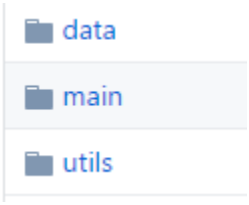
Struktura projekta i opis koda

Projekat se sastoji od tri paketa



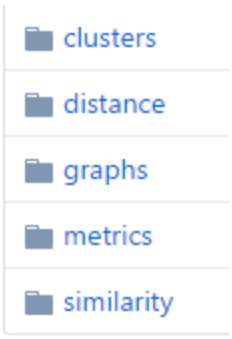
U paketu data nalazi se fajl koji sadrži melodije, a u njemu se čuvaju i grafici generisani tokom izvršenja programa.

U paketu main nalazi se skript run.R, preko kojeg je moguće pokrenuti program. U zavisnosti od tipa metrika za računanje udaljenosti melodija, u kodu su prikazane sledeće opcije:

I. Za sopstvene vrednosti:
   1. `eigenSimilarity(melodiesTable, "simple")` - Ova opcija vrši analizu sličnosti melodija koristeći proste grafove i sopstvene vrednosti odgovarajućih matrica
   2. `eigenSimilarity(melodiesTable, "multi")` - Ova opcija vrši analizu sličnosti melodija koristeći multigrafove i sopstvene vrednosti odgovarajućih matrica
   3. `eigenSimilarity(melodiesTable, "duration")` - Ova opcija vrši analizu sličnosti melodija koristeći kumulativna trajanja nota i sopstvene vrednosti odgovarajućih matrica
   4. `eigenSimilarity(melodiesTable, "duration-average")` - Ova opcija vrši analizu sličnosti melodija koristeći prosečna trajanja nota i sopstvene vrednosti odgovarajućih matrica

II. Za stringovne metrike:
   1. `stringSequenceSimilarity(melodiesTableStrings, "levenstein")` - Ova opcija vrši analizu sličnosti melodija koristeći Levenštajnovu udaljenost
   2. `stringSequenceSimilarity(melodiesTableStrings, "cosine")` - Ova opcija vrši analizu sličnosti melodija koristeći matricu dokumenti-termini i mereći kosinusnu udaljenost između dokumenata, prema terminima
   3. `stringSequenceSimilarity(melodiesTableStrings, "LCS")` - Ova opcija vrši analizu sličnosti melodija prema dužini najvećeg zajedničkog podstringa
   4. `stringSequenceSimilarity(melodiesTableStrings, "OM")` - Ova opcija vrši analizu sličnosti melodija prema metodi Optimal Matching
   5. `stringSequenceSimilarity(melodiesTableStrings, "qgrams")` - Ova opcija vrši analizu sličnosti melodija koristeći matricu dokumenti-termini, gde termini mogu biti različite dužine, i mereći kvadratno rastojanje između dokumenata(melodija)
   6. `stringSequenceSimilarity(melodiesTableStrings, "jaccard")` - Ova opcija vrši analizu sličnosti melodija prema Jaccard-ovom koeficijentu

U paketu utils nalaze se sledeći paketi:



Najpre se iz paketa similarity poziva funkcija eigenSimilarity ili stringSequenceSimilarity, u zavisnosti od toga koja metrika je potrebna.

Funkcija eigenSimilarity, tj. funkcija za računanje sličnosti melodija pomoću sopstvenih vrednosti funkcioniše na sledeći način:

1. Najpre se generišu liste melodija i trajanja na osnovu učitane tabele melodija
2. Poziva se funkcija makeMatrices, koja za svaku melodiju iz liste melodija računa matricu susedstva njenih nota. Matrica susedstva se računa u zavisnosti od tipa grafa.
   Ako je tip „simple“, tada je matrica susedstva 0-1 matrica, i pokazuje isključivo povezanost nota, zanemarujući broj veza između njih.

```
if(type == "simple") {
  if(m[melodiesList[[i]][j], melodiesList[[i]][j+1]] != 1) m[melodiesList[[i]][j], melodiesList[[i]][j+1]] = 1
  else next()
}
```

   Ukoliko je tip „multi“, matrica susedstva sadrži podatke o broju veza između svaka dva čvora.

```
if(type == "multi") m[melodiesList[[i]][j], melodiesList[[i]][j+1]] = m[melodiesList[[i]][j], melodiesList[[i]][j+1]] + 1
```

   Dodatno, ako je tip „diration“, tada se za svaku vezu između dva čvora sabiraju i trajanja te veze, čime se dobijaju kumulativna trajanja. Može se računati i sa prosečnim trajanjima, tj. Kumulativnim trajanjima podeljenim sa brojem veza između svaka dva čvora, što je tip „duration-average“.

```
if(type == "duration") m[melodiesList[[i]][j], melodiesList[[i]][j+1]] = m[melodiesList[[i]][j], melodiesList[[i]][j+1]] + as.numeric(durationsList[[i]][j])
if(type=="duration-average") {
  m[melodiesList[[i]][j], melodiesList[[i]][j+1]] = (m[melodiesList[[i]][j], melodiesList[[i]][j+1]] *  n[melodiesList[[i]][j], melodiesList[[i]][j+1]]
                                                     + as.numeric(durationsList[[i]][j])) / (n[melodiesList[[i]][j], melodiesList[[i]][j+1]] + 1)
  n[melodiesList[[i]][j], melodiesList[[i]][j+1]] <- n[melodiesList[[i]][j], melodiesList[[i]][j+1]] + 1
}
```

3. Za tako dobijenu listu matrica susedstava melodija, pomoću funkcije calcEigens računaju se sopstveni vektori matrica. Sopstvene vrednosti se određuju za matricu A*A’, tj. matricu

susedstva pomnoženu sa svojim transponentom.

```
calcEigens <- function(matricesList, melodiesTable) {

  eigensList <- list()

  len <- length(matricesList)

  for(i in 1:len) {
    e <- eigen(matricesList[[i]]%*%t(matricesList[[i]])) #Calculating eigenvalues for A*A' matrix
    eigensList[[i]] <- e$values
  }

  eigensList
}
```

4. Lista sopstvenih vektora je ulazni podatak za računanje udaljenosti između melodija. Iz paketa distance poziva se funkcija calcDistances, koja računa kvadratnu udaljenost između svaka dva sopstvena vektora, i te udaljenosti prikazuje u matrici udaljenosti.

```
d <- distanceMatrix[i,j] <- distanceMatrix[j,i] <- dist(rbind(eigensList[[i]], eigensList[[j]]))
```

5. Tako dobijena matrica udaljenosti koristi se kao ulazni podatak za klasterovanje. Funkcija calcClusters, za klasterovanje, nalazi se u paketu clusters. Klasterovanje se vrši prema sledeće tri metode:
   a. Hijerarhijsko klasterovanje – za ulazne podatke generiše se dendrogram. Korisnik zatim unosi broj koji služi za presecanje dendrograma, nakon čega se melodije grupišu prema presečenom dendrogramu. Dendrogram se čuva zatim u folderu data/plots/dendrograms

```
hierarchicalClustering <- function(colNames, author, clusterData, dataType) {

  print("------------------------------------------------------------")
  print("Hierarchical clustering:")
  print("------------------------------------------------------------")

  #Writing dendrogram to the file
  jpeg(paste("data/plots/dendrograms/dendrogram-", dataType, ".jpg", sep=""), width=1000, height=1000, unit='px')
  dendrogram <- hclust(clusterData, method="ward.D") #Ward method is used
  plot(dendrogram, labels = rownames(colNames))
  dev.off()

  #Cluster cut - melodies are divided into groups
  cut <- readline("What is the cut number for dendrogram? ")
  clusterCut <- cutree(dendrogram, cut) #Dendrogram cut - see dendrogram.jpg for cut number
  cH <- vector()
  len <- length(clusterCut)
  for(i in 1:len) cH[i] <- clusterCut[i][[1]] #Accessing predicted cluster numbers
  print("------------------------------------------------------------")
  print("Hierarchical clustering")
  print("------------------------------------------------------------")
  print(as.data.frame(list("Melody number" = colNames, "Author" = author, "Predicted cluster number" = cH)))

}
```

   b. Klasterovanje pomoću k-means algoritma – korisnik unosi parametar koji predstavlja maksimalan broj željenih grupa, a k-means algoritam zatim vrši klasterizaciju ulaznih

podataka za broj grupa od dve do maksimalnog broja grupa. U konzoli se ispisuju podaci o klasterovanju (raspored melodija po grupama za različit broj klastera, suma kvadrata unutar klastera i racio sume kvadrata između klastera i sume kvadrata unutar klastera). Prikazuje se i plot sa metodom lakta, koji grafički olakšava određivanje konačnog broja grupa

```
kmeansClustering <- function(colNames, author, clusterData) {

  k <- readline("What is the k for k-means? ")
  print("------------------------------------------------------------")
  print("K-means:")
  print("------------------------------------------------------------")
  kmeansss <- list()
  for(i in 2:k) {
    set.seed(5)
    km <- kmeans(clusterData, i)
    cKm <- km$cluster
    len <- length(colNames)
    print("------------------------------------------------------------")
    print("K-means clustering")
    print(paste("Number of clusters ", i, sep=""))
    print("------------------------------------------------------------")
    print(as.data.frame(list("Melody number" = colNames, "Author" = author,"Predicted cluster number" = cKm)))
    kmeansss[i] <- km$tot.withinss
    print(paste("Total within-cluster sum of squares: ", kmeansss[i], sep=""))
    print(paste("The ratio of between-cluster sum of squares and total sum of squares: ", km$betweenss/km$totss, sep=""))
  }
  plot(2:k, unlist(kmeansss), type="b") #Elbow method
}
```

c. Klasterovanje pomoću k-medoids algoritma – korisnik unosi parametar koji predstavlja maksimalan broj željenih grupa, a k-medoids algoritam zatim vrši klasterizaciju ulaznih podataka za broj grupa od dve do maksimalnog broja grupa. U konzoli se ispisuju podaci o klasterovanju (raspored melodija po grupama za različit broj klastera i podaci o siluetama medoida). Prikazuje se i plot koji predstavlja grafički prikazanu prosečnu širinu siluete, što

olakšava određivanje broja klastera.

```
kmedoidsClustering <- function(colNames, author, clusterData) {

  k <- readline("What is the k for k-medoids? ")
  print("------------------------------------------------------------")
  print("K-medoids:")
  print("------------------------------------------------------------")
  kmedoidssw <- list()
  for(i in 2:k) {
    print("------------------------------------------------------------")
    print("K-medoids clustering")
    print(paste("Number of clusters ", i, sep=""))
    print("------------------------------------------------------------")
    set.seed(5)
    mCluster <- pam(clusterData, i)
    cM <- mCluster$clustering
    # plot(mCluster$clustering)
    print("Medoids:")
    print(mCluster$medoids)
    print("Silhouette info:")
    for(j in 1:length(mCluster$silinfo$clus.avg.widths)) {
      print(paste("Average silhouette width per cluster ", j, " = [", mCluster$silinfo$clus.avg.widths[[j]], "]", sep=""))
    }
    kmedoidssw[i] <- mCluster$silinfo$avg.width
    print(paste("Average silhouette width = [",mCluster$silinfo$avg.width, "]", sep=""))
    print(as.data.frame(list("Melody number" = colNames, "Author" = author, "Predicted cluster number" = cM)))
  }
  plot(2:k, unlist(kmedoidssw), type="b") #Plotting average silhouette widths per number of clusters
}
```

6. I, na kraju, za svaku matricu susedstva generiše se graf. U te svrhe koristi se funckija makeGraphs, iz paketa graphs. Veličina čvora grafa se skalira prema stepenu tog čvora, kako bi vizuelno bio učestalost pojavljivanja note u melodiji.

```
#Plotting melody graph for each melody
len <- length(matricesList)
graphs <- list()
for(i in 1:len) {
  degrees <- colSums(matricesList[[i]])
  g <- graph_from_adjacency_matrix(matricesList[[i]], mode="directed")
  jpeg(paste(paste("data/plots/graphPlots/", type, sep=""), "/gplot-", melodiesNames[[i]], ".jpg", sep=""), width=4000, height=3000, unit='px')
  V(g)$color <- sample(rainbow(12),12,replace=FALSE)
  V(g)$label.color = "black"
  V(g)$label.cex <- rescale(degrees, to = c(10,20))
  E(g)$width <- 4
  E(g)$color <- alpha("gray", rescale(
    degrees, to = c(0.3, 1)))
  plot(g, vertex.size=rescale(degrees, to = c(10,20)),  layout=layout.fruchterman.reingold(g, niter=10000))
```

Sve to detaljnije ispisuje funkcija calcMetrics iz paketa metrics, gde se u konzoli ispisuju podaci o broju čvorova grafa, broju grana grafa, njegovoj gustini, dijametru, a zatim i najudaljenijim

čvorovima, ulaznim stepenima, izlaznim i ukupnim stepenima grafa, za svaki graf ponaosob.

```
calcMetrics <- function(g, name) {

  v <- V(g)$name

  metrics <- list(
    "Number of vertices" = vcount(g),
    "Number of edges" = ecount(g),
    "Graph density" = graph.density(as.undirected(g, mode = "mutual")),
    "Diameter" = diameter(g),
    "Farthest edge" = paste(v[[farthest_vertices(g)$vertices[1]]], v[[farthest_vertices(g)$vertices[2]]],
                            sep = " <--> "),
    "In-degrees of nodes" = degree(g, v = V(g), mode = "in"),
    "Out-degrees of nodes" = degree(g, v = V(g), mode = "out"),
    "All degrees of nodes" = degree(g, v = V(g), mode = "all")
  )

  print("------------------------------------------------------------")
  print(paste("Graph metrics for graph: ", name, sep=""))
  print("------------------------------------------------------------")
  print(metrics)
}
```

Funkcija stringSequenceSimilarity, tj. funkcija za računanje sličnosti melodija pomoću stringovnih metrika funkcioniše na sledeći način:

1. Nakon poziva metode iz main funkcije, proverava se koja se metrika koristi. U zavisnosti od toga, poziva se neka od sledećih funkcija:
   a. Ako je metrika Longest Common Subsequence, poziva se funkcija LCSSimilarity, i prosleđuju joj se odgovarajući podaci o melodijama. Poziva se funkcija calcDistances, u kojoj se izvršava sledeće:
      i. Kreiraju se sekvence, za svaku melodiju po jedna
      ii. Računa se matrica troškova transformacije jedne sekvence u drugu, za sve sekvence
      iii. Na osnovu sekvenci i matrice troškova, računa se matrica udaljenosti između melodija

Dobijena matrica udaljenosti prosleđuje se funkciji calcClusters, koja vrši klasterizaciju prema gore pomenutim metodama.

```
LCSSimilarity <- function(melodiesTable, method) {

  melodies <- melodiesTable$Melody
  melodiesNames <- melodiesTable$Melody.name
  authors <- melodiesTable$Author

  #Creating distance matrix
  distanceMatrix <- calcDistances(melodies, melodiesNames, authors, NULL, NULL, method = "LCS")

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, distanceMatrix, paste("string", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-medoids")
}
```

b. Ako je metrika Optimal Matching, poziva se funkcija OMSimilarity, i prosleđuju joj se odgovarajući podaci o melodijama. Poziva se funkcija calcDistances, u kojoj se izvršava sledeće:
   iv. Kreiraju se sekvence, za svaku melodiju po jedna
   v. Računa se matrica troškova transformacije jedne sekvence u drugu, za sve sekvence
   vi. Na osnovu sekvenci i matrice troškova, računa se matrica udaljenosti između melodija

