cleaning.R

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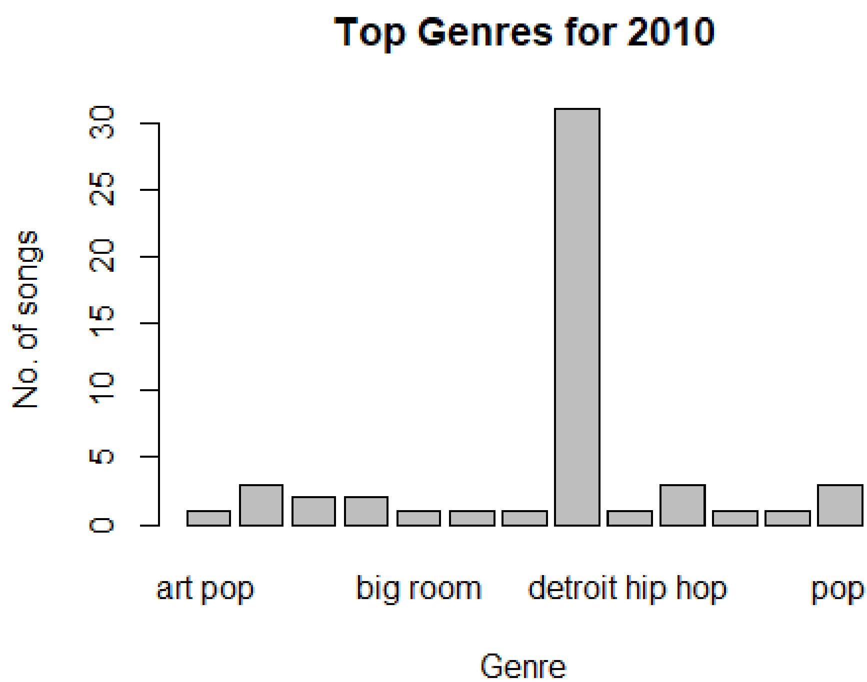
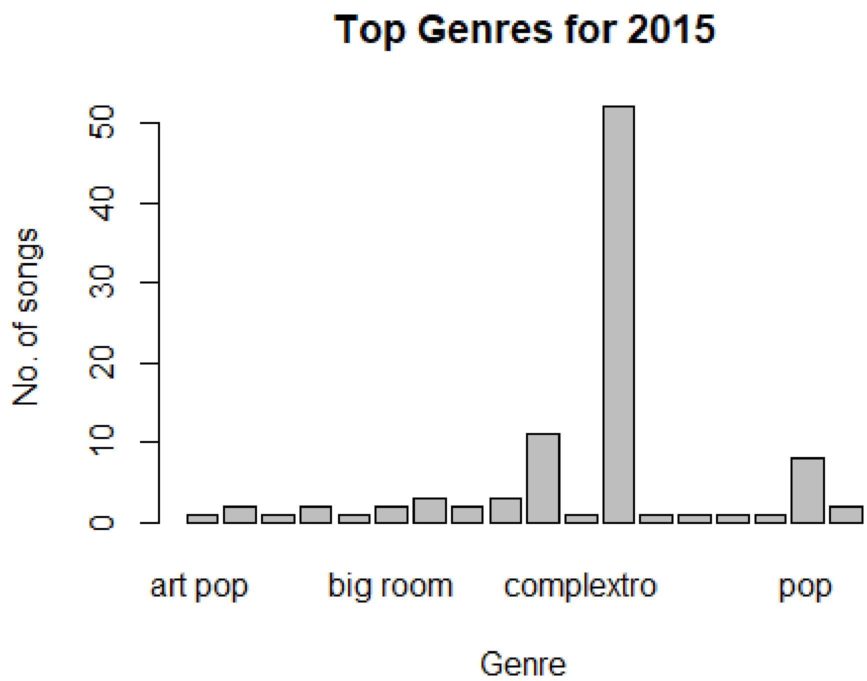
```
#Top Songs Analysis

#importing dataset top10s and copying it to test data
data <- read.csv("C:/Users/rmadh/OneDrive/Desktop/Lecture_Notes/MVA/Top-Songs
-Analysis-master/top10s.csv",header = TRUE)
View(data)

#Data Cleaning

#Adding column Rank which will denote rank of a song based on it popularity.
