Lab 5

Jean-Baptiste Astruc

Here is the URL to the repository containing the project on Github: https://github.com/JBA15/Data-Management-Lab-5

Exercise 1

In this first exercise, we are working on the Spotify top songs data set, referencing the top songs on Spotify from 2000 to 2019.

Question 1

By using the **distinct** function, we are able to compute the number of different songs, artists and musical genre that have been included in the data set. To take into account covers of the same song made by different artists (or simply songs sharing the same title), we included both the *artist* and the *song* variable. We obtain the following results:

The data set contains 1926 songs.

The data set contains 835 artists.

The data set contains 59 genres.

Question 2

We want to compute the number of distinct artists per year.

Here is the table:

Table 1: Number of distinct artists, per year

Year	Number of distinct artists per year
1998	1
1999	30

Year	Number of distinct artists per year
2000	58
2001	77
2002	56
2003	64
2004	65
2005	69
2006	63
2007	66
2008	63
2009	61
2010	62
2011	69
2012	67
2013	64
2014	70
2015	69
2016	75
2017	86
2018	81
2019	73
2020	3

Question 3

We are looking for the most popular artist in the data set. We consider the popularity of an artist as a function of the number of their songs appearing in the data set. In other words, the more the artist has his/her songs that are appearing in the data set (which contains the top songs in Spotify between 2000 and 2019), the more popular he/she is. To make sure that we count each song once, we use the data frame created at the question 1 used to get the number of songs.

After the computations done, we can conclude that the most popular artist is Rihanna with 23 songs.

Question 4

We want to compute the mean, median, maximum and minimum of the *tempo* variable, as well as the number of songs for each musical genre. To make sure that each pair (artist, song) is used only once in the analysis, we use the same data frame as in question 3.

Here is the table that we obtain:

Table 2: Summary of the tempo variable, per genre

genre	min(tempo)	max(tempo)	mean(tempo)	median(tempo)	n()
Dance/Electronic	75.255	179.642	125.5075	126.0410	41
Folk/Acoustic, pop	94.931	128.945	111.9380	111.9380	2
Folk/Acoustic, rock	84.192	84.192	84.1920	84.1920	1
Folk/Acoustic, rock, pop	138.585	138.585	138.5850	138.5850	1
R&B	71.815	170.661	106.9248	100.4600	13
World/Traditional, Folk/Acoustic	82.803	82.803	82.8030	82.8030	1
World/Traditional, hip hop	98.077	101.993	100.0350	100.0350	2
World/Traditional, pop	108.102	108.102	108.1020	108.1020	1
World/Traditional, pop, Folk/Acoustic	100.380	104.833	102.6065	102.6065	2
World/Traditional, rock	96.000	140.083	118.0415	118.0415	2
World/Traditional, rock, pop	132.013	139.048	135.5305	135.5305	2
country	103.055	205.570	138.1508	136.0020	9
country, latin	96.055	96.055	96.0550	96.0550	1
easy listening	157.920	157.920	157.9200	157.9200	1
hip hop	64.934	179.974	116.9894	111.6795	120
hip hop, Dance/Electronic	95.948	190.151	135.4297	131.0500	15
hip hop, R&B	100.215	151.181	121.1220	111.9700	3
hip hop, country	97.984	97.984	97.9840	97.9840	1
hip hop, latin, Dance/Electronic	171.993	171.993	171.9930	171.9930	1
hip hop, pop	73.003	203.911	118.9619	119.9750	265
hip hop, pop, Dance/Electronic	72.022	196.093	120.8555	126.0620	75
hip hop, pop, R&B	60.019	203.862	115.1808	107.2030	234
hip hop, pop, R&B, Dance/Electronic	82.820	127.901	103.9113	101.0130	3
hip hop, pop, R&B, latin	82.331	100.010	91.1705	91.1705	2
hip hop, pop, country	129.370	129.370	129.3700	129.3700	1
hip hop, pop, latin	89.661	180.184	127.2119	127.0265	14
hip hop, pop, rock	84.858	179.999	123.1123	125.2500	9
hip hop, rock, pop	90.052	90.052	90.0520	90.0520	1
latin	90.013	198.075	121.6049	97.0620	15
metal	79.012	147.387	106.2089	101.9680	9
pop	65.043	195.685	120.6325	119.9520	411
pop, Dance/Electronic	84.878	198.065	123.7314	124.0800	213
pop, Folk/Acoustic	76.026	171.790	118.3595	109.9505	8
pop, R&B	68.942	210.851	117.0158	111.9645	170
pop, R&B, Dance/Electronic	84.021	176.051	112.0338	104.0865	6