Dobijena matrica udaljenosti prosleđuje se funkciji calcClusters, koja vrši klasterizaciju prema gore pomenutim metodama.

```
OMSimilarity <- function(melodiesTable, method) {

  melodies <- melodiesTable$Melody
  melodiesNames <- melodiesTable$Melody.name
  authors <- melodiesTable$Author

  #Creating distance matrix
  distanceMatrix <- calcDistances(melodies, melodiesNames, authors, NULL, NULL, method = "OM")

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, distanceMatrix, paste("string", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-medoids")
}
```

c. Ako je metrika Levenštajnova udaljenost, poziva se funkcija levensteinSimilarity. U njoj se računa matrica udaljenosti pozivom funkcije calcDistances, a zatim se ta matrica prosleđuje metodi calcClusters, koja vrši klasterizaciju po pomenutim metodama.

```
levensteinSimilarity <- function(melodiesTableStrings, method) {

  melodies <- melodiesTableStrings$Melody
  melodiesNames <- melodiesTableStrings$Melody.name
  authors <- melodiesTableStrings$Author

  #Creating distance matrix
  distanceMatrix <- calcDistances(melodies, melodiesNames, authors, NULL, NULL)

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, distanceMatrix, paste("string", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-medoids")

}
```

d. Ako je metrika kosinusna udaljenost, poziva se funkcija cosineSimilarity. Za svaku melodiju kreiraju se dokumenti koji sadrže termine. Dokumenti se čuvaju u folderu data/docTerms. Matrica dokument-termin, tj. melodija-nota, dobija se pozivom metode textmatrix. Za tu matricu računa se matrica kosinusnih udaljenosti između dokumenata, po vektorima pojavljivanja termina. Ta matrica se prosleđuje funkciji calcClusters, koja vrši klasterizaciju

po pomenutim metodama.

```
cosineSimilarity <- function(melodiesTable, method) {

  #Libraries
  library('lsa')

  #Splitting melodies into notes
  melodiesList <- list()
  len <- length(melodiesTable$Melody)
  for(i in 1:len) {
    melodiesList[i] <- strsplit(as.character(melodiesTable$Melody[[i]]), "[-]")
  }

  melodies <- melodiesTable$Melody
  melodiesNames <- melodiesTable$Melody.name
  authors <- melodiesTable$Author

  #Creating documents
  directory = paste(getwd(),"data/docTerms", sep="/")
  dir.create(directory)

  #Writing terms (notes) to files
  for(i in 1:len) {
    write(melodiesList[[i]], file = paste(directory, melodiesNames[[i]], sep="/"))
  }

  #Creating document-term matrix
  docTermMatrix <- t(textmatrix(directory, minWordLength = 1))

  #Creating distance matrix with cosine distance
  distanceMatrix <- calcDistances(NULL, melodiesNames, authors, NULL, docTermMatrix)

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, distanceMatrix, paste("string", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-medoids")

}
```

e. Ako je metrica qgrams, poziva se funkcija qgramsSimilarity. U njoj se svaka melodija pretvara u string nota, i, za odgovarajuće q, tj. dužinu termina, računa se matrica dokument-termin. Ta matrica se direktno prosleđuje funkciji calcClusters, koja za te podatke vrši

klasterizaciju po pomenutim metodama.

```
qgramsSimilarity <- function(melodiesTable, a, method) {

  melodies <- melodiesTable$Melody
  melodiesNames <- melodiesTable$Melody.name
  authors <- melodiesTable$Author
  melodies <- lapply(melodiesTable$Melody, str_replace_all, pattern="-", replacement = "")

  #Matrix of occurences of the note sequences in melodies, for different length of sequences
  clusterData <- qgrams(melodies[[1]], melodies[[2]], melodies[[3]], melodies[[4]], melodies[[5]], melodies[[6]], melodies[[7]],
                        melodies[[8]], melodies[[9]], melodies[[10]], melodies[[11]], melodies[[12]], melodies[[13]], melodies[[14]],
                        melodies[[15]], melodies[[16]], melodies[[17]], melodies[[18]], q=a)

  rownames(clusterData) <- melodiesNames

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, clusterData, paste("qgramsMatrix", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, clusterData, "qgramsMatrix", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, clusterData, "qgramsMatrix", "k-medoids")
}
```

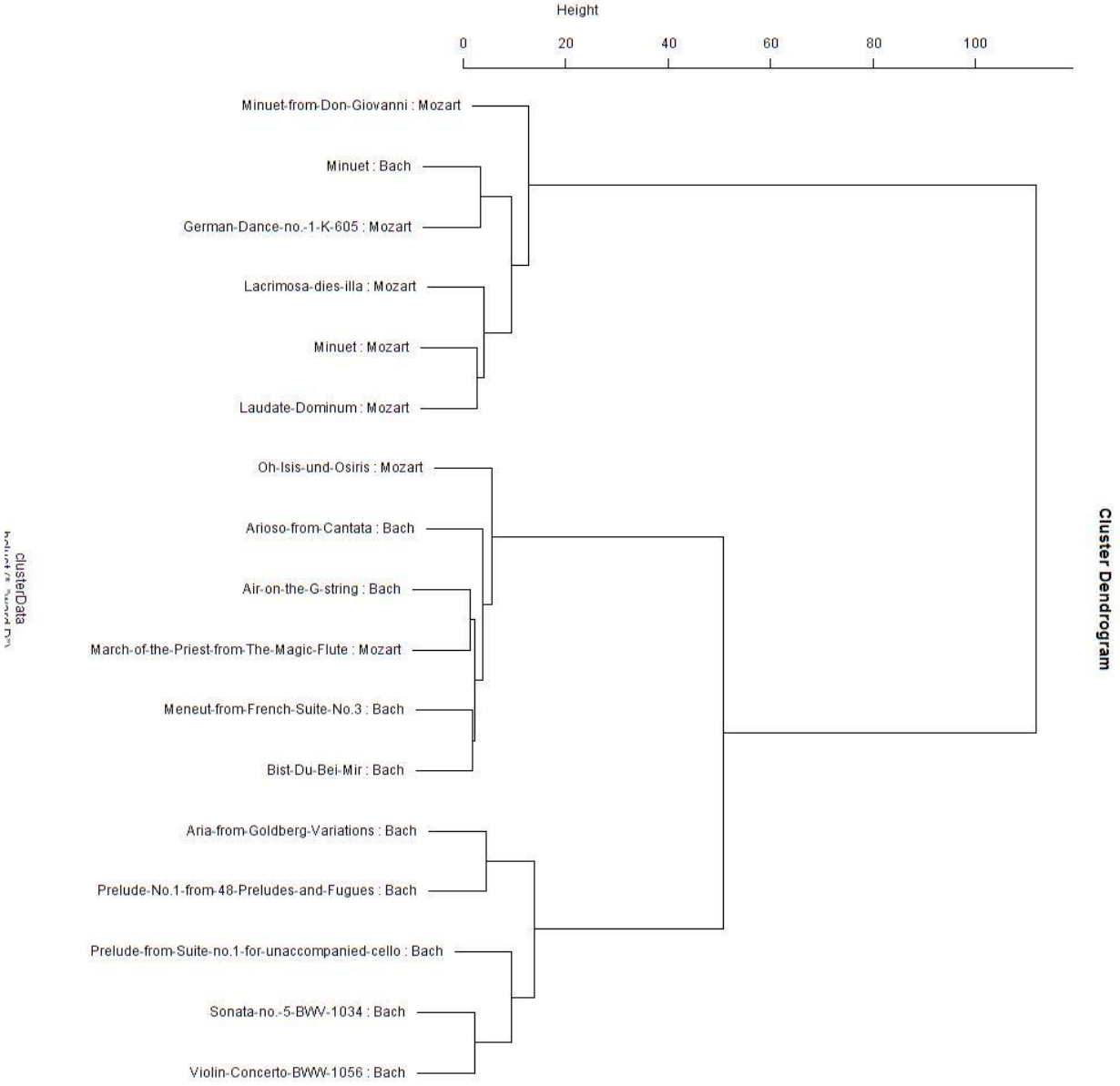
f. Ako je metrika Jaccard-ov koeficijent, poziva se funkcija jaccardSimilarity. U njoj se svaka melodija pretvara u string nota. Ti podaci se prosleđuju funkciji calcDistances, koja računa koeficijent udaljenosti među melodijama i vraća matricu udaljenosti. Ta matrica se zatim prosleđuje funkciji calcClusters, koja za podatke vrši klasterizaciju po pomenutim metodama.

```
jaccardSimilarity <- function(melodiesTable, method) {

  melodies <- melodiesTable$Melody
  melodiesNames <- melodiesTable$Melody.name
  authors <- melodiesTable$Author

  melodiesRepl <- lapply(melodiesTable$Melody, str_replace_all, pattern="-", replacement = "")

  distanceMatrix <- calcDistances(melodiesRepl, melodiesNames, authors, NULL, NULL, method = "jaccard")

  #Hierarchical clustering
  calcClusters(melodiesNames, authors, distanceMatrix, paste("string", method, sep="-"), "hierarchical")

  #K-means clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-means")

  #K-medoids clustering
  calcClusters(melodiesNames, authors, distanceMatrix, "string", "k-medoids")
}
```

Analiza rezultata

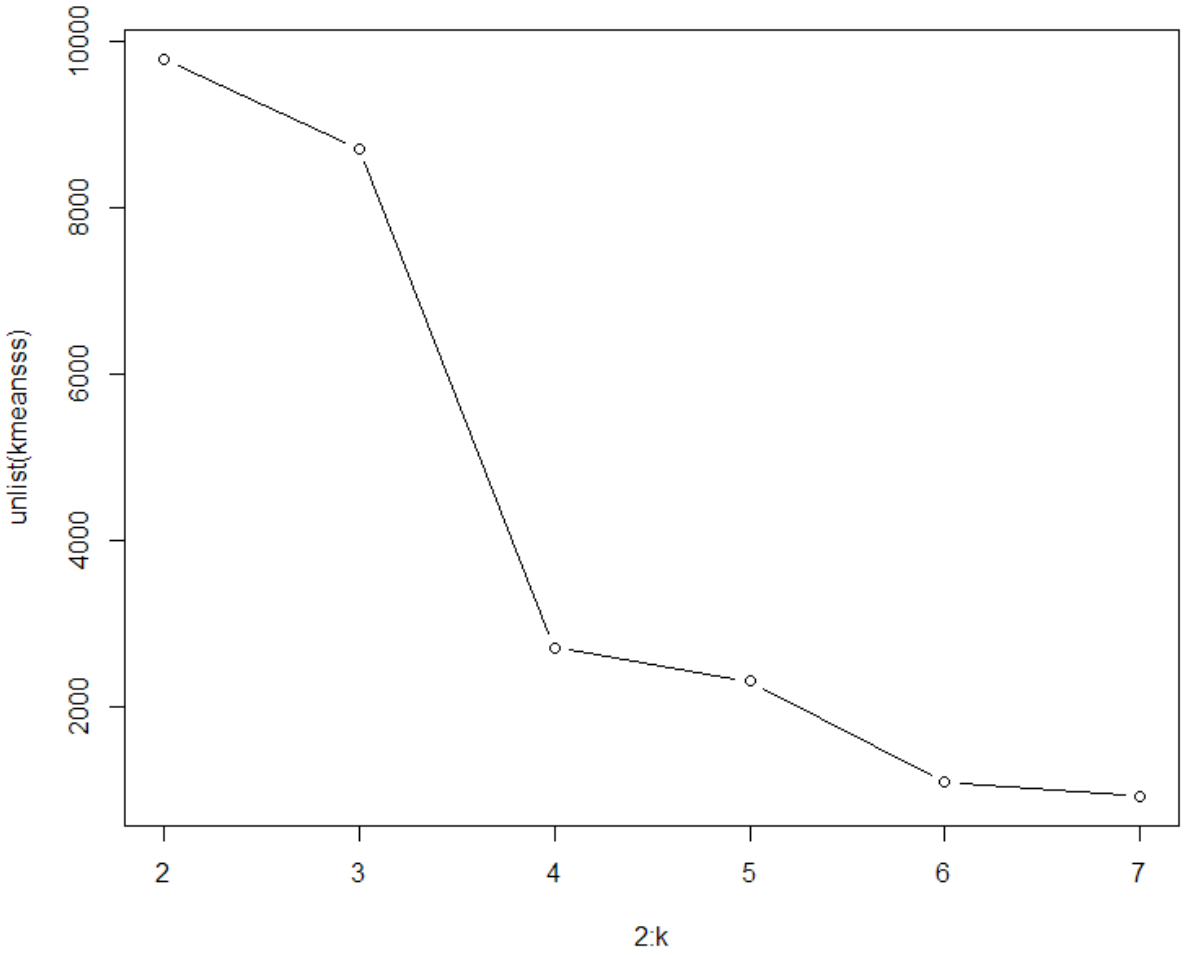
Simple

Hijerarhijsko



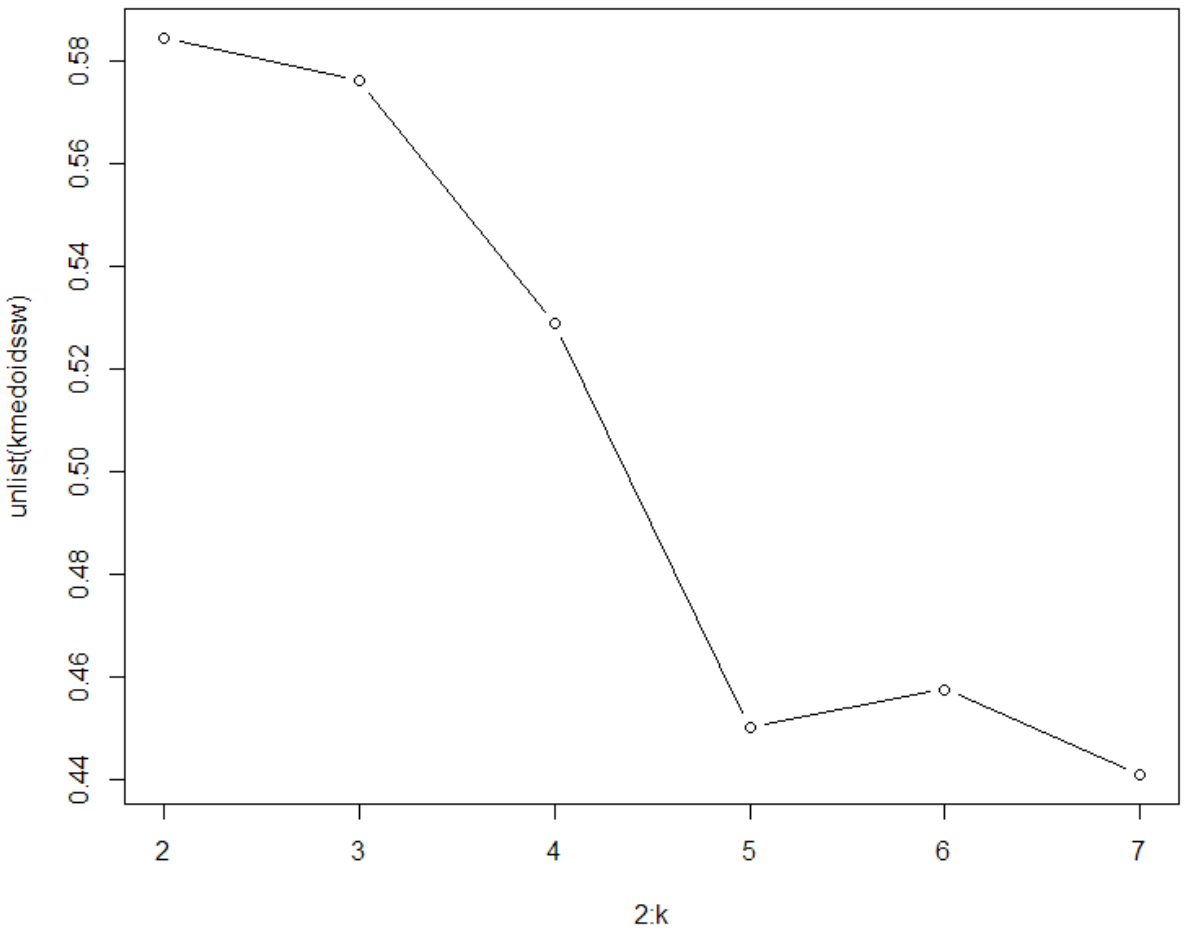
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	1
Meneut-from-French-Suite-No.3	Bach	1
Aria-from-Goldberg-Variations	Bach	1
Bist-Du-Bei-Mir	Bach	1
Arioso-from-Cantata	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
Minuet	Bach	2
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	1
Minuet-from-Don-Giovanni	Mozart	2
Minuet	Mozart	2
German-Dance-no.-1-K-605	Mozart	2
Laudate-Dominum	Mozart	2
March-of-the-Priest-from-The-Magic-Flute	Mozart	1
Oh-Isis-und-Osiris	Mozart	1
Lacrimosa-dies-illa	Mozart	2

k-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	4
Meneut-from-French-Suite-No.3 : Bach	Bach	4
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	4
Arioso-from-Cantata : Bach	Bach	4
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	4
Minuet : Bach	Bach	3
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	2
Minuet : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	3
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	4
Oh-Isis-und-Osiris : Mozart	Mozart	4
Lacrimosa-dies-illa : Mozart	Mozart	3

k-medoids



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	1
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	2
Minuet : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	2
Laudate-Dominum : Mozart	Mozart	2
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	1
Oh-Isis-und-Osiris : Mozart	Mozart	1
Lacrimosa-dies-illa : Mozart	Mozart	2