# popularity from 90 - 100 is Rank 10 and so on
for(x in 1:length(data$pop)){
  if(data[x,15] <= 100 && data[x,15] >= 80){
    data[x,16] = 5
  }else if(data[x,15] < 80 && data[x,15] >= 60){
    data[x,16] = 4
  }else if(data[x,15] < 60 && data[x,15] >= 40){
    data[x,16] = 3
  }else if(data[x,15] < 40 && data[x,15] >= 20){
    data[x,16] = 2
  }else if(data[x,15] < 20 && data[x,15] >= 0){
    data[x,16] = 1
  }
}
data$pop <- NULL
dim(data)

## [1] 603  15

#removing values with 0 BPM and duration as 0 seconds

data_clean <- data[-c(433),]
names(data_clean)[15]<- "rating"

View(data_clean)

#EDA
#checking the ranges for all columns
dim(data_clean)

## [1] 602  15
```

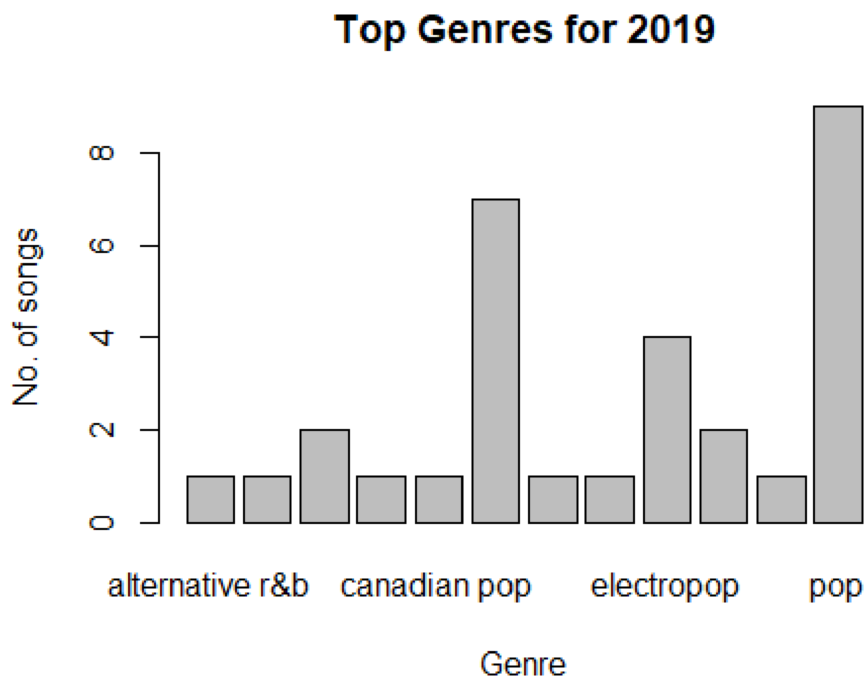
```r
library(plyr)
library(ggplot2)

#Finding top genre for 3 years
year1 = data_clean[data_clean$year == 2010,]
