Assignment on analysis of the spotify top list and the dropout datasets

GitHub URL

This is my public GitHub URL: https://github.com/kaderrsami/spotify_dropout

Exercise 1

Question 1

We are reading in the Spotify dataset and then identifying the number of unique songs, artists, and genres.

The data set contains 1926 unique songs, 835 unique artists, and 59 unique genres. This gives us a broad view of the data's diversity.

Question 2

Here, we are grouping the Spotify dataset by year and finding the number of distinct artists for each year.

Table 1: Number of Distinct Artists Per Year

Year	Number of Distinct Artists
1998	1
1999	30
2000	58
2001	77
2002	56
2003	64

Year	Number of Distinct Artists
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

This table shows the number of distinct artists contributing to the music landscape each year. Trends in these numbers can potentially inform us about the industry's evolution.

Question 3

We are identifying the most popular artist in the dataset based on the number of unique songs.

The most popular artist in the data set is Rihanna with 23 unique songs, indicating a significant contribution to the musical landscape.

Question 4

This question aims to calculate various statistics related to the 'tempo' of songs, grouped by genre.

Table 2: Statistics by Musical Genre

	Minimum	Maximum	Average	Median	Number of
Genre	Tempo	Tempo	Tempo	Tempo	Songs
Dance/Electronic	75.255	179.642	125.5075	126.0410	41

Genre	Minimum Tempo	Maximum Tempo	Average Tempo	Median Tempo	Number of Songs
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

Genre	Minimum Tempo	Maximum Tempo	Average Tempo	Median Tempo	Number of Songs
pop, R&B, Dance/Electronic	84.021	176.051	112.0338	104.0865	6
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

This table provides insights into the tempo characteristics of different genres. This can be useful for research related to musical patterns.

Question 5

Here, we are calculating the yearly mean for ‘liveness’ and ‘danceability’ in the songs.

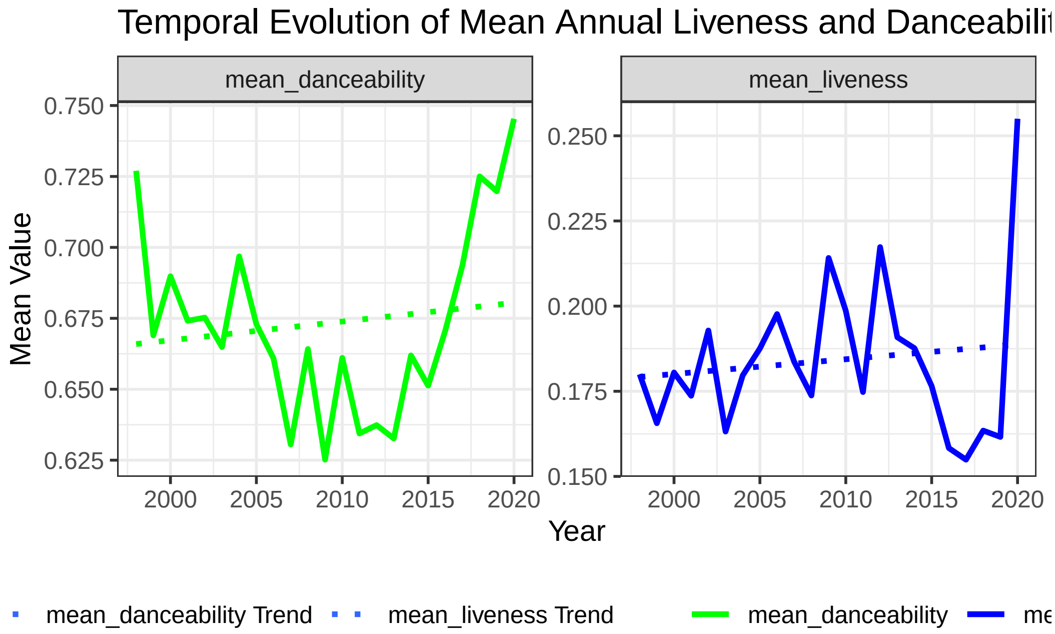
Table 3: Mean Liveness and Danceability Per Year

Year	Mean Liveness	Mean Danceability
1998	0.1800000	0.7270000
1999	0.1656000	0.6689737
2000	0.1805216	0.6898243
2001	0.1736685	0.6741296
2002	0.1928467	0.6752444
2003	0.1631701	0.6648763
2004	0.1796552	0.6968333
2005	0.1875663	0.6729231
2006	0.1976642	0.6608632
2007	0.1836223	0.6305213
2008	0.1737474	0.6641856
2009	0.2141405	0.6251667
2010	0.1986150	0.6610748
2011	0.1747636	0.6344040
2012	0.2173391	0.6373652
2013	0.1908663	0.6326404
2014	0.1876317	0.6619327
2015	0.1765152	0.6512626
2016	0.1583172	0.6707071
2017	0.1549054	0.6937387
2018	0.1634561	0.7250374
2019	0.1615809	0.7197640
2020	0.2550000	0.7453333

This table reveals the average liveness and danceability of songs year by year, which might help in analyzing trends in music preferences.

Question 6

We visualize the yearly mean values of 'liveness' and 'danceability' to understand their temporal evolution.