Multi

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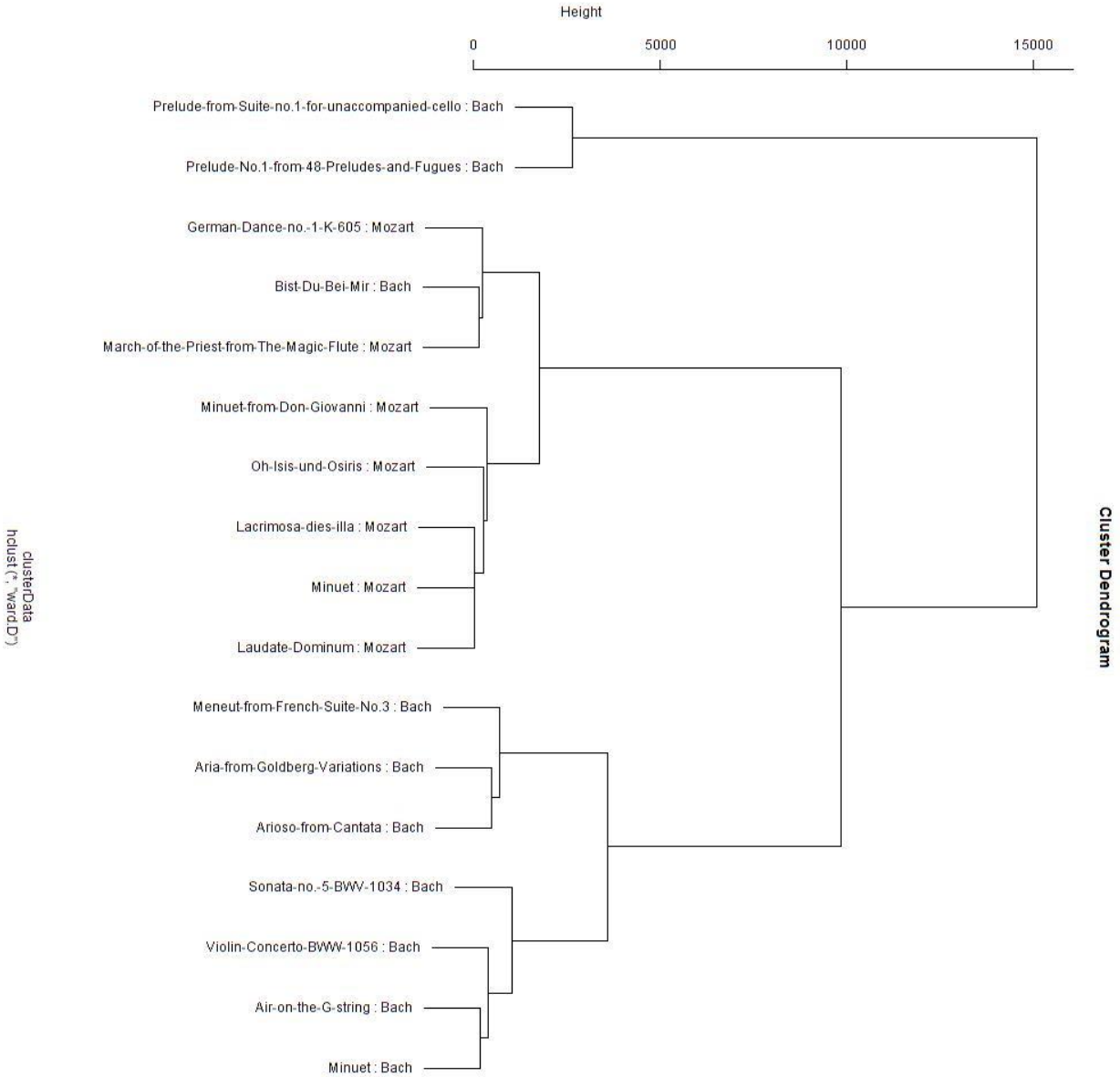
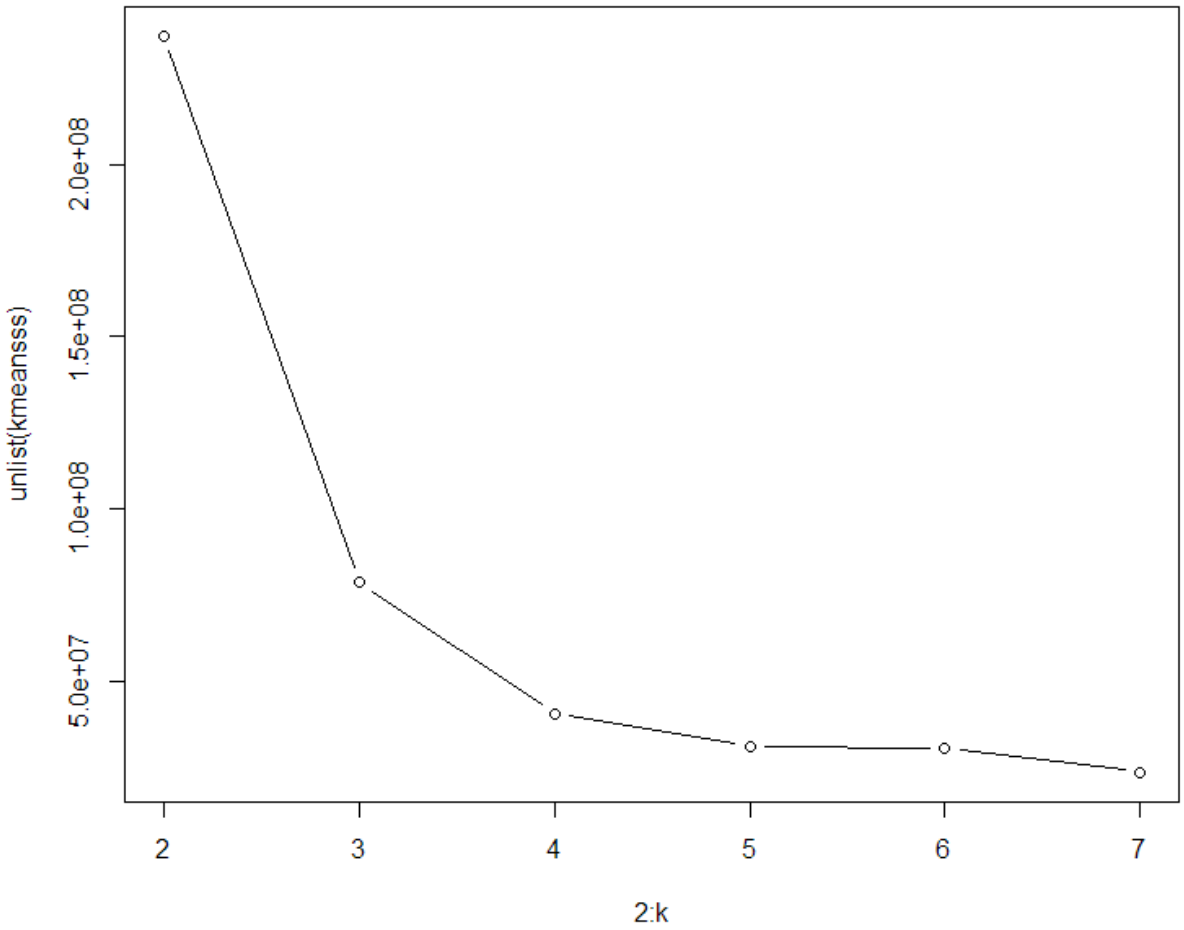


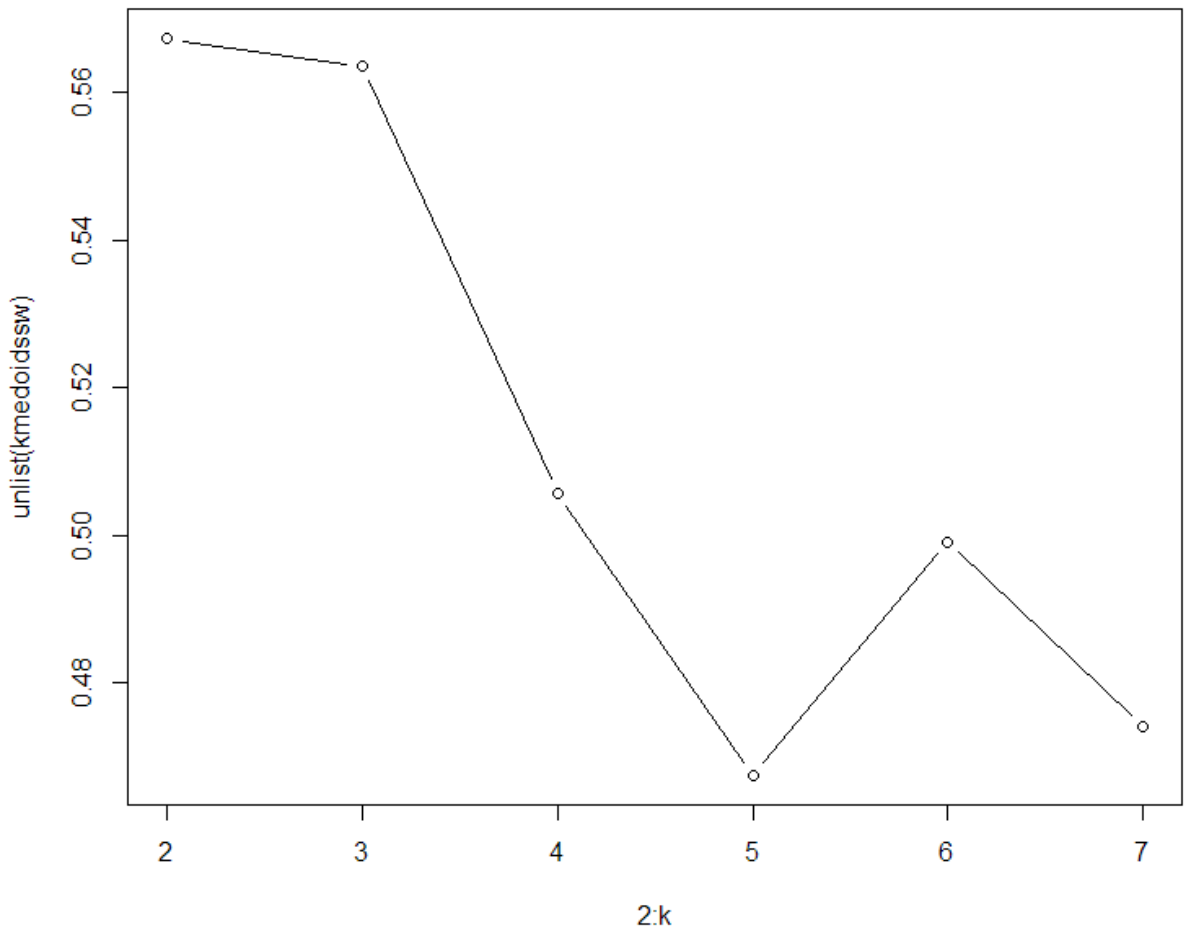
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	2
Meneut-from-French-Suite-No.3	Bach	2
Aria-from-Goldberg-Variations	Bach	2
Bist-Du-Bei-Mir	Bach	3
Arioso-from-Cantata	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
Minuet	Bach	2
Sonata-no.-5-BWV-1034	Bach	2
Violin-Concerto-BWW-1056	Bach	2
Minuet-from-Don-Giovanni	Mozart	3
Minuet	Mozart	3
German-Dance-no.-1-K-605	Mozart	3
Laudate-Dominum	Mozart	3
March-of-the-Priest-from-The-Magic-Flute	Mozart	3
Oh-Isis-und-Osiris	Mozart	3
Lacrimosa-dies-illa	Mozart	3

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	4
Meneut-from-French-Suite-No.3 : Bach	Bach	2
Aria-from-Goldberg-Variations : Bach	Bach	2
Bist-Du-Bei-Mir : Bach	Bach	3
Arioso-from-Cantata : Bach	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	4
Sonata-no.-5-BWV-1034 : Bach	Bach	4
Violin-Concerto-BWW-1056 : Bach	Bach	4
Minuet-from-Don-Giovanni : Mozart	Mozart	3
Minuet : Mozart	Mozart	3
German-Dance-no.-1-K-605 : Mozart	Mozart	3
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	3
Oh-Isis-und-Osiris : Mozart	Mozart	3
Lacrimosa-dies-illa : Mozart	Mozart	3