gen1 = count(year1$top.genre)
barplot(gen1$freq, names.arg = gen1$x,main = 'Top Genres for 2010',xlab = 'Ge
nre',ylab = 'No. of songs')
```



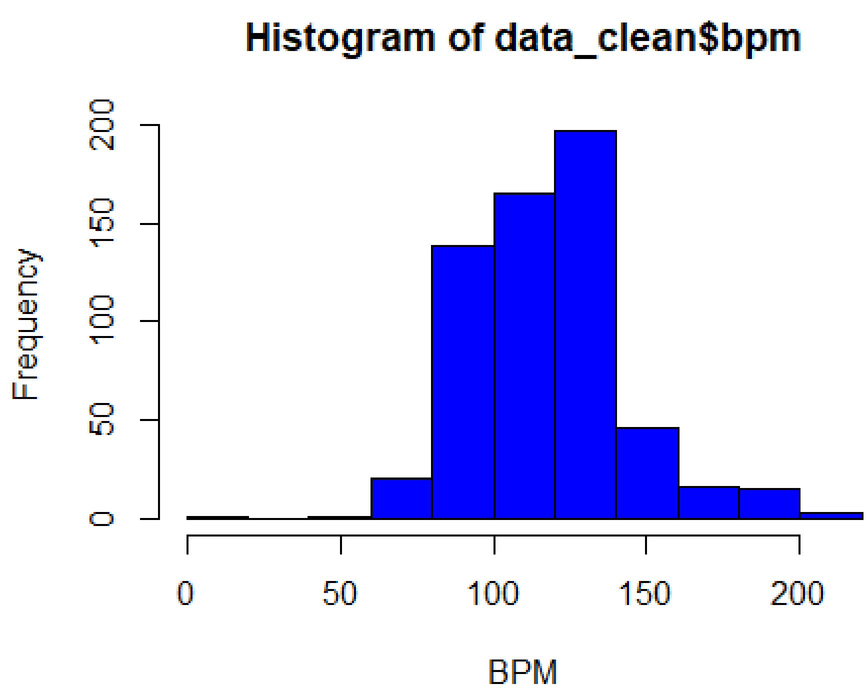

```r
year2 = data_clean[data_clean$year == 2015,]
gen2 = count(year2$top.genre)
barplot(gen2$freq, names.arg = gen2$x,main = 'Top Genres for 2015',xlab = 'Ge
nre',ylab = 'No. of songs')
```



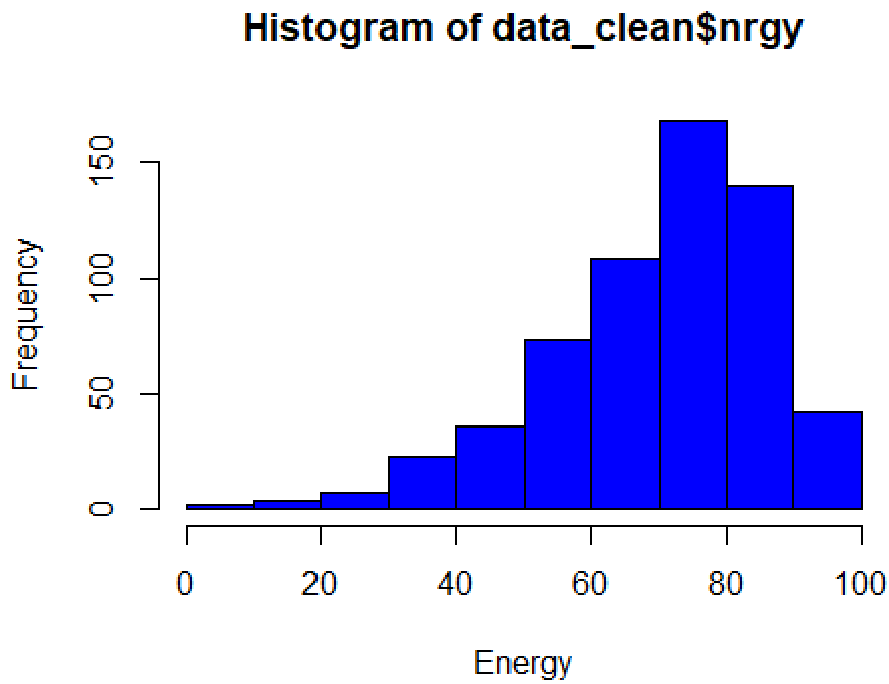

```
year3 = data_clean[data_clean$year == 2019,]
gen3 = count(year3$top.genre)
barplot(gen3$freq, names.arg = gen3$x,main = 'Top Genres for 2019',xlab = 'Ge
nre',ylab = 'No. of songs')
```



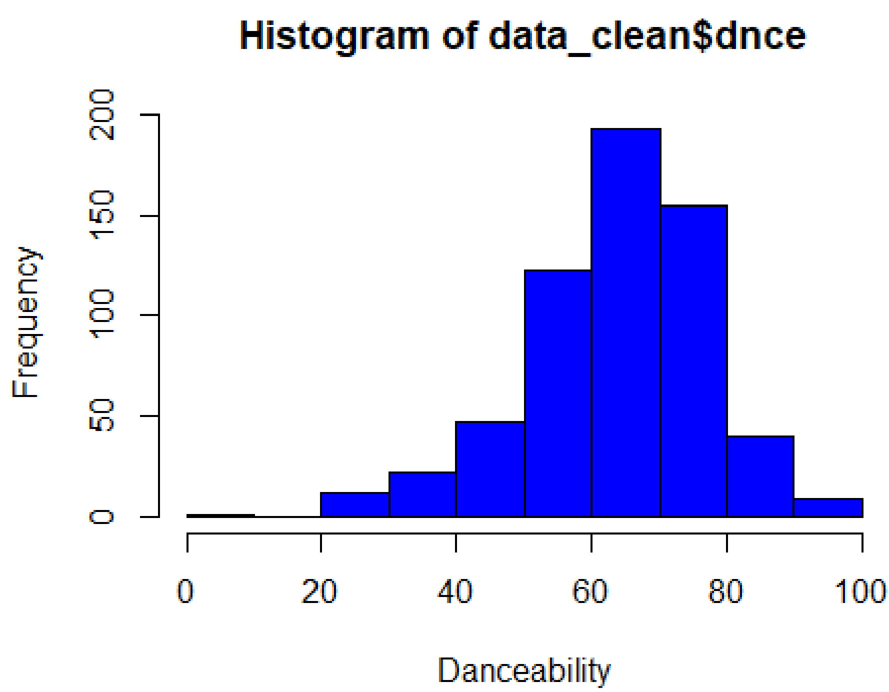

```r
#Histogram view of audio properties
hist(data_clean$bpm, breaks=12,col="blue",xlab="BPM")
```



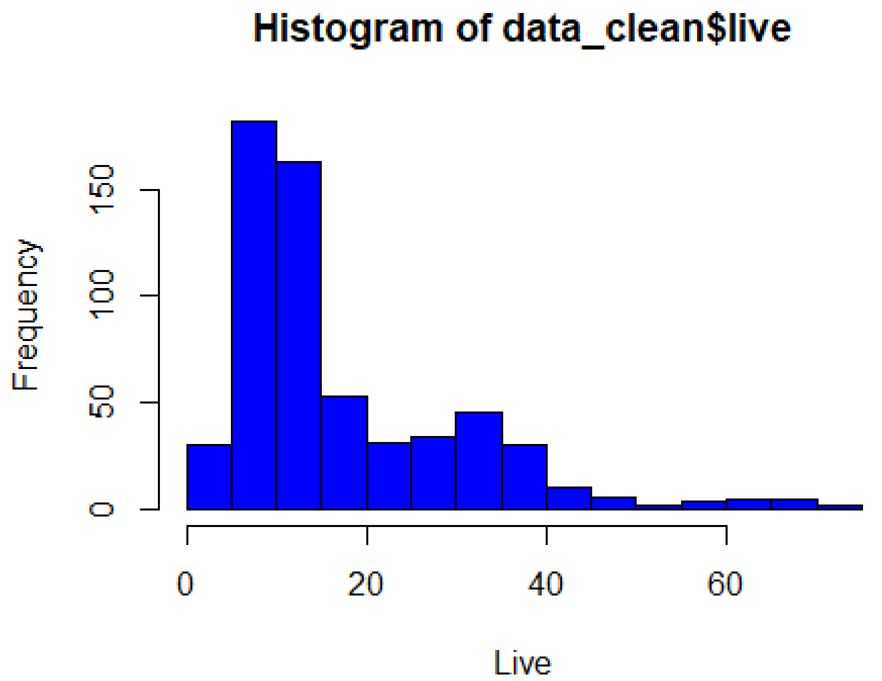
```r
hist(data_clean$nrgy, breaks=12,col="blue",xlab="Energy")
