Dendrograma

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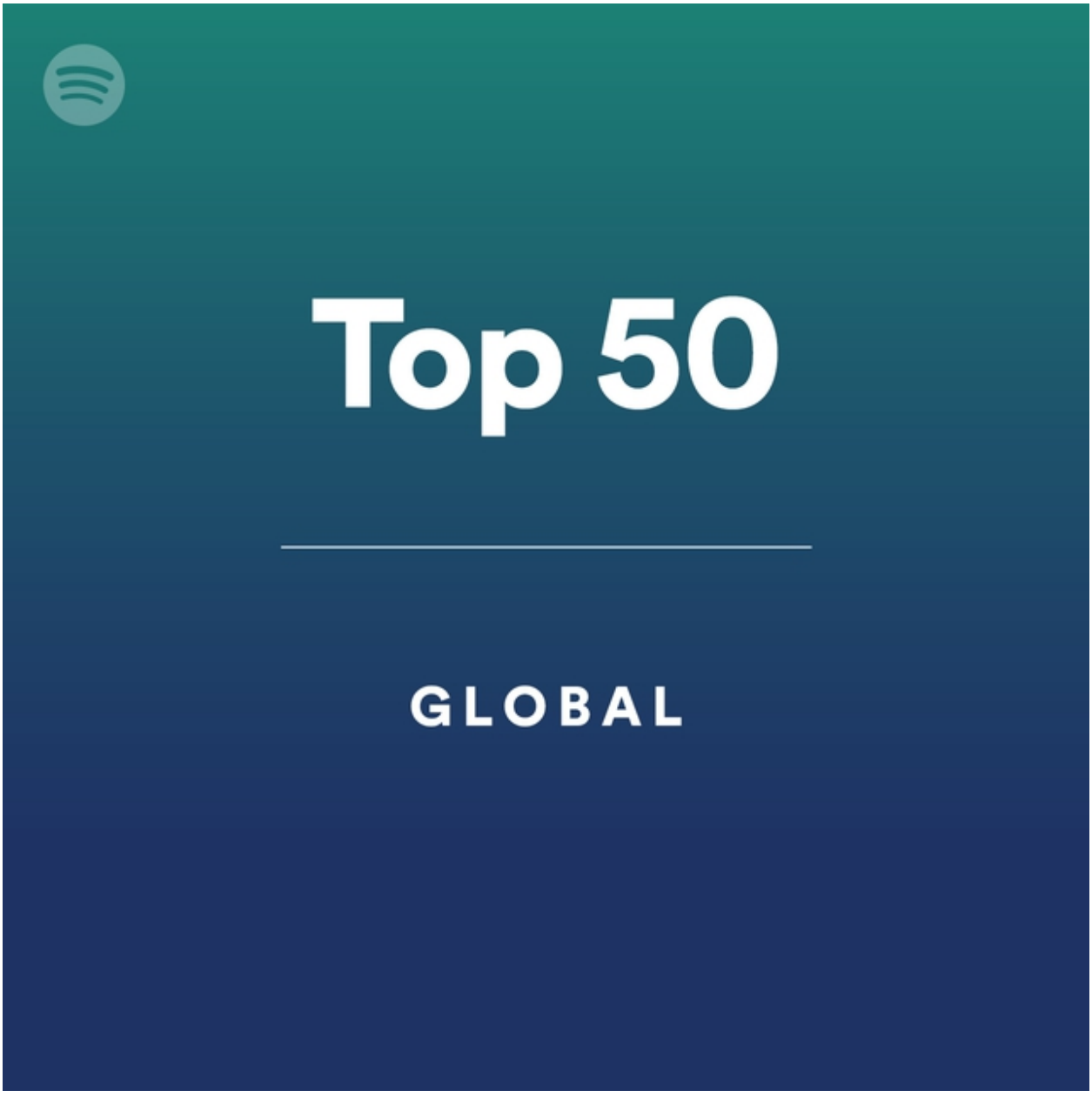

Capítulo I

Introducción

El dendrograma que muestra los grupos que se forman al crear conglomerados de observaciones en cada paso y sus niveles de similitud. hclust nos dice que un **Dendrograma** es un cluster jerárquico y los argumentos nos menciona que tiene que se una estructura de disimilitud, ya que no podemos trabajar con los datos originales, tenemos que calcular las distancias, por eso usamos mahalanobis.

```
help(hclust)
```

En este reporte de investigación se realizó un dendrograma con una base de datos sacada de **kaggle:https://www.kaggle.com/datasets/equinxx/spotify-top-50-songs-in-2021?resource=download.** La matriz de datos contiene 6 variables y 50 observaciónes. Los datos tratan de las canciones más escuchadas en el mundo en Spotify en el año 2021 y esta base tiene 6 variables descriptivas sobre las canciones que son:

-Popularity: cuanto mayor sea el valor, más popular será la canción.