K-medoids

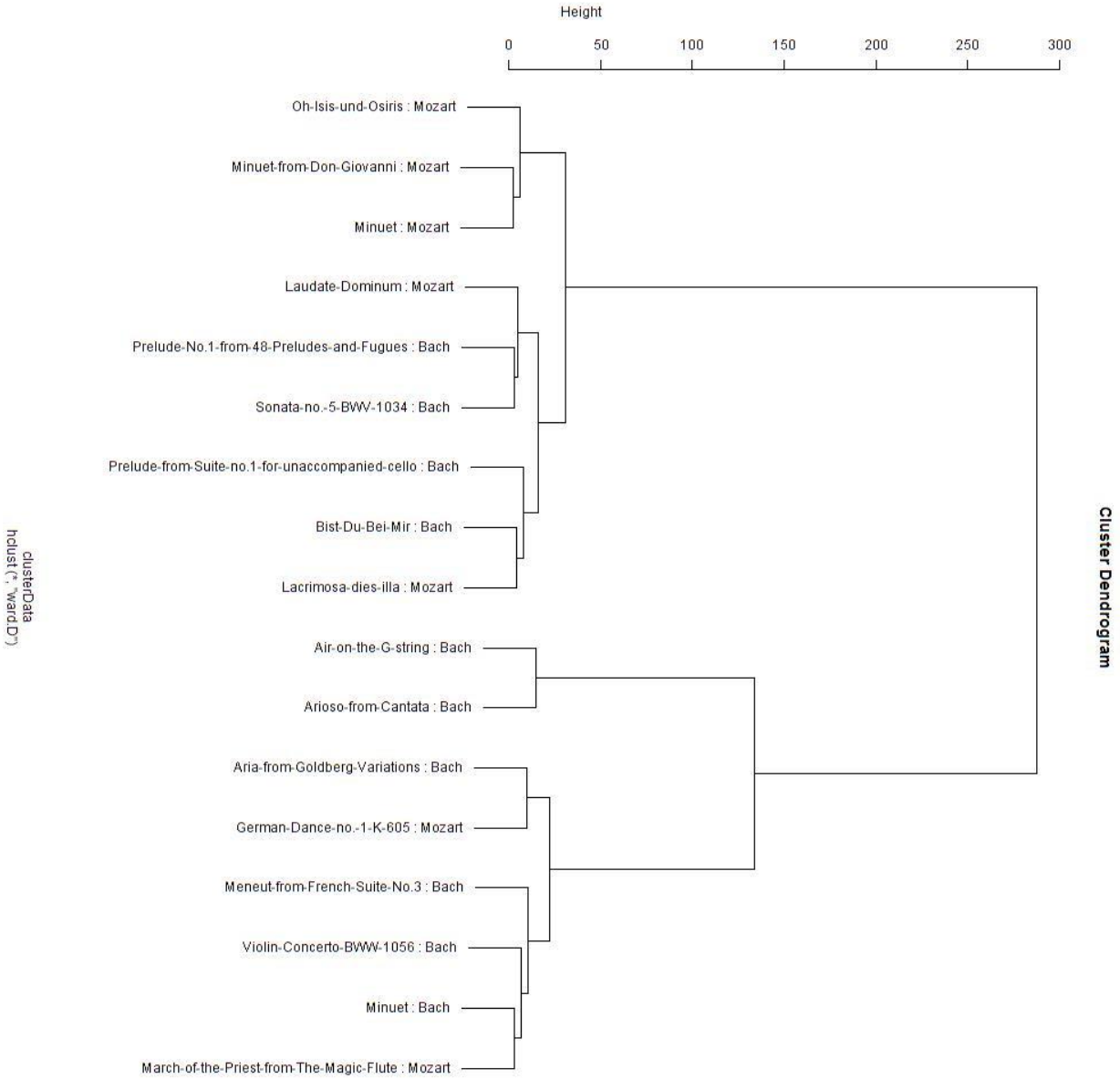


	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	2
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	2
Minuet-from-Don-Giovanni : Mozart	Mozart	2
Minuet : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	2
Laudate-Dominum : Mozart	Mozart	2
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	2

	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	3
Bist-Du-Bei-Mir : Bach	Bach	4
Arioso-from-Cantata : Bach	Bach	3
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	5
Minuet : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	2
Violin-Concerto-BWW-1056 : Bach	Bach	2
Minuet-from-Don-Giovanni : Mozart	Mozart	6
Minuet : Mozart	Mozart	6
German-Dance-no.-1-K-605 : Mozart	Mozart	4
Laudate-Dominum : Mozart	Mozart	6
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	4
Oh-Isis-und-Osiris : Mozart	Mozart	6
Lacrimosa-dies-illa : Mozart	Mozart	6

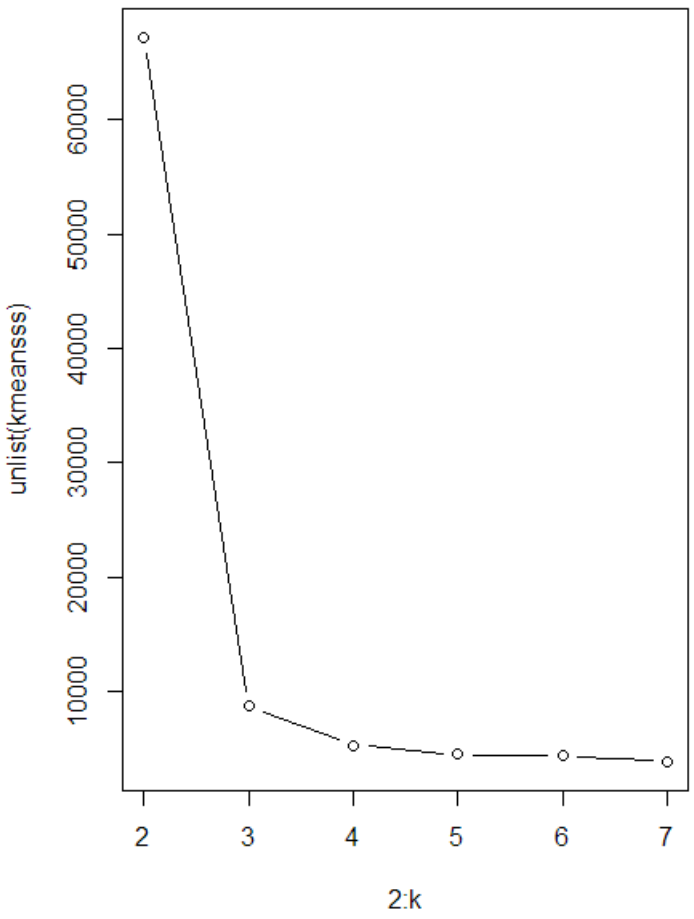
Durations cumulative

Hijerarhijsko



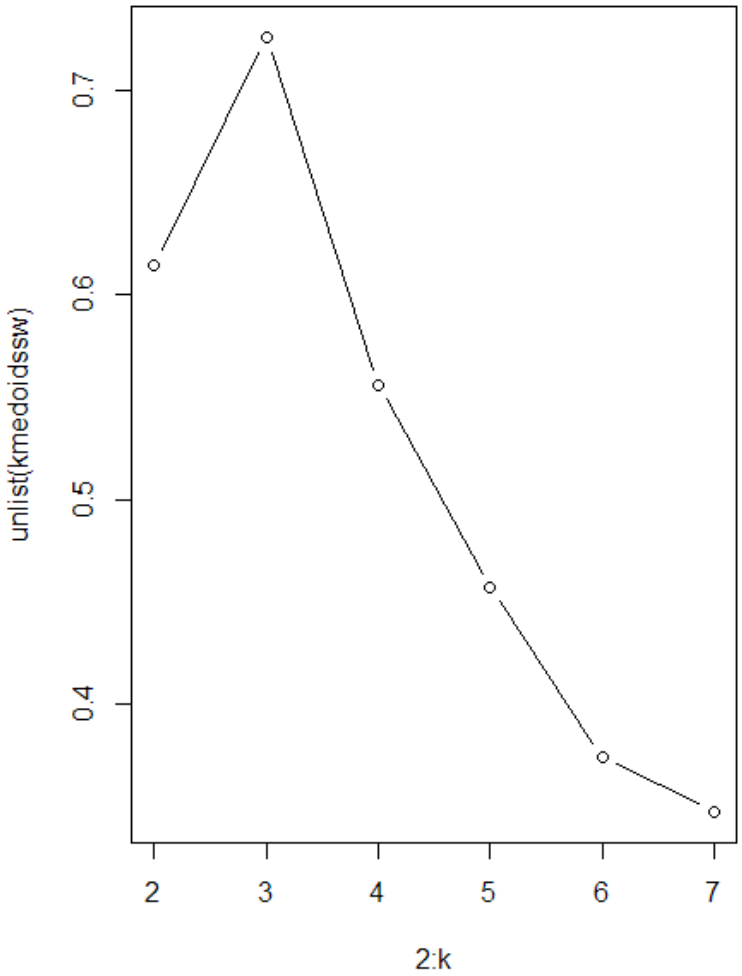
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	2
Meneut-from-French-Suite-No.3	Bach	2
Aria-from-Goldberg-Variations	Bach	2
Bist-Du-Bei-Mir	Bach	1
Arioso-from-Cantata	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
Minuet	Bach	2
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	2
Minuet-from-Don-Giovanni	Mozart	1
Minuet	Mozart	1
German-Dance-no.-1-K-605	Mozart	2
Laudate-Dominum	Mozart	1
March-of-the-Priest-from-The-Magic-Flute	Mozart	2
Oh-Isis-und-Osiris	Mozart	1
Lacrimosa-dies-illa	Mozart	1

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	2
Air-on-the-G-string : Bach	Bach	1
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	3
Bist-Du-Bei-Mir : Bach	Bach	2
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	2
Minuet : Bach	Bach	3
Sonata-no.-5-BWV-1034 : Bach	Bach	2
Violin-Concerto-BWW-1056 : Bach	Bach	3
Minuet-from-Don-Giovanni : Mozart	Mozart	2
Minuet : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	3
Laudate-Dominum : Mozart	Mozart	2
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	3
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	2

K-medoids



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	3
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	3
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	3
Minuet-from-Don-Giovanni : Mozart	Mozart	1
Minuet : Mozart	Mozart	1
German-Dance-no.-1-K-605 : Mozart	Mozart	3
Laudate-Dominum : Mozart	Mozart	1
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	3
Oh-Isis-und-Osiris : Mozart	Mozart	1
Lacrimosa-dies-illa : Mozart	Mozart	1

Durations average

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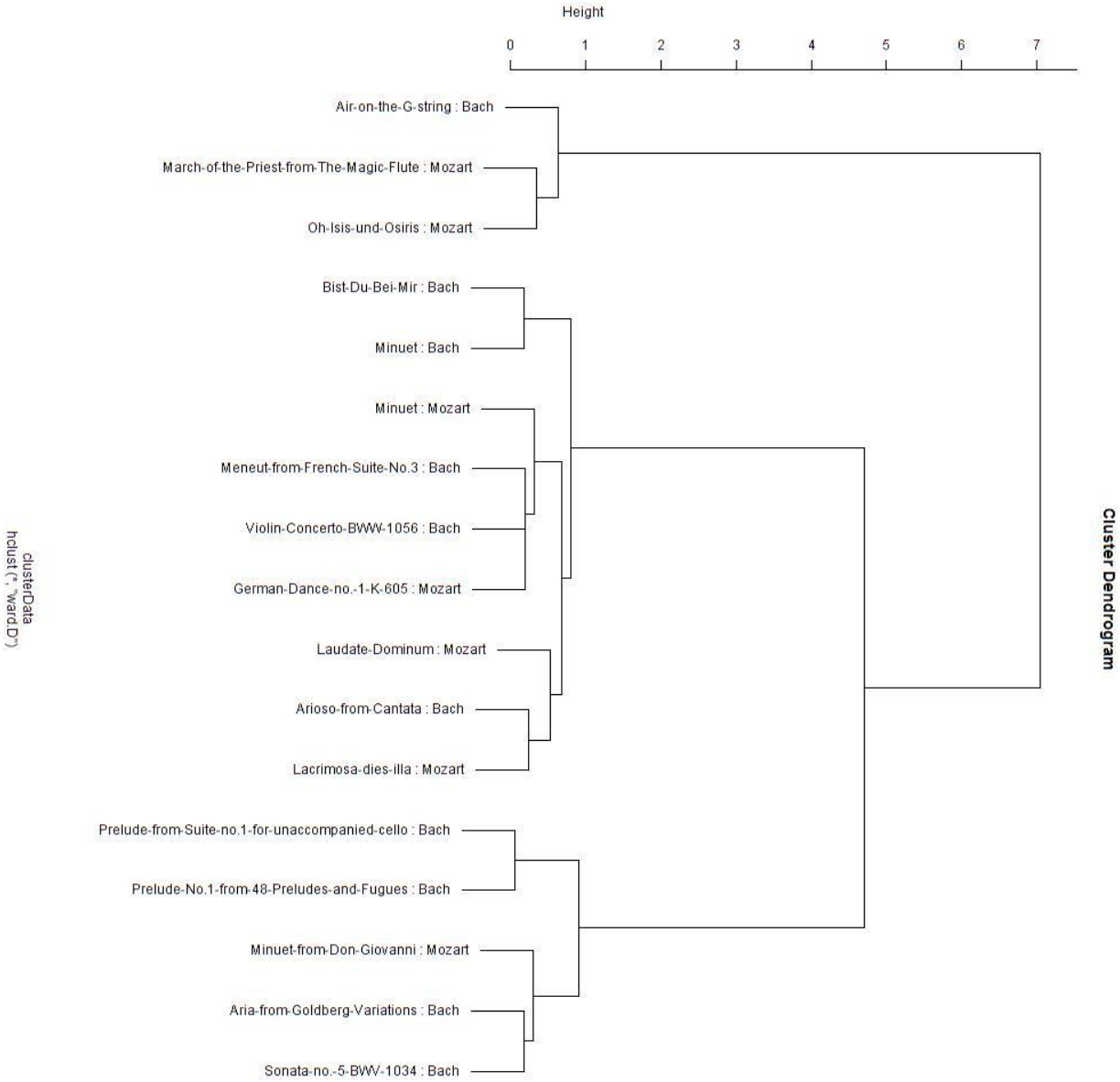
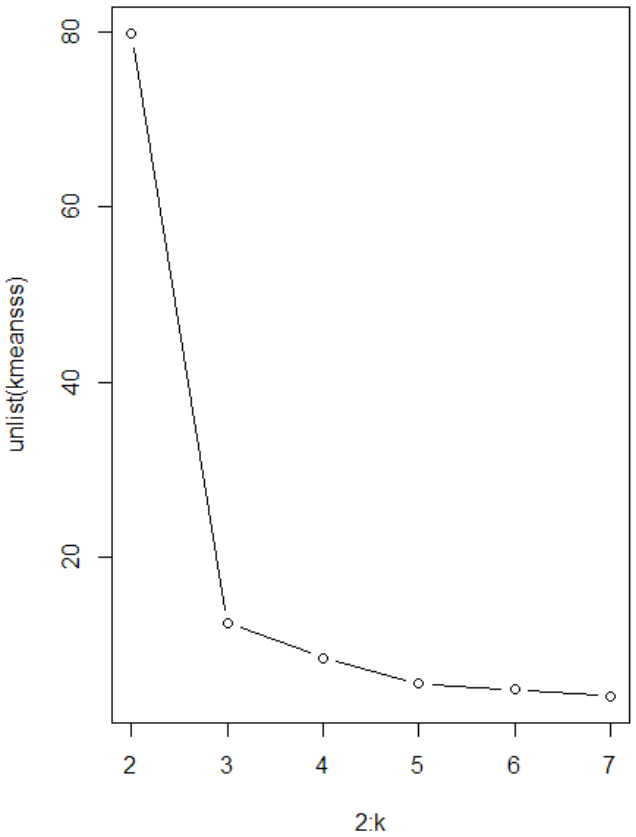


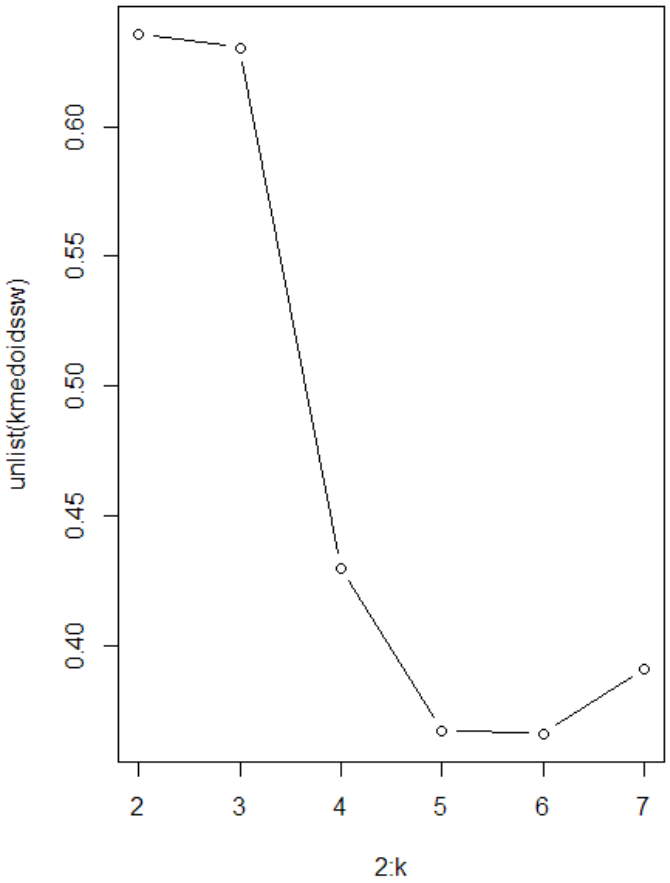
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	2
Meneut-from-French-Suite-No.3	Bach	3
Aria-from-Goldberg-Variations	Bach	1
Bist-Du-Bei-Mir	Bach	3
Arioso-from-Cantata	Bach	3
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
Minuet	Bach	3
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	3
Minuet-from-Don-Giovanni	Mozart	1
Minuet	Mozart	3
German-Dance-no.-1-K-605	Mozart	3
Laudate-Dominum	Mozart	3
March-of-the-Priest-from-The-Magic-Flute	Mozart	2
Oh-Isis-und-Osiris	Mozart	2
Lacrimosa-dies-illa	Mozart	3