```



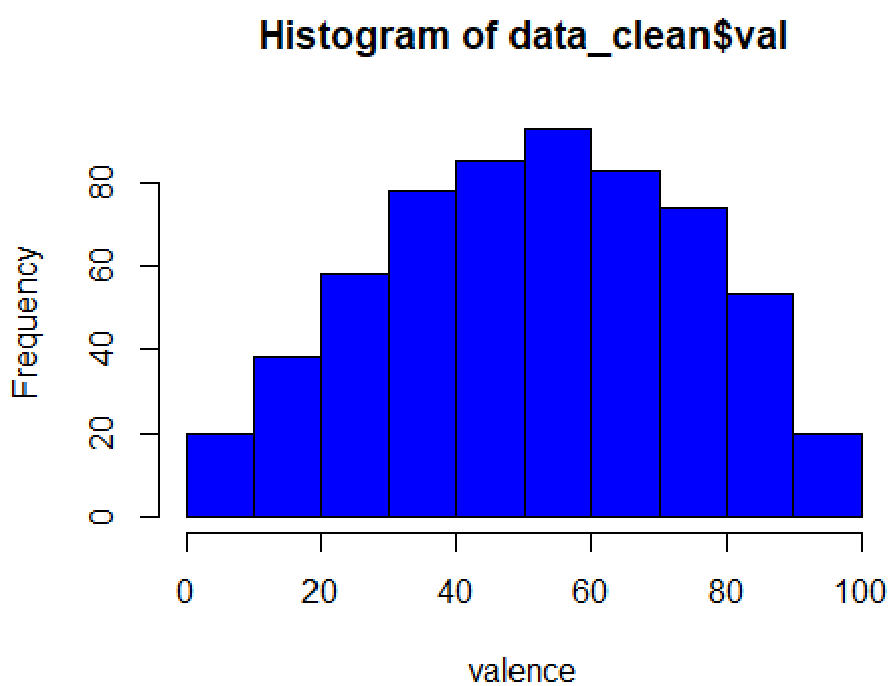

```r
hist(data_clean$dnce, breaks=12,col="blue",xlab="Danceability")
```



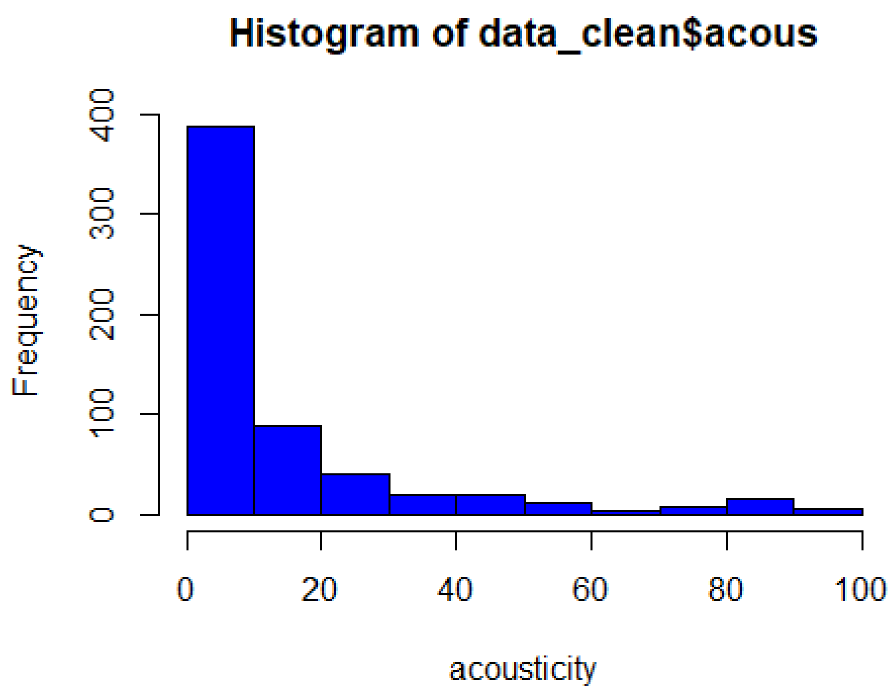
```r
hist(data_clean$live, breaks=12,col="blue",xlab="Live")
```



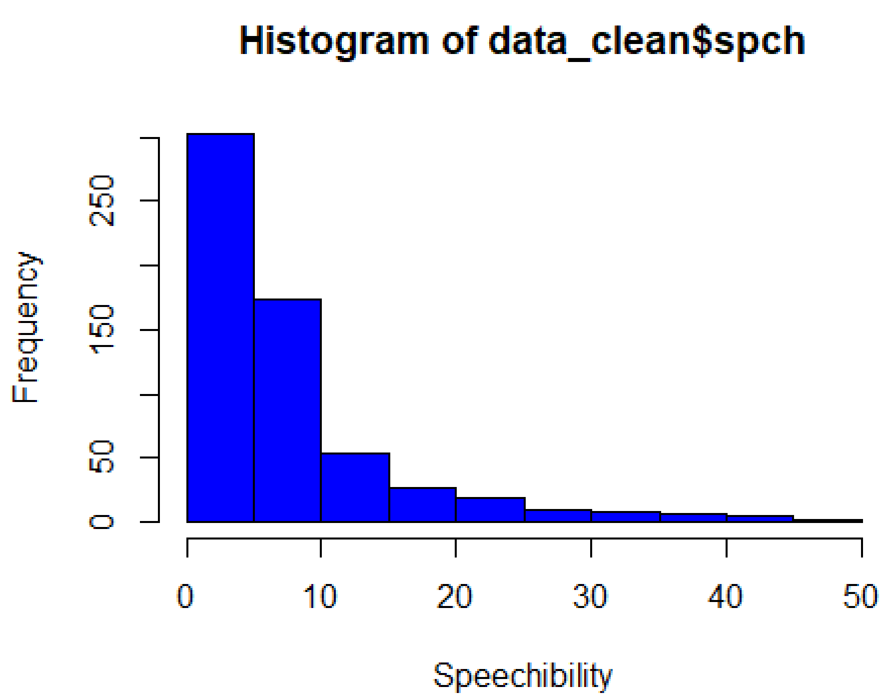

```r
hist(data_clean$val, breaks=12,col="blue",xlab="valence")
```



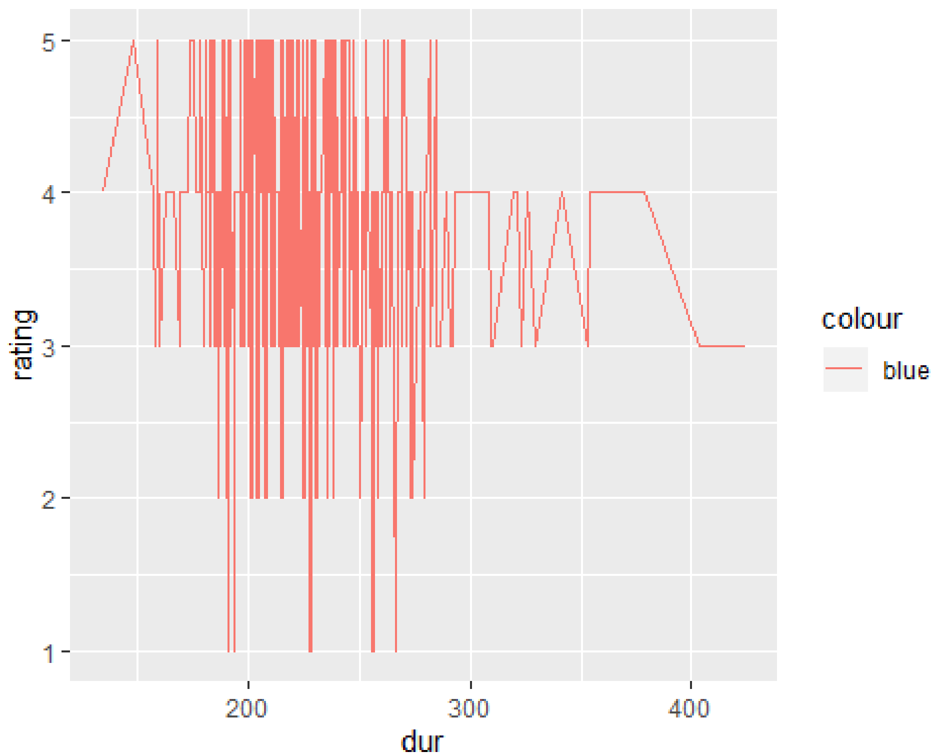
```r
hist(data_clean$acous, breaks=12,col="blue",xlab="acousticity")
```




```r
hist(data_clean$spch, breaks=12,col="blue",xlab="Speechibility")
```



```r
#Line chart for popularity and Duration
ggplot(data_clean) +geom_line(aes(x = dur, y = rating, color = "blue"))
```




```r
# T-Test on dataset columns Duration and rating
t.test(data_clean$dur,data_clean$rating, var.equal = TRUE, paired=FALSE)