-Danceability:cuanto mayor sea el valor, más fácil será bailar esta canción.

-Energy: La energía de una canción - cuanto mayor sea el valor, más enérgico.

-key: La clave en la que se encuentra la pista. Los números enteros se asignan a tonos utilizando la notación estándar de clase de tono. Por ejemplo, 0 = C, 1 = C#/D, 2 = D, y así sucesivamente. Si no se detectó ninguna clave, el valor es -1 (rango: -1; 11).

Valence: Cuanto mayor sea el valor, el estado de ánimo más positivo para la canción.

Capítulo II

Tratamiento de la matriz

Cargamos librerias

```
#install.packages("cluster.datasets")
library("cluster.datasets")
```

```
library("readxl")
```

```
library("cluster")
```

Instalar paquetes y librerias para cambiar el color del dendrograma

```
library("dendextend")
```

```
##
## ---------------------
## Welcome to dendextend version 1.15.2
## Type citation('dendextend') for how to cite the package.
##
## Type browseVignettes(package = 'dendextend') for the package vignette.
## The github page is: https://github.com/talgalili/dendextend/
##
## Suggestions and bug-reports can be submitted at: https://github.com/talgalili/dendextend/issues
## You may ask questions at stackoverflow, use the r and dendextend tags:
##   https://stackoverflow.com/questions/tagged/dendextend
##
##  To suppress this message use:  suppressPackageStartupMessages(library(dendextend))
## ---------------------
```

```
##
## Attaching package: 'dendextend'
```

```
## The following object is masked from 'package:stats':
##
##     cutree
```

```
#install.packages("factoextra")
library("factoextra")
```

```
## Loading required package: ggplot2
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
library("ggplot2")
```

Importar la matriz de datos

```
top50_2021 = read_excel("top50-2021.xlsx")
head(top50_2021)
```

```
## # A tibble: 6 x 6
##   track_name                      popularity danceability energy   key valence
##   <chr>                                <dbl>        <dbl>  <dbl> <dbl>   <dbl>
## 1 drivers license                         92        0.561  0.431    10   0.137
```

```
## 2 MONTERO (Call Me By Your Name)            90        0.593  0.503     8   0.71
## 3 STAY (with Justin Bieber)                 92        0.591  0.764     1   0.478
## 4 good 4 u                                  95        0.563  0.664     9   0.688
## 5 Levitating (feat. DaBaby)                 89        0.702  0.825     6   0.915
## 6 Peaches (feat. Daniel Caesar & G~         90        0.677  0.696     0   0.464
```

Cambiamos el nombre de la matriz

```
S=top50_2021
```

Exploración de la base de datos

```
head(S)
```

```
## # A tibble: 6 x 6
##   track_name                          popularity danceability energy   key valence
##   <chr>                                    <dbl>        <dbl>  <dbl> <dbl>   <dbl>
## 1 drivers license                             92        0.561  0.431    10   0.137
## 2 MONTERO (Call Me By Your Name)              90        0.593  0.503     8   0.71
## 3 STAY (with Justin Bieber)                   92        0.591  0.764     1   0.478
## 4 good 4 u                                    95        0.563  0.664     9   0.688
## 5 Levitating (feat. DaBaby)                   89        0.702  0.825     6   0.915
## 6 Peaches (feat. Daniel Caesar & G~           90        0.677  0.696     0   0.464
```

Tenemos una dimensión de 50 x 6

```
dim(S)
```

```
## [1] 50  6
```

Nombre de las Variables

```
colnames(S)
```

```
## [1] "track_name"   "popularity"   "danceability" "energy"       "key"
## [6] "valence"
```

Tenemos 1 variable númerica y 5 de caracter

```
str(S)
```

```
## tibble [50 x 6] (S3: tbl_df/tbl/data.frame)
##  $ track_name  : chr [1:50] "drivers license" "MONTERO (Call Me By Your Name)" "STAY (with Justin Bi
##  $ popularity  : num [1:50] 92 90 92 95 89 90 88 93 94 93 ...
##  $ danceability: num [1:50] 0.561 0.593 0.591 0.563 0.702 0.677 0.764 0.514 0.761 0.714 ...
##  $ energy      : num [1:50] 0.431 0.503 0.764 0.664 0.825 0.696 0.705 0.73 0.525 0.8 ...
##  $ key         : num [1:50] 10 8 1 9 6 0 8 1 11 11 ...
##  $ valence     : num [1:50] 0.137 0.71 0.478 0.688 0.915 0.464 0.781 0.334 0.531 0.589 ...
```

Vemos que no tenemos datos perdidos

```
anyNA(S)
```

```
## [1] FALSE
```

Cápitulo III

Metodología

Cálculo de la matriz de distancia de Mahalonobis.