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	2
Air-on-the-G-string : Bach	Bach	3
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	2
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	2
Minuet : Bach	Bach	1
Sonata-no.-5-BWV-1034 : Bach	Bach	2
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	2
Minuet : Mozart	Mozart	1
German-Dance-no.-1-K-605 : Mozart	Mozart	1
Laudate-Dominum : Mozart	Mozart	1
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	3
Oh-Isis-und-Osiris : Mozart	Mozart	3
Lacrimosa-dies-illa : Mozart	Mozart	1

K-medoids

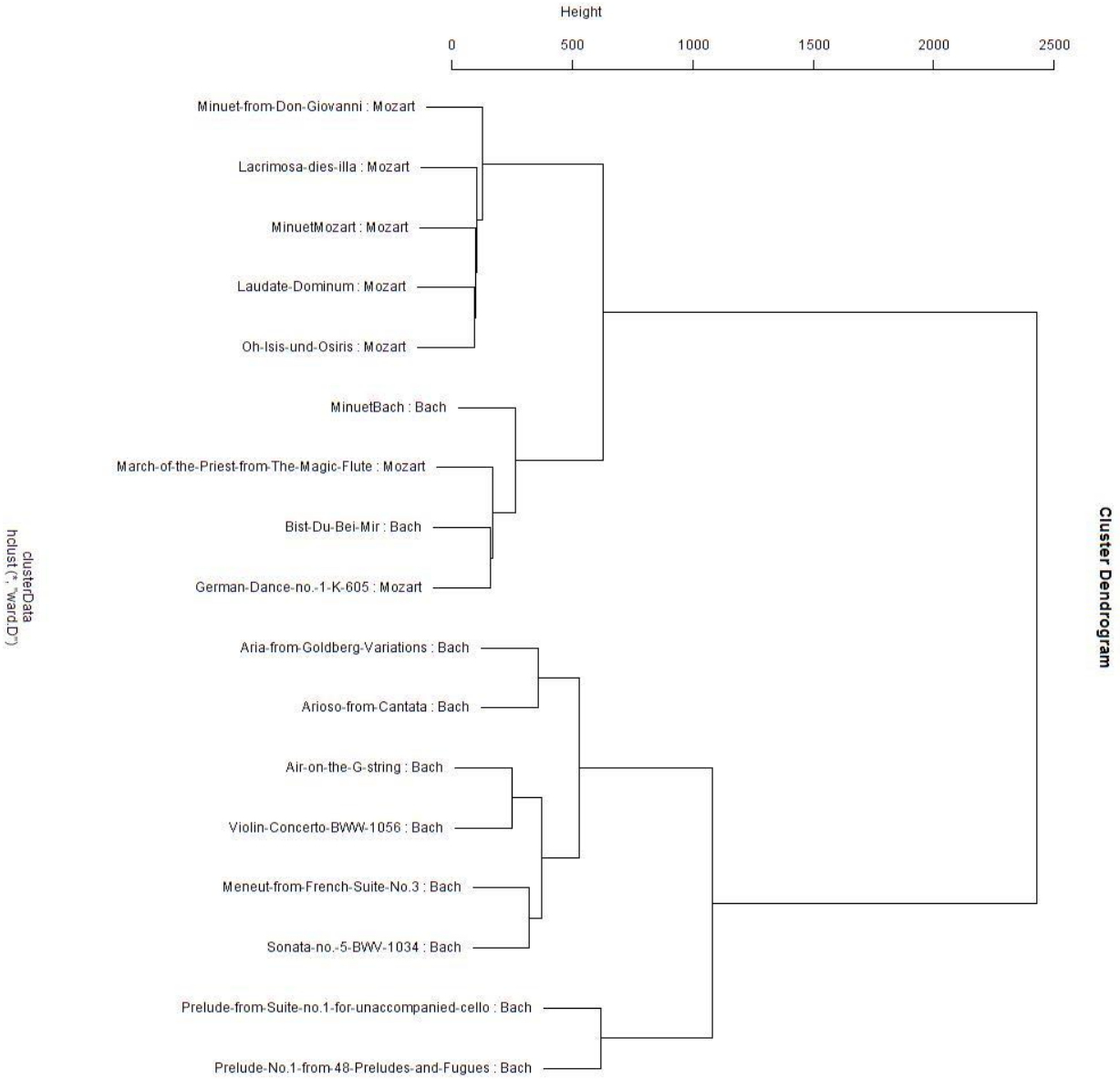


	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	1
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	1
Minuet : Mozart	Mozart	1
German-Dance-no.-1-K-605 : Mozart	Mozart	1
Laudate-Dominum : Mozart	Mozart	1
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	1

	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	3
Arioso-from-Cantata : Bach	Bach	3
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
Minuet : Bach	Bach	3
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	3
Minuet-from-Don-Giovanni : Mozart	Mozart	1
Minuet : Mozart	Mozart	3
German-Dance-no.-1-K-605 : Mozart	Mozart	3
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	3

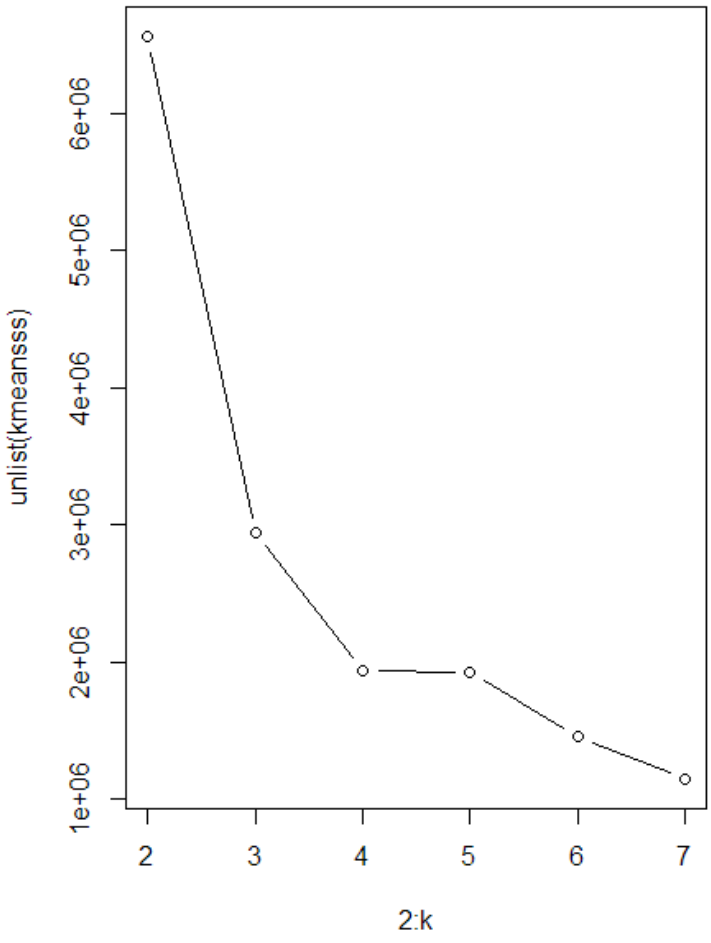
Levenstein

Hijerarhijsko



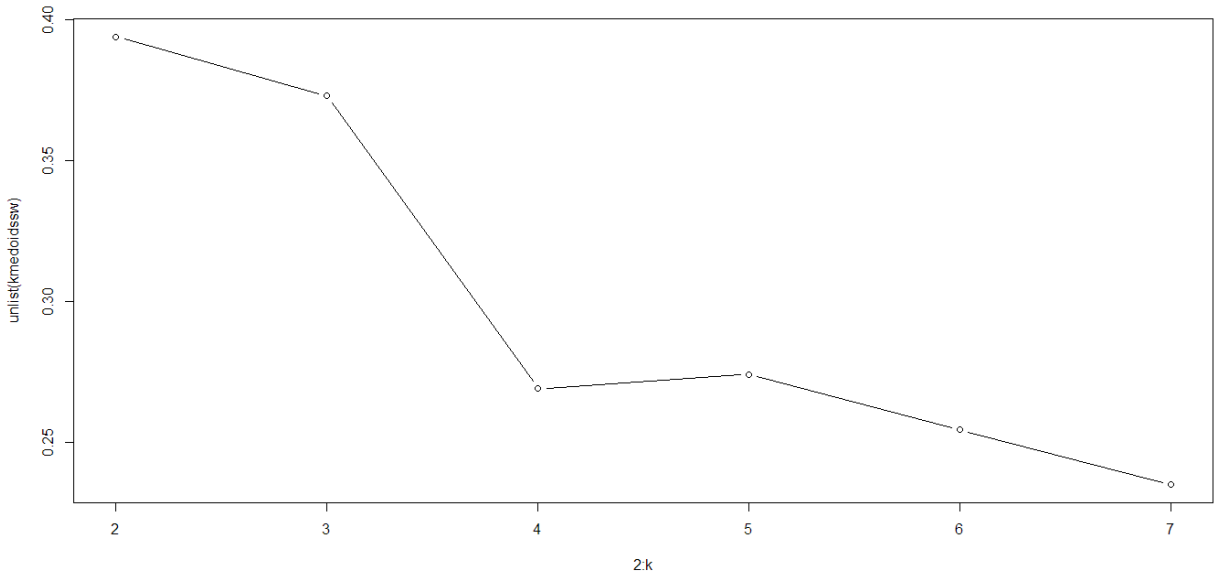
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	2
Meneut-from-French-Suite-No.3	Bach	2
Aria-from-Goldberg-Variations	Bach	3
Bist-Du-Bei-Mir	Bach	4
Arioso-from-Cantata	Bach	3
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	5
MinuetBach	Bach	4
Sonata-no.-5-BWV-1034	Bach	2
Violin-Concerto-BWW-1056	Bach	2
Minuet-from-Don-Giovanni	Mozart	6
MinuetMozart	Mozart	6
German-Dance-no.-1-K-605	Mozart	4
Laudate-Dominum	Mozart	6
March-of-the-Priest-from-The-Magic-Flute	Mozart	4
Oh-Isis-und-Osiris	Mozart	6
Lacrimosa-dies-illa	Mozart	6

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	4
Meneut-from-French-Suite-No.3 : Bach	Bach	2
Aria-from-Goldberg-Variations : Bach	Bach	2
Bist-Du-Bei-Mir : Bach	Bach	4
Arioso-from-Cantata : Bach	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
MinuetBach : Bach	Bach	4
Sonata-no.-5-BWV-1034 : Bach	Bach	2
Violin-Concerto-BWW-1056 : Bach	Bach	4
Minuet-from-Don-Giovanni : Mozart	Mozart	3
MinuetMozart : Mozart	Mozart	3
German-Dance-no.-1-K-605 : Mozart	Mozart	4
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	4
Oh-Isis-und-Osiris : Mozart	Mozart	3
Lacrimosa-dies-illa : Mozart	Mozart	3

K-medoids



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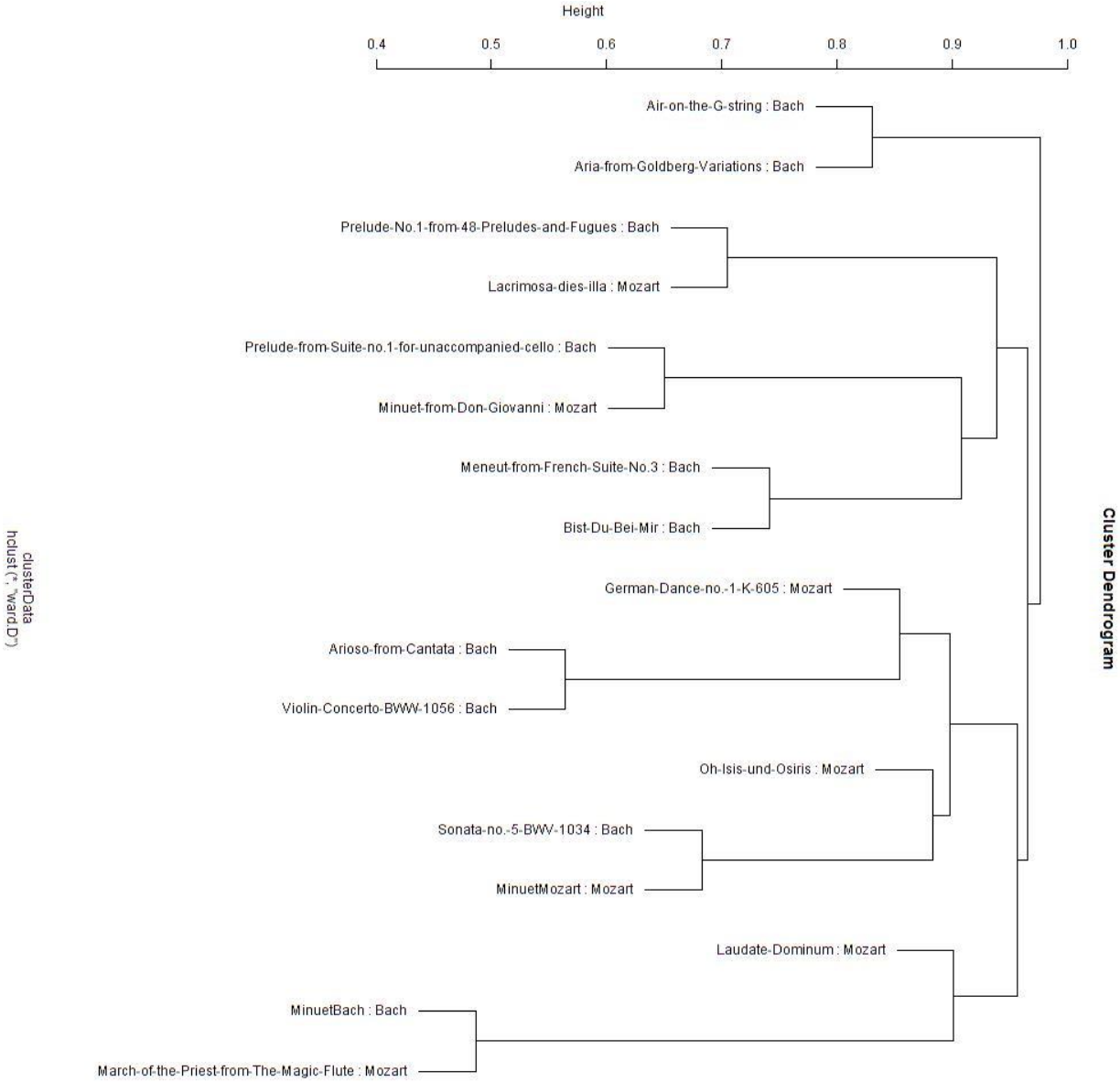
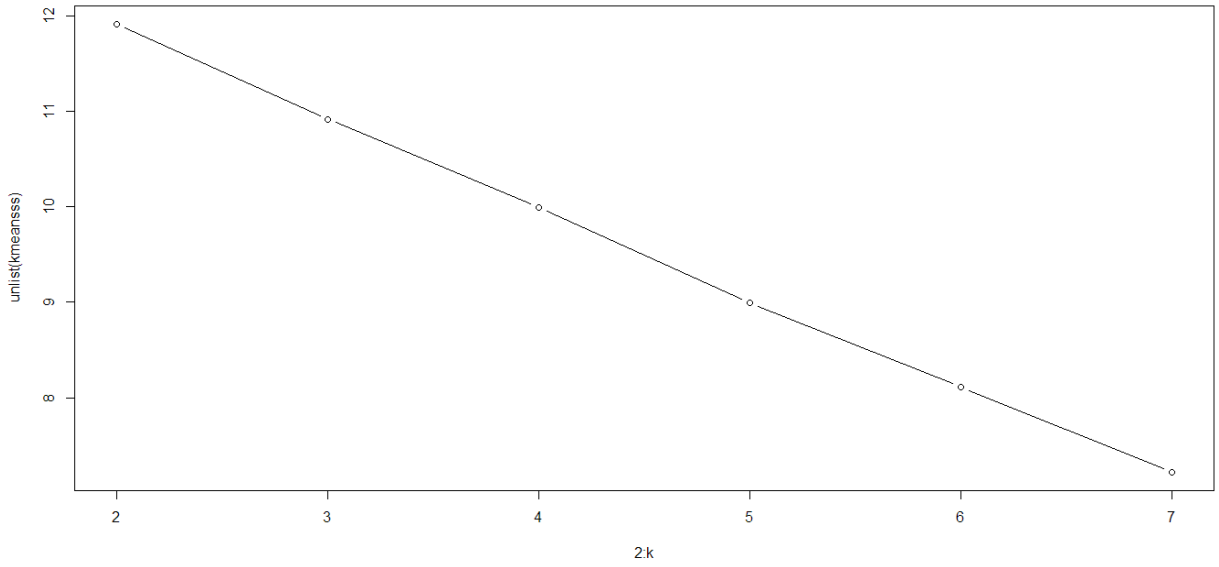
	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	1
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	2
Arioso-from-Cantata : Bach	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
MinuetBach : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	2
MinuetMozart : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	2
Laudate-Dominum : Mozart	Mozart	2
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	2