##
##  Two Sample t-test
##
## data:  data_clean$dur and data_clean$rating
## t = 158.71, df = 1202, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  218.0532 223.5116
## sample estimates:
##  mean of x  mean of y
## 224.611296   3.828904

#Comparing relation between two top genre from 2010 to 2019.
star5 = data_clean[which(data_clean$rating==5),]

with(star5,t.test(dnce[top.genre=="dance pop"],dnce[top.genre=="pop"],var.equ
al=TRUE))

##
##  Two Sample t-test
##
```

```
## data:  dnce[top.genre == "dance pop"] and dnce[top.genre == "pop"]
## t = -1.0029, df = 40, p-value = 0.3219
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -13.676389   4.604961
## sample estimates:
## mean of x mean of y
##  67.03571  71.57143
```

```
with(star5,t.test(nrgy[top.genre=="dance pop"],nrgy[top.genre=="pop"],var.equ
al=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  nrgy[top.genre == "dance pop"] and nrgy[top.genre == "pop"]
## t = 1.7587, df = 40, p-value = 0.08629
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.433565 20.647851
## sample estimates:
## mean of x mean of y
##  66.67857  57.07143
```

```
with(star5,t.test(bpm[top.genre=="dance pop"],bpm[top.genre=="pop"],var.equal
=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  bpm[top.genre == "dance pop"] and bpm[top.genre == "pop"]
## t = 2.1881, df = 40, p-value = 0.03456
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   1.147886 28.923542
## sample estimates:
## mean of x mean of y
##  119.3929  104.3571
```

```
with(star5,t.test(val[top.genre=="dance pop"],val[top.genre=="pop"],var.equal
=TRUE))
```

```
##
##  Two Sample t-test
##
## data:  val[top.genre == "dance pop"] and val[top.genre == "pop"]
## t = -1.4541, df = 40, p-value = 0.1537
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -27.825938   4.540224
## sample estimates:
```

```
## mean of x mean of y
##  48.78571  60.42857

#------------------PCA------------------------

#Splitting the rating column in 2 groups as we need 2 levels for t test
#and var test (f test) calculation, so rating 1 has ratings in range 1 to 3
#and rating 5 has ratings in range from 4 to 5.
#A new column v16 stores this new rating value which is used for above mentio
ned tests

for(y in 1:length(data_clean$rating)){
  if(data_clean[y,15] >= 1 & data_clean[y,15] <= 3){
    data_clean[y,16] = 1
  }else{
    data_clean[y,16] = 5
  }
}
View(data_clean)
#We are selecting audio properties to check if any correlation
#exist between them and does that affect the rating energy, danceability, val
ence, acoustics
#and speechability is observed.