Solamente calculamos las variables de la 2 a la 6, ya que la primera es de carácter y es el nombre de las canciones y las demás son númericas.

```
dist.S<-dist(S[,2:6])
dist.S
```

```
##             1          2          3          4          5          6          7
## 2   2.8869598
## 3   9.0126616  7.2884806
## 4   3.2183682  5.1016963  8.5472150
## 5   5.0774404  2.2710328  5.8486760  6.7154129
## 6  10.2073802  8.0065486  2.2387979 10.2987473  6.1008743
## 7   4.5311170  2.0186842  8.0700198  7.0746541  2.2441479  8.2527655
## 8   9.0625835  7.6288365  1.0138151  8.2542155  6.4328788  3.1693256  8.6175944
## 9   2.2812435  5.0060712 10.2023933  2.2545895  7.0880842 11.7064421  6.7152743
## 10  1.5374895  4.2564646 10.0513057  2.8374457  6.4114776 11.4029737  5.8350997
## 11 16.1625805 13.6061653 15.2983583 18.6840531 12.1745195 13.6018479 11.7087906
## 12  7.8133941  5.0341999  5.8452519  9.4515265  2.9423197  5.0119663  4.1740878
## 13  2.1610241  2.0224668  9.2303426  5.1062735  4.1255310 10.0093609  2.8307324
## 14  3.2301641  5.8504551 10.4435041  2.0334154  7.8203921 12.0855715  7.6221210
## 15 10.2189645  8.0072626  2.2448432 10.2976633  6.0888362  0.2220563  8.2486645
## 16 21.1033493 19.0007820 22.1397457 24.0224997 18.1158937 20.6183475 17.0019980
## 17  7.8341288  5.0012897  7.2166481  9.8490504  3.1773500  6.4093452  3.6115715
## 18  8.2491577  6.0264173  2.2661211  8.6184363  4.2019208  2.0357006  6.3620706
## 19 24.0451764 21.5921630 23.0880469 26.6865887 20.2324630 21.2138521 19.6519332
## 20  4.2959108  1.4344048  6.7140837  6.3264274  1.0224339  7.0762137  1.4165066
## 21  4.4834690  2.0691397  8.0698596  7.0895959  2.3481143  8.2506277  0.5536217
## 22 25.3279644 23.0888021 25.4968843 28.1610740 22.0008459 23.7714966 21.0951620
## 23  9.2274475  8.0682418  2.0044224  8.0664937  7.0894512  4.1235869  9.2268050
## 24 10.2139509  8.0077090  2.2384803 10.2975963  6.0952408  0.1992235  8.2528270
## 25  8.9830856  6.3395996  4.1434553  9.9055587  4.1266511  2.8570499  6.0023869
## 26  5.1176331  4.2460205 11.1833389  8.2489954  5.4059269 11.4034241  3.1775881
## 27 12.2114465  9.4377916  7.0801386 13.4581441  7.2368535  5.0080259  8.5553646
## 28 11.6695559  8.9470704  6.0921088 12.7308139  6.7329038  4.0139240  8.2591446
## 29  7.0031378  5.4279844  2.0927670  6.7455796  4.3622180  3.6550479  6.4626595
## 30  6.7264888  4.1436161  8.4870808  9.2255364  3.1985637  8.0630397  2.2624425
## 31 10.7919249  8.2529341  4.1309050 11.4039184  6.0873675  2.0155297  8.0012461
## 32  9.8539209  7.2861351  4.0172136 10.6362347  5.1416692  2.2618534  7.0193585
## 33 10.2154160  8.0017611 12.2097547 13.0393537  7.2868151 11.3161416  6.0016786
## 34  9.8864094  7.2867810  4.0348503 10.6353658  5.1040417  2.2928386  7.0029232
## 35 10.7774305  8.2531227 11.1844923 13.3465524  7.0227896 10.0019435  6.3362072
## 36  5.8469231  3.1912623  7.8165920  8.2568865  2.3110909  7.6186255  1.4724581
## 37  5.1028494  4.2775433 11.1892397  8.2658332  5.4461297 11.4076772  3.2263374
## 38  0.4605410  2.8618387  9.0004828  3.1791430  5.0274957 10.1990638  4.4922374
## 39 10.7838429  8.2551054 11.1835264 13.3460351  7.0146336 10.0015644  6.3311466
## 40  9.0578994  7.6342998  1.0535701  8.2617953  6.4473205  3.1750020  8.6234439
## 41  8.0918868  6.7175190 12.8094514 11.1834530  7.0756626 12.5327208  5.0018985
## 42 14.2202066 11.4073826 11.0025076 16.1278418  9.4468356  9.0563004  9.9048102
## 43  5.8935214  5.8438620  5.0216230  4.0143953  6.0843867  7.0852044  7.6168944
## 44 14.0370363 12.0510900 16.1316472 17.0081738 11.4320655 15.0068024 10.0734676
```