Cosine

Hijerarhijsko



K-means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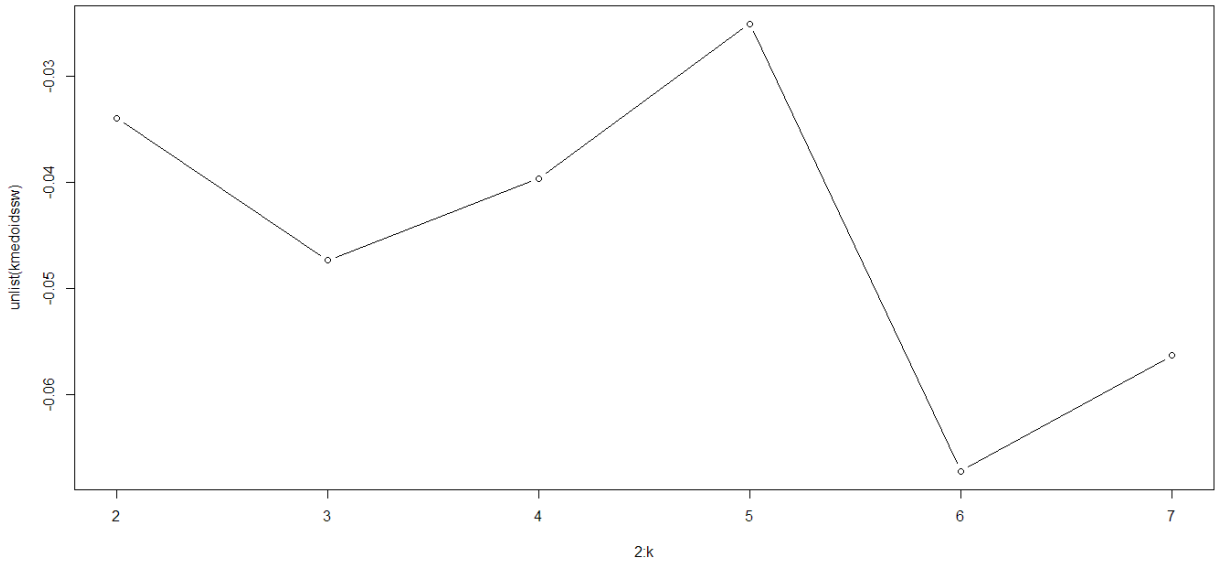
K-medoids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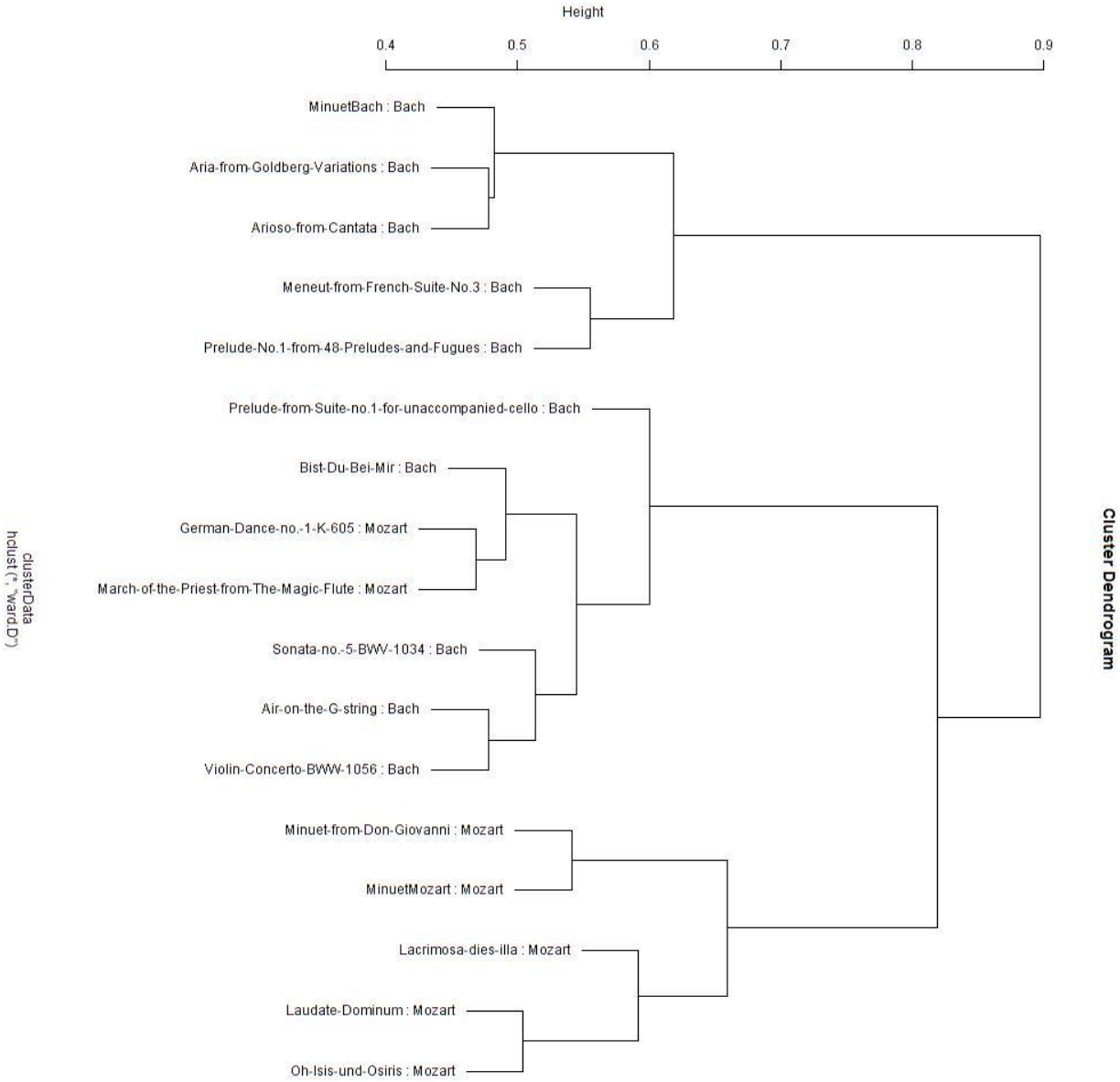
	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	1
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	4
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	3
MinuetBach : Bach	Bach	3
Sonata-no.-5-BWV-1034 : Bach	Bach	4
Violin-Concerto-BWW-1056 : Bach	Bach	4
Minuet-from-Don-Giovanni : Mozart	Mozart	3
MinuetMozart : Mozart	Mozart	1
German-Dance-no.-1-K-605 : Mozart	Mozart	5
Laudate-Dominum : Mozart	Mozart	1
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	1
Oh-Isis-und-Osiris : Mozart	Mozart	1
Lacrimosa-dies-illa : Mozart	Mozart	1

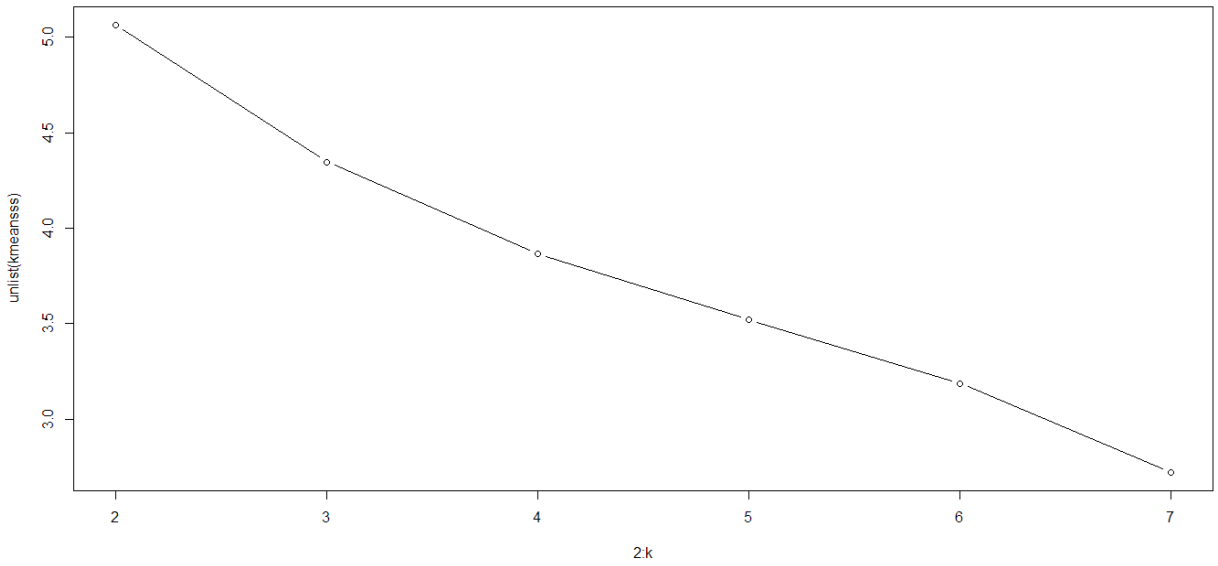
LCS

Hijerarhijsko

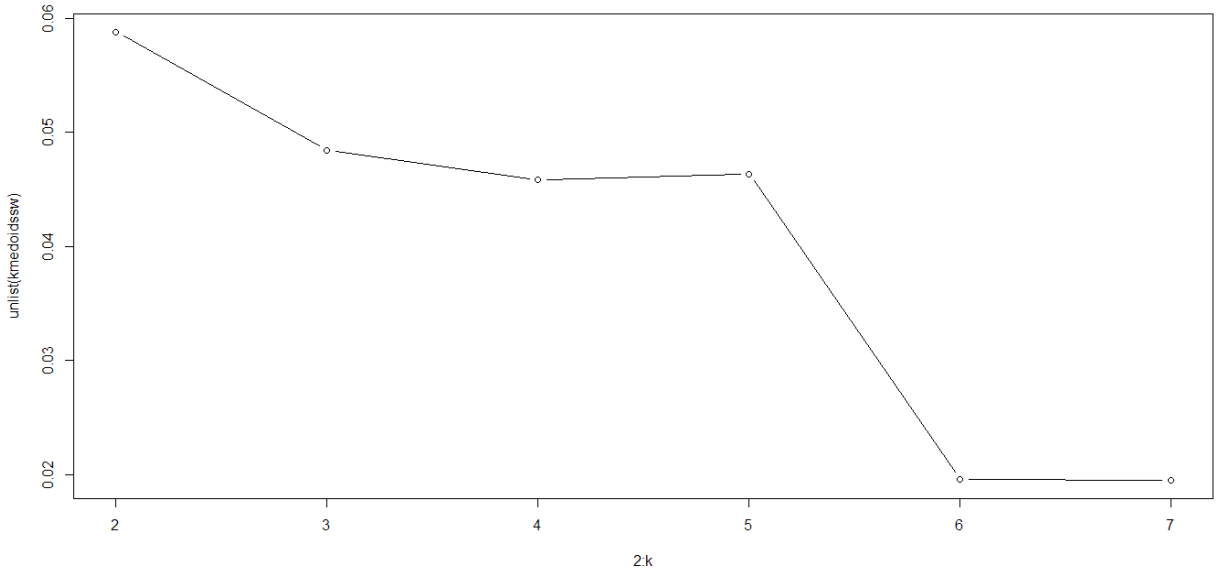


Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	1
Meneut-from-French-Suite-No.3	Bach	2
Aria-from-Goldberg-Variations	Bach	2
Bist-Du-Bei-Mir	Bach	1
Arioso-from-Cantata	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	2
MinuetBach	Bach	2
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	1
Minuet-from-Don-Giovanni	Mozart	3
MinuetMozart	Mozart	3
German-Dance-no.-1-K-605	Mozart	1
Laudate-Dominum	Mozart	3
March-of-the-Priest-from-The-Magic-Flute	Mozart	1
Oh-Isis-und-Osiris	Mozart	3
Lacrimosa-dies-illa	Mozart	3

