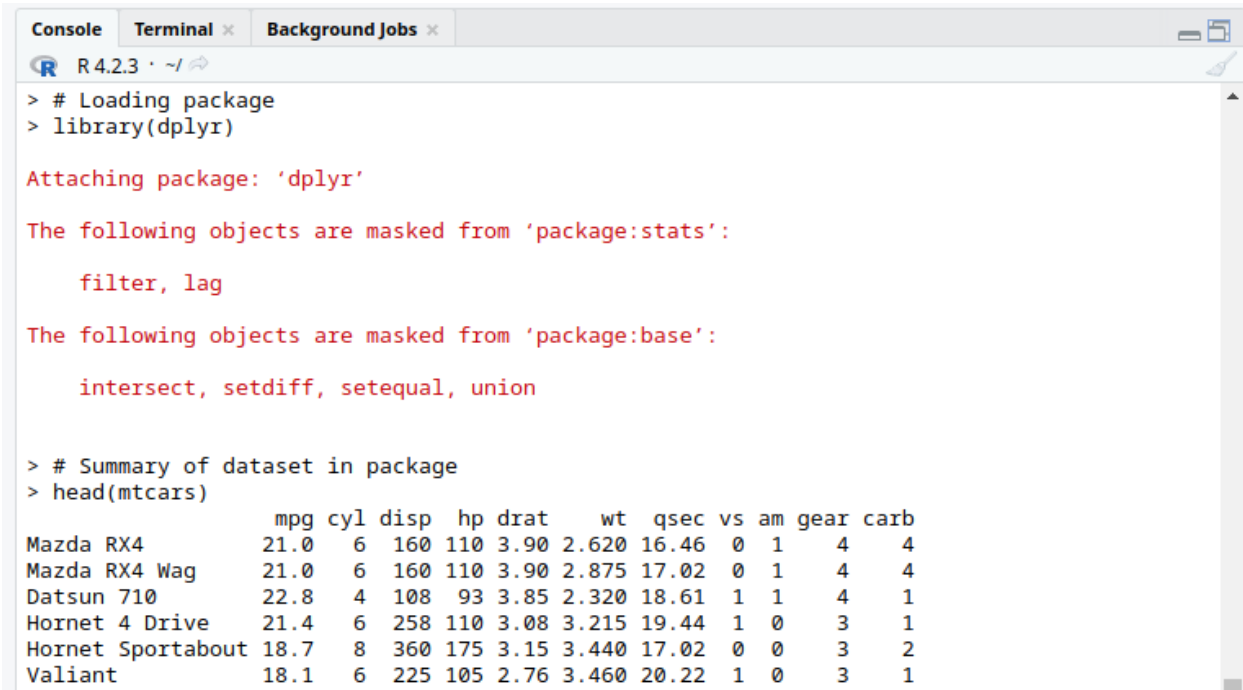*abline(h = 110, col = "green")*

fit <- cutree(Hierar_cl, k = 3)

  fit

  table(fit)

rect.hclust(Hierar_cl, k = 3, border = "green")