```
## 45 10.8231893  8.0707222  6.0033542 12.0454301  5.8611147  4.1306738  7.2970025
## 46 13.1764937 11.0088682 14.7703984 16.0356149 10.2016643 13.6065257  9.0019035
## 47  6.3887403  4.0243691  9.2311905  9.0620323  3.6060401  8.9570874  2.0111780
## 48 12.2154485  9.4399957  7.0773732 13.4580362  7.2290306  5.0036158  8.5502264
## 49  7.2123222  4.5184492  5.0314248  8.6291581  2.4287689  4.5000138  4.0752687
## 50  8.5153061  5.6602693  6.7189612 10.2975370  3.6128696  5.6679146  4.4732560
##             8          9         10         11         12         13         14
## 2
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## 9  10.0569301
## 10 10.0054947  1.0398067
## 11 16.2815836 18.3856648 17.4650740
## 12  6.7162087  9.9071792  9.2330360 10.0061992
## 13  9.5060199  4.1422551  3.1787449 14.3240282  6.7507061
## 14 10.2055684  1.0665721  2.0049943 19.3143540 10.6424546  5.1157780
## 15  3.1832172 11.7093950 11.4019672 13.6035418  5.0314621 10.0041716 12.0843728
## 16 23.0925050 23.1955008 22.2065203  7.2184338 16.5020084 19.1074058 24.1912303
## 17  8.0725712 10.0037118  9.2231849  9.0611320  1.5337373  6.4077749 10.8239870
## 18  3.1691393  9.8607271  9.5014867 13.1607834  3.6174758  8.0377508 10.3121805
## 19 24.0846607 26.2502576 25.2997021  8.0634407 18.0294259 22.1429772 27.2042535
## 20  7.2245117  6.4094057  5.6592998 12.3723066  3.6559428  3.1666741  7.2166883
## 21  8.6082842  6.7155052  5.8450639 11.7073564  4.1248998  2.9051573  7.6266516
## 22 26.4805109 27.4608860 26.4768607 10.2017719 20.1093897 23.3458674 28.4439819
## 23  1.0172807 10.0018548 10.0523731 17.2632902  7.6223500  9.8597952 10.0546508
## 24  3.1714793 11.7102829 11.4030187 13.6042187  5.0261598 10.0082515 12.0860833
## 25  5.1314338 10.8254532 10.2985867 11.1865207  2.3500013  8.2489036 11.4048650
## 26 11.6666070  7.0008677  6.0067623 12.2086620  7.0124852  3.1859934  8.0100021
## 27  8.0709406 14.2136006 13.6076213  8.9494695  4.4870976 11.1921468 14.8746874
## 28  7.0794160 13.6051861 13.0454807  9.8572908  4.1532628 10.7823068 14.2236206
## 29  2.2875506  8.2691452  8.0980364 15.0477569  5.1167928  7.3420457  8.5845000
## 30  9.2235820  8.9479608  8.0638123  9.4871596  3.1822035  5.0208133  9.8502375
## 31  5.1162503 12.5339581 12.0834259 11.7071444  4.1642341 10.2008057 13.0397165
## 32  5.0118198 11.6657287 11.1902566 11.4088345  3.1893142  9.2378738 12.2204771
## 33 13.0450555 12.3706737 11.4036020  6.4073715  6.4257785  8.2492642 13.3456374
## 34  5.0457860 11.6700188 11.1881330 11.4124734  3.2653568  9.2201587 12.2172712
## 35 12.0881707 13.0003746 12.0871181  5.3876365  5.3935143  8.9573073 13.9333332
## 36  8.4931006  8.0645691  7.2175129 10.4411960  3.0129995  4.2742900  8.9498236
## 37 11.6682278  7.0086341  6.0228560 12.2120741  7.0010256  3.2475001  8.0193122
## 38  9.0564689  2.2626122  1.4307110 16.1569049  7.8187548  2.0673976  3.1724978
## 39 12.0889332 13.0015151 12.0844976  5.3857373  5.3999915  8.9532973 13.9298116
## 40  0.2382037 10.0563430 10.0097456 16.2818204  6.7088141  9.5131413 10.2087587
## 41 13.4610860 10.0047365  9.0007994  9.9021552  7.6378924  6.0875674 11.0013799
## 42 12.0043061 16.4019502 15.6218977  5.0001953  6.7165821 12.7353630 17.2064203
## 43  4.5162446  6.0978349  6.3323503 18.0325860  8.0985694  7.0719403  6.0112616
## 44 17.0044449 16.1303749 15.1448579  5.1246365 10.3026681 12.0654463 17.1314544
## 45  7.0012708 12.8115841 12.2118646  9.4932694  3.1882657  9.8653292 13.4614230
## 46 15.6626081 15.3018244 14.3197926  4.4830915  8.9684831 11.1833680 16.2804489
## 47  9.9194343  8.5593461  7.6227116  9.8600946  4.2033570  4.4759029  9.4942674
## 48  8.0711636 14.2130390 13.6040618  8.9451089  4.4861504 11.1886016 14.8693677
```