aud_prop_cor = cor(data_clean[c(7,8,11,13,14)])
##             nrgy        dnce        val      acous        spch
## nrgy   1.0000000  0.16685024  0.4102908 -0.5625564  0.10711812
## dnce   0.1668502  1.00000000  0.5049296 -0.2413363 -0.02922118
## val    0.4102908  0.50492963  1.0000000 -0.2486811  0.12284677
## acous -0.5625564 -0.24133632 -0.2486811  1.0000000  0.00246410
## spch   0.1071181 -0.02922118  0.1228468  0.0024641  1.00000000

# Correlation is low but danceability and valence are closely related

# Calculating PCA for the cleaned data
data_pca = prcomp(aud_prop_cor,scale. = TRUE)
data_pca

## Standard deviations (1, .., p=5):
## [1] 1.4439153 1.0176814 1.0011165 0.7365874 0.5784789
##
## Rotation (n x k) = (5 x 5):
##               PC1        PC2        PC3        PC4         PC5
## nrgy  -0.53106816  0.3018103 -0.3408606 -0.3818033 -0.60408400
## dnce  -0.43372652 -0.5131816  0.3929811  0.4823965 -0.40172805
## val   -0.52681796 -0.1571937  0.3907000 -0.5388521  0.50472255
## acous  0.49239464 -0.1382874  0.5100046 -0.5094188 -0.46777338
## spch  -0.09928882  0.7757074  0.5626977  0.2676767 -0.01184546

summary(data_pca)
```

```
## Importance of components:
##                           PC1    PC2    PC3    PC4     PC5
## Standard deviation     1.444 1.0177 1.0011 0.7366 0.57848
## Proportion of Variance 0.417 0.2071 0.2004 0.1085 0.06693
## Cumulative Proportion  0.417 0.6241 0.8246 0.9331 1.00000
```

```
data_pca$x
```

```
##                PC1          PC2          PC3          PC4           PC5
## 1   -1.168320396 -0.435362099 -0.039151263 -1.271456683 -0.2412041809
## 2   -1.317131044  1.378217388  1.385378953 -0.136793273 -1.1308962645
## 3   -1.432924832  0.285364744  0.704262305 -0.036255619 -0.3415971627
## 4   -1.602879141 -0.305790987 -0.636065986 -0.552231502 -0.2164379874
## 5   -0.445434523 -0.041214120 -1.082152129  0.039428584 -0.4127259666
```

```
data_pca1 = cbind(data.frame(data_clean$V16),data_pca$x)
data_pca1
```

```
##     data_clean.V16          PC1          PC2          PC3          PC4
## 1                5 -1.168320396 -0.435362099 -0.039151263 -1.271456683
## 2                5 -1.317131044  1.378217388  1.385378953 -0.136793273
## 3                5 -1.432924832  0.285364744  0.704262305 -0.036255619
## 4                5 -1.602879141 -0.305790987 -0.636065986 -0.552231502
## 5                5 -0.445434523 -0.041214120 -1.082152129  0.039428584


##               PC5
## 1   -0.2412041809
## 2   -1.1308962645
## 3   -0.3415971627
## 4   -0.2164379874
## 5   -0.4127259666
```

```
var.test(PC3~data_clean$V16,data=data_pca1)
```

```
##
##  F test to compare two variances
##
## data:  PC3 by data_clean$V16
## F = 1.022, num df = 146, denom df = 454, p-value = 0.8534
## alternative hypothesis: true ratio of variances is not equal to 1
## 95 percent confidence interval:
##  0.7915999 1.3436023
## sample estimates:
## ratio of variances
##           1.021978
```

```r
#t.test(PC1~data_clean$V16,data=data_pca)
#t.test(PC2~data_clean$V16,data=data_pca)
t.test(PC3~data_clean$V16,data=data_pca1)
```

```
##
##  Welch Two Sample t-test
##
## data:  PC3 by data_clean$V16
## t = -0.065215, df = 245.03, p-value = 0.9481
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.1945103  0.1820429
## sample estimates:
## mean in group 1 mean in group 5
##    -0.004711502     0.001522178
```