Temporal Evolution of Mean Annual Liveness and Danceability

From the graph, the following conclusions and observations can be made:

Overall Trend:

Mean danceability has remained relatively consistent over the 20-year period, hovering around 0.75. There are minor fluctuations, but no significant upward or downward trend is observed. This suggests that the danceability of songs has remained relatively stable over the years. Mean liveness has shown more variability over the years. The value was mostly stable from 2000 to around 2014 but has seen a sharp increase from 2015 onwards, peaking around 2020, with a mean of 0.26.

Year 2015 Onwards:

There's a noticeable uptick in the mean liveness value from 2015 onwards. This sudden rise could be indicative of a change in the music industry, where more live or live-feeling recordings made it to the top hits on Spotify. Another interpretation could be that the method of measuring 'liveness' changed or the way music was produced shifted.

Comparative Analysis:

For the majority of the years, the danceability of songs has been considerably higher than their liveness. This could suggest that, historically, top hits on Spotify have been more geared towards tracks that are catchy and easy to dance to rather than tracks that have a live performance feel. However, as we approach 2020, the gap between danceability and liveness starts to narrow, indicating a shift in preference or production towards songs with a more live-feeling.

Exercise 2

Question 1

We are grouping the dropout dataset by 'Target' and 'Marital Status' and finding the median 'Admission Grade' for these groups.

```
`summarise()` has grouped output by 'Target'. You can override using the
`.groups` argument.
```

Table 4: Median Admission Grade by Target and Marital Status

Target	Marital status	Median Admission
Dropout	single	123.35
Dropout	married	126.50
Dropout	divorced	126.50
Dropout	widower	129.40
Dropout	facto union	119.40
Dropout	legally separated	112.50
Graduate	single	127.30
Graduate	married	130.00
Graduate	divorced	126.00
Graduate	widower	170.00
Graduate	facto union	120.00
Graduate	legally separated	114.80
Enrolled	single	124.05
Enrolled	married	122.95
Enrolled	divorced	130.20
Enrolled	widower	151.75
Enrolled	facto union	119.70
Enrolled	legally separated	119.00

This table allows us to examine how median admission grades vary between different target and marital status groups.

Question 2

We are transforming the data to compare the 'Median Admission Grade' across marital statuses for each target group.

Table 5: Median Admission Grade by Marital Status and Target

Marital status	Dropout	Graduate	Enrolled
single	123.35	127.3	124.05
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

Among the dropouts, widowers have the highest median admission grade at 129.40, followed closely by those who are divorced and married. Singles have a median grade of 123.35, while those in a facto union or legally separated have the lowest median admission grades at 119.40 and 112.50 respectively.

Among the graduates, the marital status with the highest median admission grade is widower, with a significantly high score of 170. Married individuals follow at 130.0. It's worth noting the vast difference between widowers and the rest in this category.

For those enrolled, the divorced group leads with a median grade of 130.20, whereas those in a facto union and legally separated have the lowest median grades, both being under 120.

It appears that, on average, widowers tend to perform exceptionally well in terms of median admission grades when compared to other marital statuses, especially among graduates. The reasons for this might be varied and would require deeper investigation. Also, those who are legally separated or in a facto union generally have the lowest median admission grades across all target outcomes.

Question 3

Here, we are calculating the median of all curricular units, grouped by gender.

Table 6: Conditional Median of Curricular Units by Gender

	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU	CU
	1S	1S	1S	1S	1S	1S No	2S	2S	2S	2S	2S	2S No
Gender	Cred	Enr	Eval	Appr	Grade	Eval	Cred	Enr	Eval	Appr	Grade	Eval
Male	0	6	8	4	11.83333	0	0	6	8	4	11.63604	0
Female	0	6	8	6	12.50000	0	0	6	8	5	12.50000	0

Legend

Here is a breakdown of the symbols and abbreviations used in the code for table:

- `CU`: Stands for "Curricular Units," denoting the subject or course components.
- `1S`: Abbreviation for "1st Semester," indicating the period or term of the course.
- `2S`: Abbreviation for "2nd Semester," indicating the period or term of the course.
- `Cred`: Short for "credited," representing the units that have been credited to the student.
- `Enr`: Stands for "enrolled," showing the number of units the student is currently enrolled in.
- `Eval`: Short for "evaluations," showing the number of units for which the student has been evaluated.
- `Appr`: Stands for "approved," indicating the units that the student has passed or been approved for.
- `Grade`: Indicates the grade received by the student for a particular curricular unit.
- `No Eval`: Short for "without evaluations," denoting the units that have not been evaluated.

This table provides a gender-based view on the median values of different curricular units, shedding light on academic performance disparities if any.

Question 4

We are pivoting the data to a long format and then back to a wide format to calculate median values for curricular units by gender.

Table 7: Median Value of Curricular Units by Gender

Units	Male	Female
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 (approved)	4.00000	6.0
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

For credited curricular units in the first semester, both males and females have a median value of 0 and 0 respectively, implying no credited units on average.

Both males and females are enrolled in 6 and 6 curricular units on average in the first semester.

The evaluations of curricular units in the first semester for males and females are 8 and 8 respectively, indicating equal performance.

For approved curricular units in the first semester, males have a median value of 4, while females have a median value of 6, suggesting that females tend to outperform males.

The median grade for curricular units in the first semester for males is 11.8333333, and for females, it's 12.5.

For curricular units in the first semester without evaluations, both genders have a median of 0 and 0 respectively.

From the data, we can infer that, in terms of curricular units, females tend to have slightly better academic performance, especially in the context of approved units and grades. The differences, however, are not vast and might not be statistically significant, depending on the data distribution and sample size.