```
## 49  5.8492915  9.2321867  8.6279362 11.0121692  1.0237320  6.3845293  9.9245530
## 50  7.6339204 10.6342961  9.9035169  9.0067860  1.2009271  7.2119687 11.4085646
##            15         16         17         18         19         20         21
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## 16 20.6190090
## 17  6.4076955 15.2988612
## 18  2.0783638 19.9346730  5.0312457
## 19 21.2159448  5.4034176 17.1229359 21.0273787
## 20  7.0725020 18.0297194  3.6087940  5.1366149 20.4000751
## 21  8.2597603 17.0070292  3.6440659  6.3348283 19.6474000  1.5052023
## 22 23.7700805  4.4828082 19.0275622 23.3544066  3.6282328 22.0228166 21.1015576
## 23  4.1321418 24.0440007  8.9488675  4.1365135 25.0805573  7.8162099  9.2231516
## 24  0.1584077 20.6201604  6.4084076  2.0485344 21.2158449  7.0755943  8.2586076
## 25  2.8366672 18.0326889  3.6226902  2.1439573 19.0325671  5.1030585  6.0315500
## 26 11.4061481 16.2799148  6.0860914  9.4969937 19.7002854  4.4800903  3.1829805
## 27  5.0201815 16.1264847  5.1098424  5.4010667 16.2826509  8.0723946  8.5507408
## 28  4.0241624 17.0035067  5.0072493  4.4894190 17.2689585  7.6264163  8.2607923
## 29  3.6932048 21.5993116  6.3656302  2.2554469 23.0079867  5.0659558  6.4246568
## 30  8.0654279 15.0385593  2.0322906  6.4183964 17.4646434  3.0150159  2.2506579
## 31  2.0013168 18.7914423  5.3906183  2.8943291 19.2387228  7.0718592  8.0147772
## 32  2.2909574 18.3883518  4.4862317  2.2623338 19.1099068  6.1006981  7.0127709
## 33 11.3157507 11.0012385  5.0017496 10.0163607 13.9332196  7.0719478  6.0172288
## 34  2.2695859 18.3872633  4.4815266  2.3881541 19.1154415  6.0881147  7.0374127
## 35 10.0069391 11.1836216  4.1384940  8.9550693 13.3433044  7.0800543  6.3283443
## 36  7.6248442 16.0351834  2.2760685  5.8495129 18.4396042  2.0371328  1.4239747
## 37 11.4168102 16.2866863  6.1099000  9.4929748 19.6999519  4.5123344  3.1668859
## 38 10.2012500 21.1004958  7.8192198  8.2532009 24.0424585  4.2576705  4.4828712
## 39 10.0031748 11.1849347  4.1378968  8.9599386 13.3429249  7.0762743  6.3310396
## 40  3.2015379 23.0929107  8.0797127  3.1701024 24.0841383  7.2320303  8.6034736
## 41 12.5305659 13.3458970  6.3305433 10.8354494 17.0036259  6.4044673  5.0226577
## 42  9.0595667 12.2104697  6.4119895  9.0670246 12.1663469 10.0043023  9.9021703
## 43  7.0767753 24.1894987  9.0058199  5.8875493 26.0825801  6.3276879  7.6445227
## 44 15.0137047  7.0907385  8.9600248 13.8952857 10.8280349 11.1982440 10.0595159
## 45  4.1403624 16.5596749  4.0147565  4.1299686 17.1209874  6.7213351  7.2913372
## 46 13.6035861  8.0093863  7.6250285 12.5523489 11.1884561 10.0524129  9.0164762
## 47  8.9483709 15.0072299  3.0204410  7.2582668 17.7299155  3.1711168  2.1254440
## 48  5.0105750 16.1265315  5.1103085  5.4079129 16.2801307  8.0681355  8.5477921
## 49  4.5299983 17.4754474  2.3390162  2.8490182 19.0314700  3.2466775  4.0126659
## 50  5.6630148 15.5255040  1.0122243  4.5245474 17.0363264  4.2443855  4.5094592
##            22         23         24         25         26         27         28
## 2
```