genre	min(tempo)	max(tempo)	mean(tempo)	median(tempo)	n()
pop, R&B, easy listening	108.984	108.984	108.9840	108.9840	1
pop, country	97.865	147.905	130.5087	136.9250	8
pop, easy listening, Dance/Electronic	135.099	135.099	135.0990	135.0990	1
pop, easy listening, jazz	82.168	127.831	104.9995	104.9995	2
pop, latin	79.997	177.833	113.5903	104.2540	28
pop, rock	77.967	176.667	121.0976	119.0095	26
pop, rock, Dance/Electronic	87.016	189.857	133.9808	135.9875	12
pop, rock, Folk/Acoustic	102.961	112.960	107.9605	107.9605	2
pop, rock, metal	82.952	155.827	128.9358	134.7165	14
rock	74.989	199.935	129.5312	123.6960	57
rock, Dance/Electronic	127.988	127.988	127.9880	127.9880	1
rock, Folk/Acoustic, easy listening	122.979	122.979	122.9790	122.9790	1
rock, Folk/Acoustic, pop	80.529	80.529	80.5290	80.5290	1
rock, R&B, Folk/Acoustic, pop	105.987	105.987	105.9870	105.9870	1
rock, blues	123.904	141.933	132.9185	132.9185	2
rock, blues, latin	97.911	127.981	112.9460	112.9460	2
rock, classical	81.663	81.663	81.6630	81.6630	1
rock, easy listening	114.999	114.999	114.9990	114.9990	1
rock, metal	89.342	187.961	127.3922	120.0555	36
rock, pop	68.976	184.086	123.8996	124.9700	39
rock, pop, Dance/Electronic	113.049	181.994	135.7678	127.4480	8
rock, pop, metal	126.115	152.034	140.2785	141.4825	4
rock, pop, metal, Dance/Electronic	105.013	105.013	105.0130	105.0130	1
set()	68.507	184.819	120.1329	126.9620	22

Question 5

We want to compute the means of the *liveness* and the *danceability* variables, per year, in a single data frame.

Here is the table that we have:

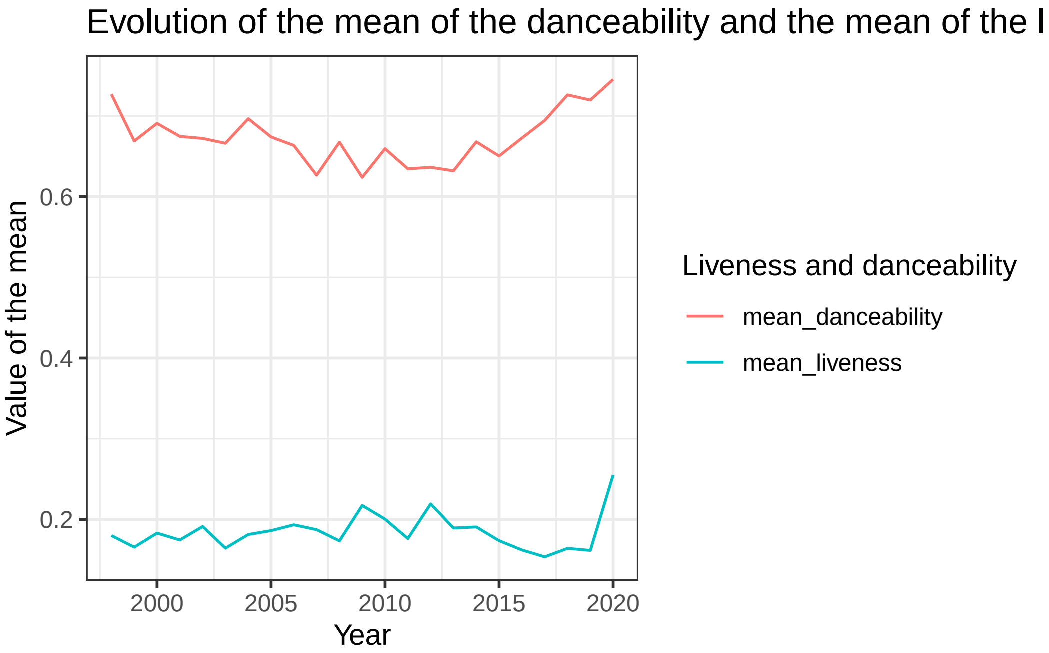
Table 3: Mean liveness and danceability, per year