K-means



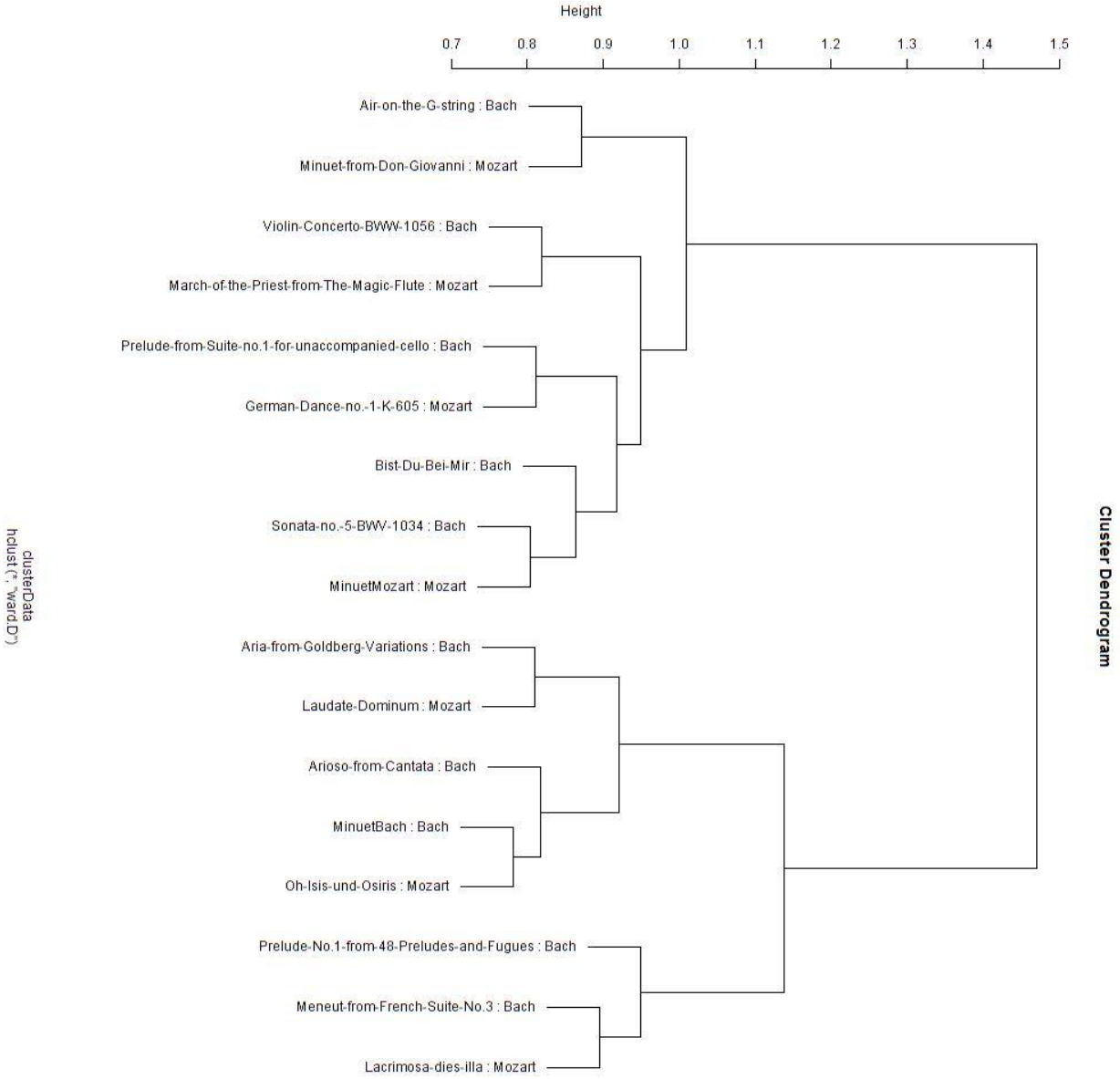
K-medoids



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	1
Meneut-from-French-Suite-No.3 : Bach	Bach	1
Aria-from-Goldberg-Variations : Bach	Bach	2
Bist-Du-Bei-Mir : Bach	Bach	1
Arioso-from-Cantata : Bach	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	2
MinuetBach : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	1
Minuet-from-Don-Giovanni : Mozart	Mozart	2
MinuetMozart : Mozart	Mozart	1
German-Dance-no.-1-K-605 : Mozart	Mozart	1
Laudate-Dominum : Mozart	Mozart	2
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	1
Oh-Isis-und-Osiris : Mozart	Mozart	2
Lacrimosa-dies-illa : Mozart	Mozart	1

	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	4
Bist-Du-Bei-Mir : Bach	Bach	2
Arioso-from-Cantata : Bach	Bach	4
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	3
MinuetBach : Bach	Bach	4
Sonata-no.-5-BWV-1034 : Bach	Bach	2
Violin-Concerto-BWW-1056 : Bach	Bach	2
Minuet-from-Don-Giovanni : Mozart	Mozart	4
MinuetMozart : Mozart	Mozart	2
German-Dance-no.-1-K-605 : Mozart	Mozart	2
Laudate-Dominum : Mozart	Mozart	4
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	4
Lacrimosa-dies-illa : Mozart	Mozart	5

OM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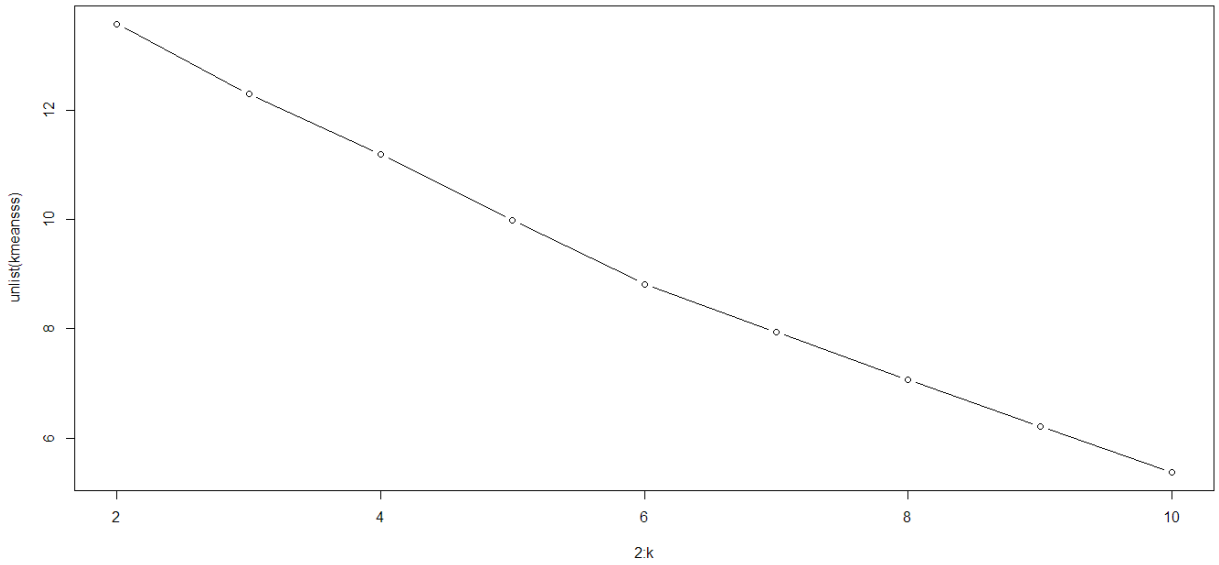
Air-on-the-G-string : Bach
Minuet-from-Don-Giovanni : Mozart
Violin-Concerto-BWV-1056 : Bach
March-of-the-Priest-from-The-Magic-Flute : Mozart
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach
German-Dance-no.-1-K-605 : Mozart
Bist-Du-Bei-Mir : Bach
Sonata-no.-5-BWV-1034 : Bach
MinuetMozart : Mozart
Aria-from-Goldberg-Variations : Bach
Laudate-Dominum : Mozart
Arioso-from-Cantata : Bach
MinuetBach : Bach
Oh-Isis-und-Osiris : Mozart
Prelude-No.1-from-48-Preludes-and-Fugues : Bach
Meneut-from-French-Suite-No.3 : Bach
Lacrimosa-dies-illa : Mozart
clusterData
hclust (*, "ward.D")
Cluster Dendrogram

K-means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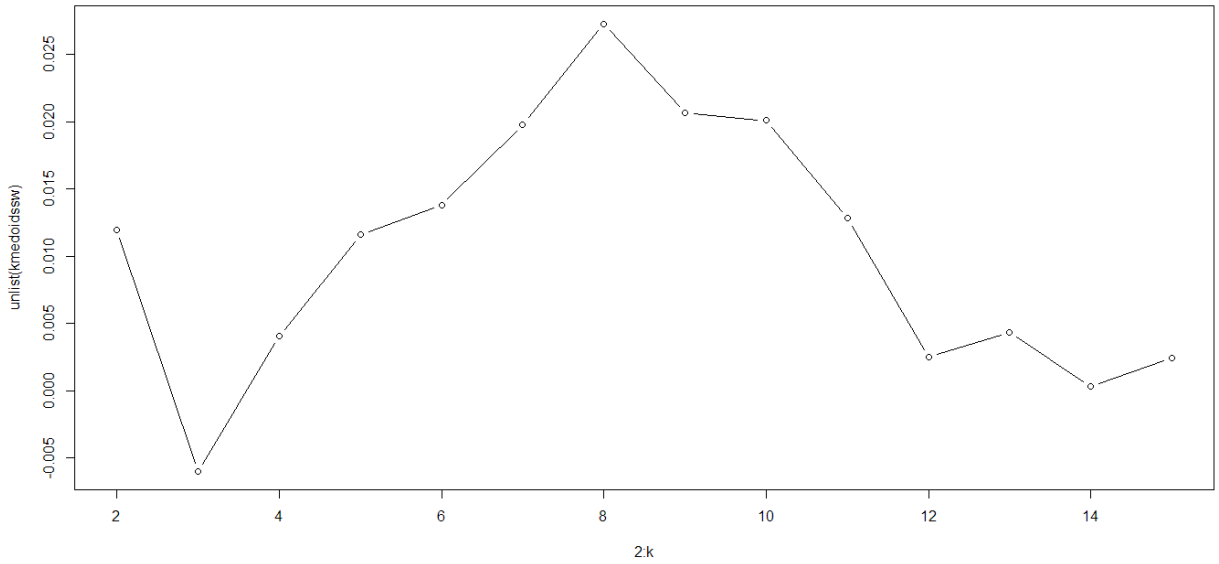
K-medoids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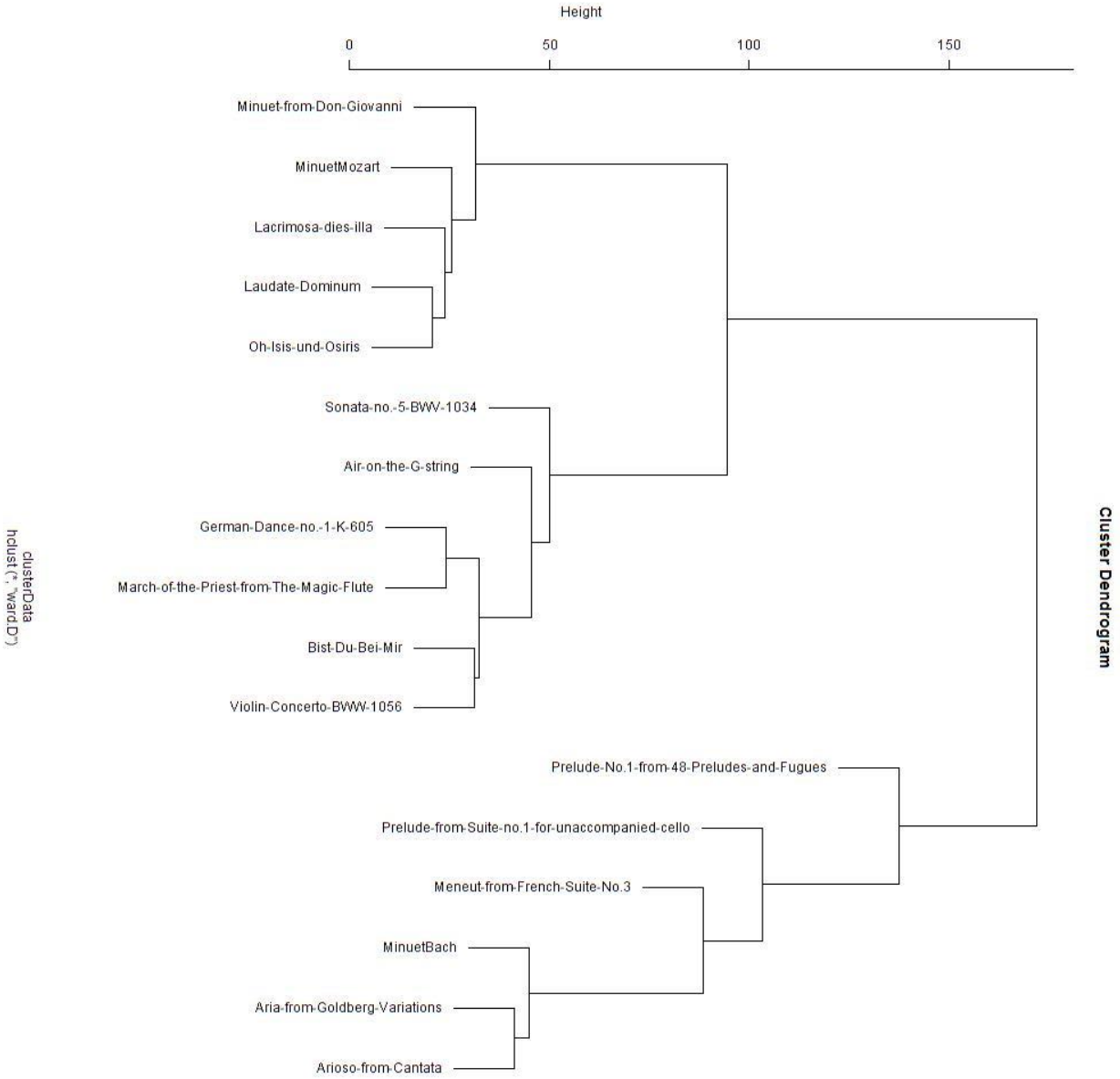
	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	2
Meneut-from-French-Suite-No.3 : Bach	Bach	3
Aria-from-Goldberg-Variations : Bach	Bach	4
Bist-Du-Bei-Mir : Bach	Bach	5
Arioso-from-Cantata : Bach	Bach	4
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	6
MinuetBach : Bach	Bach	4
Sonata-no.-5-BWV-1034 : Bach	Bach	5
Violin-Concerto-BWW-1056 : Bach	Bach	2
Minuet-from-Don-Giovanni : Mozart	Mozart	7
MinuetMozart : Mozart	Mozart	5
German-Dance-no.-1-K-605 : Mozart	Mozart	1
Laudate-Dominum : Mozart	Mozart	4
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	2
Oh-Isis-und-Osiris : Mozart	Mozart	4
Lacrimosa-dies-illa : Mozart	Mozart	8