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## 3
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## 23 27.4611053
## 24 23.7712895  4.1293013
## 25 21.3780165  6.0998784  2.8526879
## 26 20.6179676 12.2077117 11.4059767  9.0666967
## 27 18.9790374  9.0584920  5.0183169  3.6523145 11.1812252
## 28 19.9302746  8.0673492  4.0166152  2.8921961 11.0474068  1.0265715
## 29 25.1940601  2.8794571  3.6713256  4.2406915  9.4513423  7.6309240  6.7253619
## 30 19.0285912 10.0013925  8.0660722  5.3983276  4.1331303  7.0806238  7.0141836
## 31 21.8404321  6.0902323  2.0128443  2.0063225 11.0499313  3.0336729  2.0532496
## 32 21.5933857  6.0066242  2.2767194  1.1996679 10.0522989  3.1664532  2.2395788
## 33 15.1336056 13.8947575 11.3173518  8.4903773  5.8334287  8.5492948  8.9505375
## 34 21.5887356  6.0233844  2.2901679  1.0462509 10.0588513  3.2073120  2.2985376
## 35 15.0048089 13.0012914 10.0075412  7.2277242  7.0733370  6.7106004  7.2202408
## 36 20.0288149  9.2221605  7.6263769  5.1213924  4.0095248  7.2859754  7.0860541
## 37 20.6250216 12.2109889 11.4149216  9.0851181  0.3813568 11.1842458 11.0551038
## 38 25.3206367  9.2210666 10.1994832  8.9560247  5.1093830 12.2132099 11.6689570
## 39 15.0022841 13.0018867 10.0053251  7.2190139  7.0761606  6.7170944  7.2261428
## 40 26.4825586  1.0307458  3.1918763  5.1437397 11.6677430  8.0692595  7.0844027
## 41 17.7202245 14.1456830 12.5329740  9.8499039  3.0179193 11.0547051 11.1912652
## 42 14.8690951 13.0009584  9.0607667  7.0821687 11.6639550  4.1326861  5.1153701
## 43 28.0183301  4.1521485  7.0840565  7.6168237 10.0097165 11.1946791 10.3123358
## 44 11.4222519 17.8927697 15.0101121 12.2340618  9.2274239 11.4053932 12.0450379
## 45 19.6523237  8.0027556  4.1303135  2.3118638 10.0540604  1.4535009  1.0263674
## 46 12.1666502 16.5584089 13.6072279 10.8172560  8.5545538 10.0145655 10.6473349
## 47 19.1060265 10.6430917  8.9531594  6.3260620  3.2020251  8.0876170  8.0236868
## 48 18.9763790  9.0576261  5.0137879  3.6299616 11.1821140  0.2411058  1.0783900
## 49 21.1089682  6.7233997  4.5205918  2.1863896  7.0883394  5.0149396  4.5020254
## 50 19.1056654  8.5522594  5.6682031  2.8406918  7.0766145  4.1427975  4.0206504
##            29         30         31         32         33         34         35
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## 30  7.2426358
## 31  5.0693536  7.2841967
## 32  4.4888072  6.3402254  1.1264994
## 33 11.2046732  4.1330621 10.0017399  9.2274365
## 34  4.5794721  6.3475479  1.0554530  0.6044452  9.2237534
## 35 10.4561018  4.1296070  8.4931434  7.8166608  2.0180094  7.8280359
## 36  6.4341366  1.0165338  7.0804448  6.0970828  5.1093181  6.1100593  5.1003264
## 37  9.4425830  4.1419786 11.0615602 10.0563869  5.8538928 10.0802970  7.0759051
## 38  7.0264415  6.7101503 10.7747996  9.8578004 10.2042617  9.8677376 10.7752629
## 39 10.4655382  4.1250167  8.4884671  7.8238227  2.0141701  7.8245549  0.1882790
## 40  2.2727646  9.2247361  5.1264727  5.0131516 13.0476285  5.0587640 12.0863561
## 41 11.3459085  4.4786001 11.7048377 10.7837886  3.6107319 10.7756167  5.3967239
## 42 11.1991234  7.8111144  7.0762352  7.0109676  7.0751431  7.0179068  5.1005519
## 43  3.7431987  9.2301988  8.6051504  8.0884136 13.3444195  8.0644740 13.0480016
## 44 15.2329618  8.2640853 13.4702401 12.8075454  4.1594829 12.8302694  5.0172160
## 45  6.3411345  6.0099498  2.2770837  2.0168989  8.0716215  2.0973605  6.4139999
## 46 13.9614022  7.0786003 12.0428519 11.4198574  3.0130715 11.4069350  3.6302868
## 47  7.8793467  1.1076177  8.2495407  7.3133393  4.0145011  7.2851782  4.5095779
## 48  7.6435002  7.0738415  3.0157167  3.1846761  8.5471353  3.1985400  6.7086799
## 49  4.1332229  3.6459372  4.0679947  3.0266909  7.2402550  3.1351179  6.3377650
## 50  6.1412692  3.0260372  4.4775842  3.6364721  5.6582599  3.6088670  4.4889323
##            36         37         38         39         40         41         42
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## 37  4.0095234
## 38  5.8391186  5.1167163
## 39  5.1009738  7.0828314 10.7739897
## 40  8.4897440 11.6631285  9.0599958 12.0888134
## 41  5.0117400  3.0579300  8.0691956  5.3890515 13.4642386
## 42  8.4858575 11.6668400 14.2148388  5.0996175 12.0038628 10.4434364
## 43  8.2621087 10.0287133  5.8549195 13.0440013  4.5300766 12.5316641 14.5666528
## 44  9.2329181  9.2254260 14.0445111  5.0330004 17.0034946  6.3617489  8.5585491
## 45  6.0973937 10.0590537 10.8191624  6.4172684  7.0072551 10.2087111  5.0134823
## 46  8.0720562  8.5699405 13.1604079  3.6149552 15.6649235  5.8322796  7.2875778
## 47  1.5312139  3.2683026  6.3463708  4.4947919  9.9287787  3.6140169  8.6166850
## 48  7.2808379 11.1852162 12.2108303  6.7092635  8.0692511 11.0490845  4.1239251
## 49  3.1923411  7.0729208  7.2312549  6.3497546  5.8367955  8.0961921  7.6317158
## 50  3.1927709  7.0999717  8.4978194  4.4850871  7.6406653  7.2836781  5.8419378
##           43         44         45         46         47         48         49
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## 44 17.4834619
## 45  9.8682514 11.3186131
## 46 16.2797804  1.6204314  9.9169921
## 47  9.4879279  8.1083545  7.0270772  7.0044085
## 48 11.1887843 11.4122649  1.4715519 10.0060063  8.0789317
## 49  7.1284958 11.1841413  3.6388992  9.8830634  4.5751858  5.0233137
## 50  9.0574485  9.4563454  3.0390370  8.0671646  4.0091488  4.1375020  2.1426492
```

Convertir los resultados del Calculo de la distancia a una matriz de datos y me indique 3 digitos.