year	mean_liveness	mean_danceability
1998	0.1800000	0.7270000
1999	0.1656000	0.6689737

year	mean_liveness	mean_danceability
2000	0.1830141	0.6908169
2001	0.1745019	0.6746981
2002	0.1911812	0.6722000
2003	0.1643511	0.6661556
2004	0.1812862	0.6966383
2005	0.1860881	0.6740198
2006	0.1933129	0.6634624
2007	0.1872922	0.6265889
2008	0.1733648	0.6675055
2009	0.2173341	0.6239146
2010	0.2003471	0.6594412
2011	0.1762427	0.6345312
2012	0.2192598	0.6363839
2013	0.1893674	0.6320000
2014	0.1906531	0.6679898
2015	0.1736300	0.6503889
2016	0.1621426	0.6726064
2017	0.1536101	0.6944404
2018	0.1641243	0.7260971
2019	0.1615809	0.7197640
2020	0.2550000	0.7453333

Question 6

Finally, we want to draw on a single graph the temporal evolution of the mean annual liveness and the mean annual danceability. To do so, we use the data frame from question 5. Thus:



Exercise 2

We now study the students' dropout data set from the UCI.

Question 1

We first compute the median admission grade conditioned both the *Target* variable and on the *Marital status* variable.

Question 2

We want to transform the data frame that we obtained in question 1 in order to have four variables: one for the *Marital status* variable, and one for each of the possible value of the *Target* variable.

Here is the table that we obtain:

Table 4: Target and Marital status

Marital status	Dropout	Graduate	Enrolled
single	123.35	127.3	124.05

Marital status	Dropout	Graduate	Enrolled
married	126.50	130.0	122.95
divorced	126.50	126.0	130.20
widower	129.40	170.0	151.75
facto union	119.40	120.0	119.70
legally separated	112.50	114.8	119.00

Question 3

We can compute the conditional median of all variables related to curricular units given the value of the *Gender* variable.

Question 4

We can present our results in this form:

Table 5: Curricular units, per gender

Units	Male	Female
Curricular units 1st sem (approved)	4.00000	6.0
Curricular units 1st sem (credited)	0.00000	0.0
Curricular units 1st sem (enrolled)	6.00000	6.0
Curricular units 1st sem (evaluations)	8.00000	8.0
Curricular units 1st sem (grade)	11.83333	12.5
Curricular units 1st sem (without evaluations)	0.00000	0.0
Curricular units 2nd sem (approved)	4.00000	5.0
Curricular units 2nd sem (credited)	0.00000	0.0
Curricular units 2nd sem (enrolled)	6.00000	6.0
Curricular units 2nd sem (evaluations)	8.00000	8.0
Curricular units 2nd sem (grade)	11.63604	12.5
Curricular units 2nd sem (without evaluations)	0.00000	0.0