4) Output:

```
Console    Terminal ×    Background Jobs ×
R  R 4.2.3 · ~/
> # Loading package
> library(dplyr)

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union


> # Summary of dataset in package
> head(mtcars)
                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
> distance_mat <- dist(mtcars, method = 'euclidean')

> distance_mat
                    Mazda RX4 Mazda RX4 Wag  Datsun 710 Hornet 4 Drive
Mazda RX4 Wag         0.6153251
Datsun 710           54.9086059    54.8915169
Hornet 4 Drive       98.1125212    98.0958939 150.9935191
Hornet Sportabout   210.3374396   210.3358546 265.0831615    121.0297564
Valiant              65.4717710    65.4392224 117.7547018     33.5508692
Duster 360          241.4076490   241.4088680 294.4790230    169.4299647
Merc 240D            50.1532711    50.1146059  49.6584796    121.2739722
Merc 230             25.4683117    25.3284509  33.1803843    118.2433145
Merc 280             15.3641921    15.2956865  66.9363534     91.4224033
Merc 280C            15.6724727    15.5837744  67.0261397     91.4612914
Merc 450SE          135.4307018   135.4254826 189.1954941     72.4964325
Merc 450SL          135.4014424   135.3960351 189.1631745     72.4313532
Merc 450SLC         135.4794674   135.4723157 189.2345426     72.5718466
Cadillac Fleetwood  326.3395903   326.3355070 381.0926242    234.4403876
Lincoln Continental 318.0469808   318.0429333 372.8012090    227.9726091
Chrysler Imperial   304.7203408   304.7169175 359.3014906    218.1548299
Fiat 128             93.2679950    93.2530993  40.9933763    184.9689734
Honda Civic         102.8307567   102.8238713  52.7704607    191.5518700
Toyota Corolla      100.6040368   100.5887588  47.6535017    192.6714187
Toyota Corona        42.3075233    42.2659224  12.9654743    138.5304725
```

```
                    Hornet Sportabout    Valiant  Duster 360   Merc 240D    Merc 230
Mazda RX4 Wag
Datsun 710
Hornet 4 Drive
Hornet Sportabout
Valiant                    152.1241352
Duster 360                  70.1767262 194.6094525
Merc 240D                  241.5069657  89.5911056 281.2962502
Merc 230                   233.4924012  85.0079649 265.8823313  33.6873047
Merc 280                   199.3344960  60.2909811 227.8998521  64.7754228  39.2994160
Merc 280C                  199.3406564  60.2655656 227.8813169  64.8898713  39.3868519
Merc 450SE                  84.3888482  90.6970264 106.4084264 175.1620073 159.8179555
Merc 450SL                  84.3683999  90.6769728 106.4320572 175.1189767 159.7760899
Merc 450SLC                 84.4332423  90.7092989 106.4010305 175.2118218 159.8495837
Cadillac Fleetwood         116.2804201 266.6280942 119.0239068 355.6627498 349.2832611
Lincoln Continental        108.0624299 259.6304391 104.5112999 348.9901277 341.3154316
Chrysler Imperial           97.2049146 248.7713290  81.4297699 338.1959373 328.4335161
Fiat 128                   302.0377212 152.1153263 333.9792070  68.6105903  69.3127910
Honda Civic                310.0324645 158.9615769 344.0518316  72.0014488  78.5387212
Toyota Corolla             309.5581776 159.8302995 341.0218232  76.2806458  76.7731674
Toyota Corona              252.3331988 105.2876428 282.0508820  44.0850975  21.0962017
Dodge Challenger            48.9838851 103.4310693 103.9023864 192.8617917 185.8331870
AMC Javelin                 61.4274240  91.0444349 110.3084921 180.5479760 172.5312555
Camaro Z28                  70.9665308 187.8463771  10.0761203 273.8367985 257.7469734
```

```
Lincoln Continental
Chrysler Imperial
Fiat 128
Honda Civic
Toyota Corolla
Toyota Corona
Dodge Challenger
AMC Javelin                 14.0154995
Camaro Z28                 100.3046106 105.6062618
Pontiac Firebird            85.8075196  99.2836114  86.2665759
Fiat X1-9                  253.6624046 240.5266823 325.1490914      339.1396182
Porsche 914-2              206.6452569 193.3080584 276.8924414      292.1646488
Lotus Europa               226.5004836 212.7568765 287.6179004      311.3862342
Ford Pantera L             118.7516779 123.3832044  19.3589023      101.7389686
Ferrari Dino               174.9280395 161.1060307 216.7489910      255.0570519
Maserati Bora              185.9059273 185.1553411 102.5946154      188.3240020
Volvo 142E                 201.3682522 187.6978440 266.5277736      286.7497823
                    Fiat X1-9 Porsche 914-2 Lotus Europa Ford Pantera L Ferrari Dino

Mazda RX4 Wag
Datsun 710
Hornet 4 Drive
Hornet Sportabout
Valiant
Duster 360
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Honda Civic
Toyota Corolla
Toyota Corona
Dodge Challenger
AMC Javelin
Camaro Z28
Pontiac Firebird
Fiat X1-9
Porsche 914-2         48.3775209
Lotus Europa          49.8406880     33.7678653
Ford Pantera L       336.7018783    288.5852993   297.5376920
Ferrari Dino         127.8210813     87.9105966    80.4553451    224.4587490
Maserati Bora        349.1199576    303.9222549   303.2796468     86.9383253   223.5342175
Volvo 142E            60.4120429     18.7555858    27.8104457    277.4803312    70.4751034
                     Maserati Bora

Mazda RX4 Wag
Datsun 710
Hornet 4 Drive
Hornet Sportabout
Valiant
Duster 360
Merc 240D
Merc 230
Merc 280
Merc 280C
Merc 450SE
```

```
Maserati Bora
Volvo 142E          289.1157363

> # Fitting Hierarchical clustering Model
> # to training dataset
> set.seed(240) # Setting seed

> Hierar_cl <- hclust(distance_mat, method = "average")

> Hierar_cl

Call:
hclust(d = distance_mat, method = "average")

Cluster method   : average
Distance         : euclidean
Number of objects: 32


> # Plotting dendrogram
> plot(Hierar_cl)

> # Choosing no. of clusters
> # Cutting tree by height
> abline(h = 110, col = "green")
```

```
> # Cutting tree by no. of clusters
> fit <- cutree(Hierar_cl, k = 3 )

> fit
          Mazda RX4        Mazda RX4 Wag           Datsun 710      Hornet 4 Drive
                  1                    1                    1                   2
  Hornet Sportabout              Valiant            Duster 360          Merc 240D
                  2                    2                    2                   1
          Merc 230             Merc 280            Merc 280C          Merc 450SE
                  1                    1                    1                   2
          Merc 450SL          Merc 450SLC  Cadillac Fleetwood Lincoln Continental
                  2                    2                    2                   2
  Chrysler Imperial             Fiat 128          Honda Civic      Toyota Corolla
                  2                    1                    1                   1
       Toyota Corona     Dodge Challenger          AMC Javelin          Camaro Z28
                  1                    2                    2                   2
    Pontiac Firebird             Fiat X1-9         Porsche 914-2        Lotus Europa
                  2                    1                    1                   1
      Ford Pantera L          Ferrari Dino        Maserati Bora          Volvo 142E
                  2                    1                    3                   1

> table(fit)
fit
 1  2  3
16 15  1

> rect.hclust(Hierar_cl, k = 3, border = "green")
```