```
round(as.matrix(dist.S)[1:6, 1:6],3)
```

```
##        1     2     3      4     5      6
## 1  0.000 2.887 9.013  3.218 5.077 10.207
## 2  2.887 0.000 7.288  5.102 2.271  8.007
## 3  9.013 7.288 0.000  8.547 5.849  2.239
## 4  3.218 5.102 8.547  0.000 6.715 10.299
## 5  5.077 2.271 5.849  6.715 0.000  6.101
## 6 10.207 8.007 2.239 10.299 6.101  0.000
```

Calculo del dendrograma

```
dend.S<-as.dendrogram(hclust(dist.S))
dend.S
```

```
## 'dendrogram' with 2 branches and 50 members total, at height 28.44398
```

Generacion del dendrograma

Guardar las etiquetas en un objeto "L"

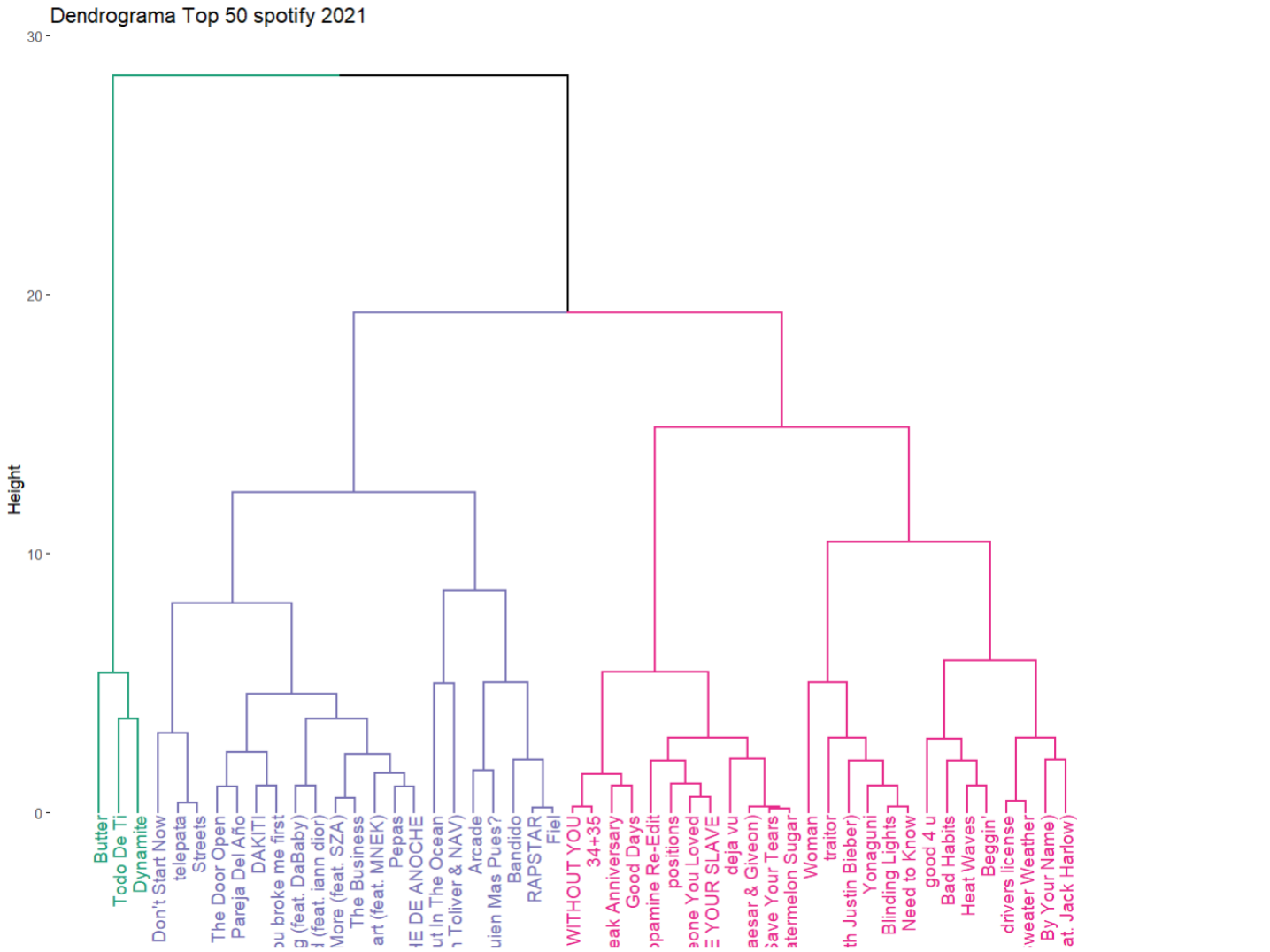
```
L=labels(dend.S)
labels(dend.S)=S$track_name[L]
```

Capítulo IV

Resultados

El Dendrograma es un árbol ultramétrico. Podemos visualizar una jerarquía indexada mediante un gráfico. En este caso vamos a realizar un Dendrograma con la base de datos **top50__2021**.