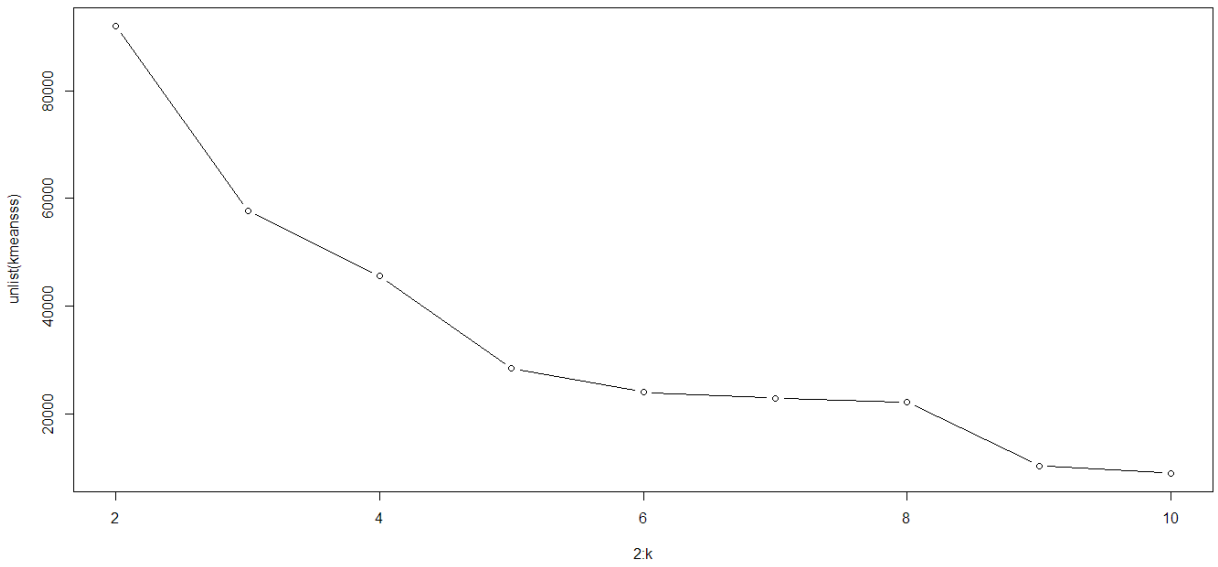
Qgrams

Hijerarhijsko



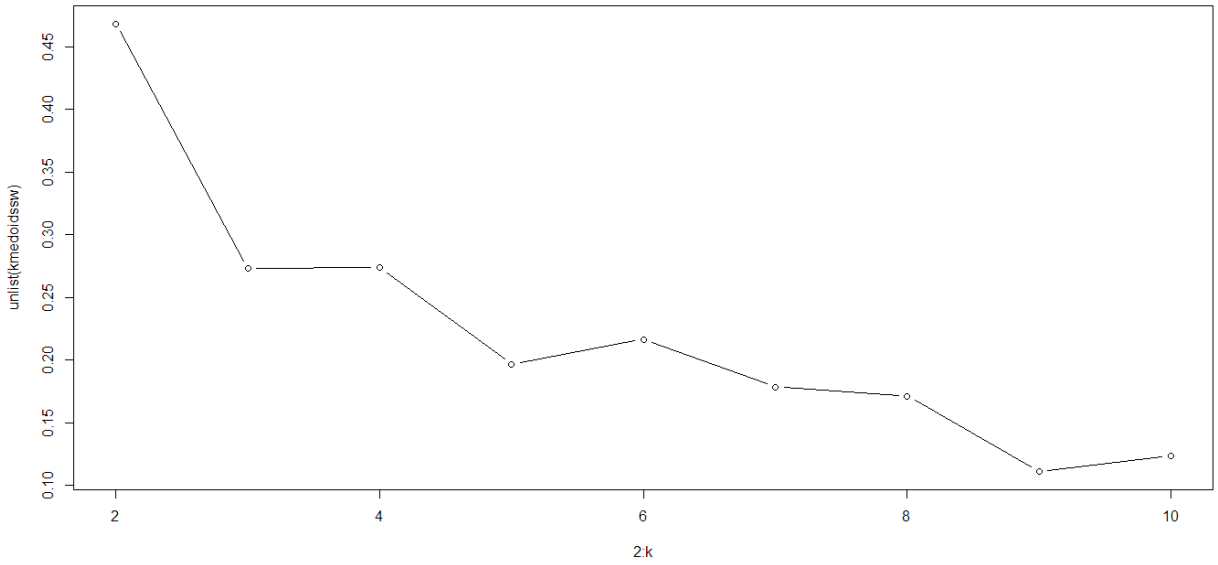
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	2
Meneut-from-French-Suite-No.3	Bach	1
Aria-from-Goldberg-Variations	Bach	1
Bist-Du-Bei-Mir	Bach	2
Arioso-from-Cantata	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
MinuetBach	Bach	1
Sonata-no.-5-BWV-1034	Bach	2
Violin-Concerto-BWW-1056	Bach	2
Minuet-from-Don-Giovanni	Mozart	2
MinuetMozart	Mozart	2
German-Dance-no.-1-K-605	Mozart	2
Laudate-Dominum	Mozart	2
March-of-the-Priest-from-The-Magic-Flute	Mozart	2
Oh-Isis-und-Osiris	Mozart	2
Lacrimosa-dies-illa	Mozart	2

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	5
Air-on-the-G-string	Bach	4
Meneut-from-French-Suite-No.3	Bach	2
Aria-from-Goldberg-Variations	Bach	2
Bist-Du-Bei-Mir	Bach	3
Arioso-from-Cantata	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
MinuetBach	Bach	2
Sonata-no.-5-BWV-1034	Bach	4
Violin-Concerto-BWW-1056	Bach	4
Minuet-from-Don-Giovanni	Mozart	3
MinuetMozart	Mozart	3
German-Dance-no.-1-K-605	Mozart	4
Laudate-Dominum	Mozart	3
March-of-the-Priest-from-The-Magic-Flute	Mozart	4
Oh-Isis-und-Osiris	Mozart	3
Lacrimosa-dies-illa	Mozart	3

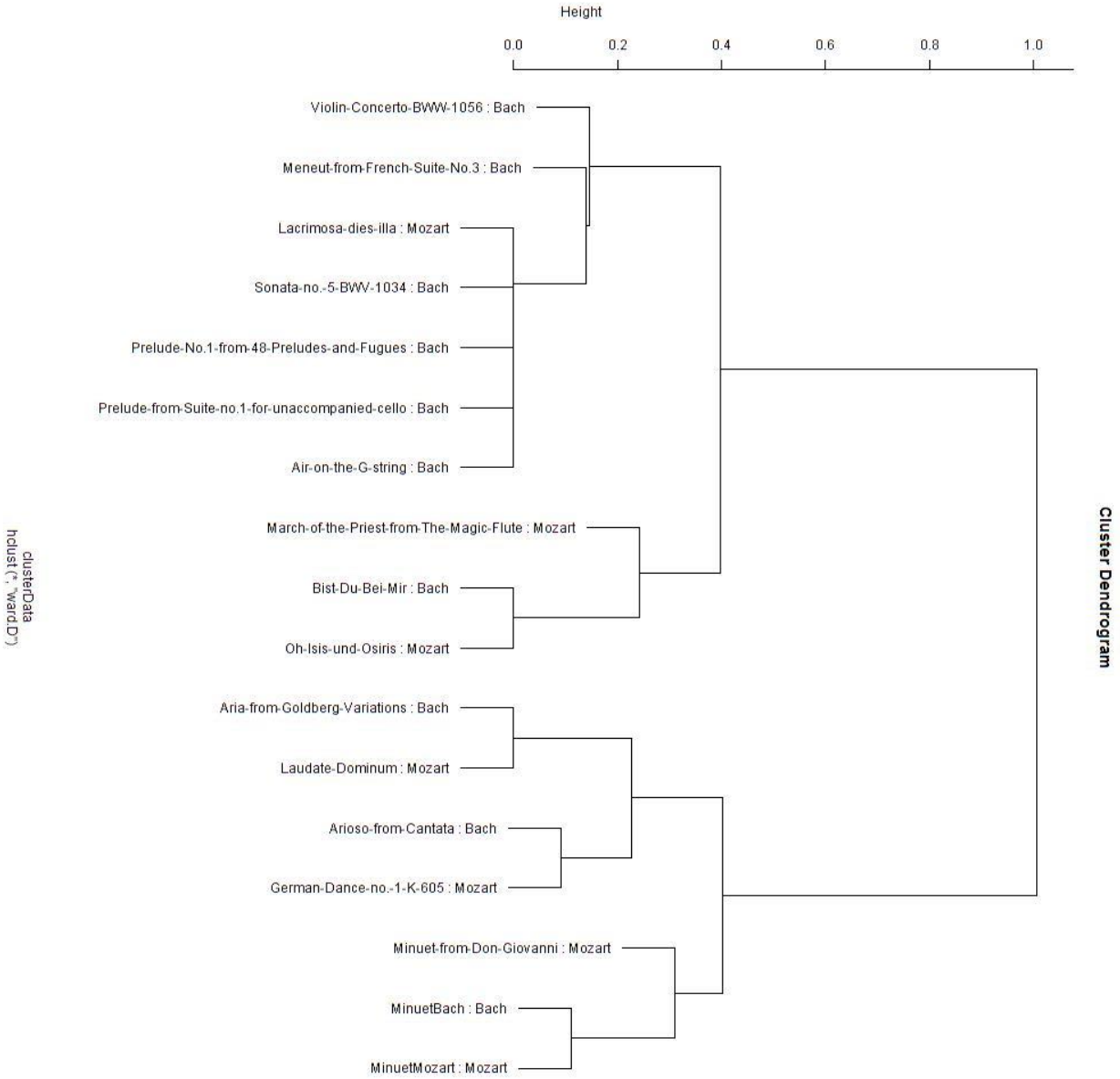
K-medoids



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	1
Meneut-from-French-Suite-No.3	Bach	1
Aria-from-Goldberg-Variations	Bach	1
Bist-Du-Bei-Mir	Bach	1
Arioso-from-Cantata	Bach	1
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	2
MinuetBach	Bach	1
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	1
Minuet-from-Don-Giovanni	Mozart	1
MinuetMozart	Mozart	1
German-Dance-no.-1-K-605	Mozart	1
Laudate-Dominum	Mozart	1
March-of-the-Priest-from-The-Magic-Flute	Mozart	1
Oh-Isis-und-Osiris	Mozart	1
Lacrimosa-dies-illa	Mozart	1

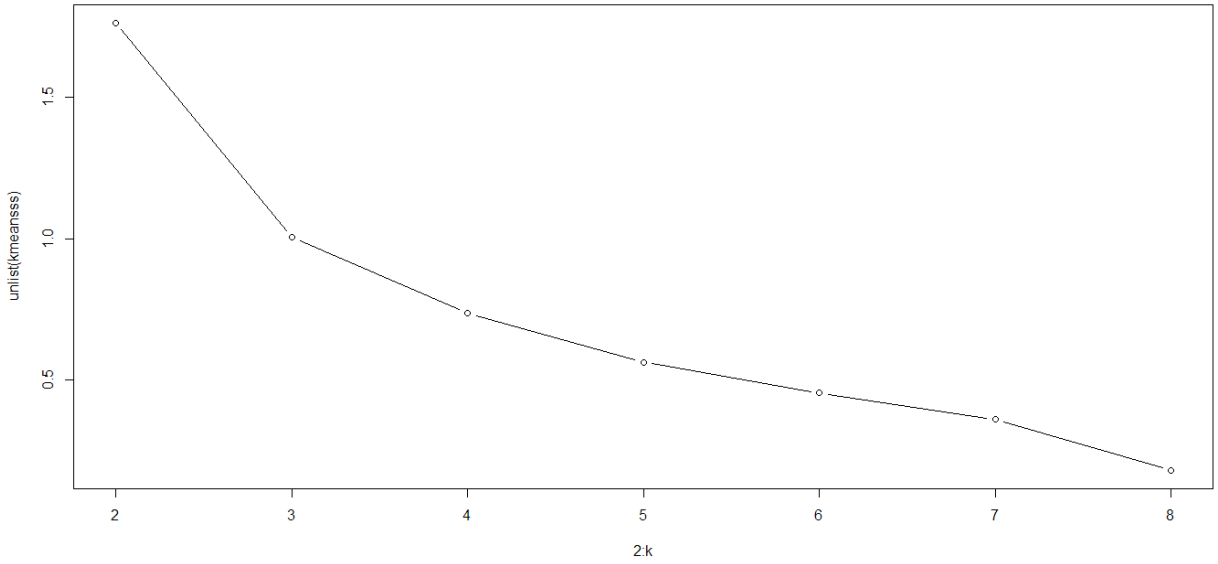
Jaccard

Hijerarhijsko



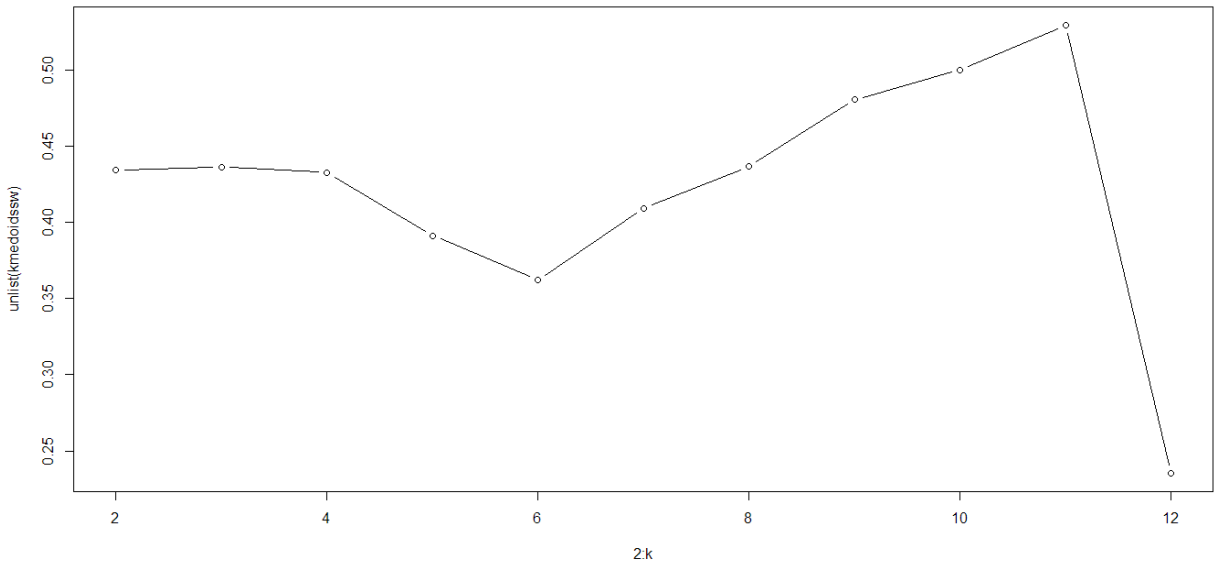
Melody.number	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello	Bach	1
Air-on-the-G-string	Bach	1
Meneut-from-French-Suite-No.3	Bach	1
Aria-from-Goldberg-Variations	Bach	2
Bist-Du-Bei-Mir	Bach	3
Arioso-from-Cantata	Bach	2
Prelude-No.1-from-48-Preludes-and-Fugues	Bach	1
MinuetBach	Bach	4
Sonata-no.-5-BWV-1034	Bach	1
Violin-Concerto-BWW-1056	Bach	1
Minuet-from-Don-Giovanni	Mozart	4
MinuetMozart	Mozart	4
German-Dance-no.-1-K-605	Mozart	2
Laudate-Dominum	Mozart	2
March-of-the-Priest-from-The-Magic-Flute	Mozart	3
Oh-Isis-und-Osiris	Mozart	3
Lacrimosa-dies-illa	Mozart	1

K-means



	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	4
Air-on-the-G-string : Bach	Bach	4
Meneut-from-French-Suite-No.3 : Bach	Bach	4
Aria-from-Goldberg-Variations : Bach	Bach	3
Bist-Du-Bei-Mir : Bach	Bach	4
Arioso-from-Cantata : Bach	Bach	3
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	4
MinuetBach : Bach	Bach	2
Sonata-no.-5-BWV-1034 : Bach	Bach	4
Violin-Concerto-BWW-1056 : Bach	Bach	4
Minuet-from-Don-Giovanni : Mozart	Mozart	2
MinuetMozart : Mozart	Mozart	3
German-Dance-no.-1-K-605 : Mozart	Mozart	4
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	1
Oh-Isis-und-Osiris : Mozart	Mozart	4
Lacrimosa-dies-illa : Mozart	Mozart	4

K-medoids



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	Author	Predicted.cluster.number
Prelude-from-Suite-no.1-for-unaccompanied-cello : Bach	Bach	1
Air-on-the-G-string : Bach	Bach	1
Meneut-from-French-Suite-No.3 : Bach	Bach	2
Aria-from-Goldberg-Variations : Bach	Bach	3
Bist-Du-Bei-Mir : Bach	Bach	4
Arioso-from-Cantata : Bach	Bach	5
Prelude-No.1-from-48-Preludes-and-Fugues : Bach	Bach	1
MinuetBach : Bach	Bach	6
Sonata-no.-5-BWV-1034 : Bach	Bach	1
Violin-Concerto-BWW-1056 : Bach	Bach	7
Minuet-from-Don-Giovanni : Mozart	Mozart	8
MinuetMozart : Mozart	Mozart	9
German-Dance-no.-1-K-605 : Mozart	Mozart	10
Laudate-Dominum : Mozart	Mozart	3
March-of-the-Priest-from-The-Magic-Flute : Mozart	Mozart	11
Oh-Isis-und-Osiris : Mozart	Mozart	4
Lacrimosa-dies-illa : Mozart	Mozart	1