```
dend.S %>%
  set(what="labels_cex", 0.7) %>%
  plot(main="Dendrograma Top 50 spotify 2020")
fviz_dend(dend.S,
          k=3, k_colors = c("#1B9E77", "#7570B3", "#E7298A"), main = "Dendrograma Top 50 spotify 2021")
```



Capítulo V

Conclusiones

Interpretación del Dendrograma

En el dendrograma se observan 2 grupos en general y de esos 2 parten otros 3 grupos. En el primer subgrupo que esta de color verde se compone de 3 canciones (Butter, Todo De Ti y Dynamite). Estas comparten casi la misma popularidad y también la misma bailabilidad, aunque tienen diferencia en la energía, clave y valance. En el segundo subgrupo que esta de color morado se compone de 21 canciones (Don't Start Now, telepata, Streets, The Door Open, Pareja del Año, DAKITI, u broke me first, I(feat. iann dior), More(feat. SZA), The Business, Head & Heart (feat. MNEK), Pepas, LA NOCHE DE ANOCHE, Astronaut In The Ocean, Lemonade (feat. Gunna Don Toliver & NAV), Arcade, Quien Mas Pues?, Bandido, RAPSTAR, Fiel). En este subgrupo se volvieron a crear otros y se se paran dependiendo de su popularidad, ya que de las otras 4 variables tienen diferencias. En el tercer subgrupo que esta de color rosado se compone de 26 canciones (WITHOUT YOU, 34+35, Heartbreak Anniversary, Good Days, Friday (feat. Mufasa & Hypeman)-Dopamine Re-Edit, positions, Someone You Loved, I WANNA BE YOUR SLAVE, deja vu, Peaches (feat. Daniel Caesar & Giveon), Save Your Tears, Watermelon Sugar, Woman, traitor, STAY (with Justin Bieber), Yonaguni, Blinding Lights, Need to Know, good 4 u, Bad Habits, Heat Waves, Beggin, drivers license, Sweater Weather, MONTERO (Call Me By Your Name), INDUSTRY BABY (feat. Jack Harlow)). En este subgrupo se volvieron a crear otros y se se paran dependiendo de su popularidad, ya que de las otras 4 variables tienen diferencias.

Gracias a todo lo anterior, podemos interpretar la matriz de datos de las canciones de Spotify del año 2021, podemos ver sus categorías y subcategarías..

Referencias

Yukhymenko, H. (Febrero de 2021). Kaggle. Obtenido de https://www.kaggle.com/datasets/equinxx/spotify-top-50-songs-in-2021

Lestrade, Y. (2022). Estadística multivariada. [PDF].

Los paquetes que se utilizaron fueron:

- ***cluster.datasets***
- ***cluster***
- ***readxl***
- ***dendextend***
- ***factoextra***
- ***ggplot2***