

```
[1] import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

In [50]: df = pd.read_csv("C:\\Users\\DELL\\Documents\\Computational data analysis project\\vp1\\tracks.csv", encoding='latin-1')

Out[50]:
```

	id	name	popularity	duration_ms	explicit	artists	id_artists	release_date	danceability	energy	key	loudness	mode	speechiness	acousticness
0	35wq3dKx1tjEWEs4tQ	CapAduo 2.16 - Banguero Atmosfera	6	126903	0	[LUI]	[45H0X5oR0i04LBEVys]	1922-02-22	0.645	0.4450	0	-13.338	1	0.4510	0
1	001585GyUdUgXK9Z3j	Vivo para Quererte - Remasterizado	0	181640	0	[Ignacio Carrara]	[5L0oOb3wSVAMkBS2Um3X2]	1922-03-21	0.434	0.1770	1	-21.180	1	0.0512	0
2	07A5y5He9e0eVJAZh3nc	El Prisionero - Remasterizado	0	176907	0	[Ignacio Carrara]	[5L0oOb3wSVAMkBS2Um3X2]	1922-03-21	0.321	0.0946	7	-27.961	1	0.0504	0
3	00f0r0BhUy1tjEWEs4tQ	Lady of the Evening	0	163080	0	[Dick Haymes]	[3BLUG2zYx9s3chTq5SAT5u]	1922	0.402	0.1580	3	-16.900	0	0.0390	0

```
In [51]: df.info()
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 586672 entries, 0 to 586671
Data columns (total 20 columns):
 #  Column                Non-Null Count  Dtype
---  --
 0  id                    586672 non-null object
 1  name                  586669 non-null object
 2  popularity            586672 non-null int64
 3  duration_ms          586672 non-null int64
 4  release_date         586672 non-null object
 5  artists              586672 non-null object
 6  id_artists           586672 non-null object
 7  release_date         586672 non-null object
 8  danceability         586672 non-null float64
 9  energy              586672 non-null float64
10  key                  586672 non-null int64
11  loudness             586672 non-null float64
12  mode                586672 non-null int64
13  speechiness         586672 non-null float64
14  acousticness         586672 non-null float64
15  instrumentality     586672 non-null float64
16  liveness             586672 non-null float64
17  valence             586672 non-null float64
18  tempo               586672 non-null float64
19  time_signature       586672 non-null int64
20  text                 float64(18), int64(8), object(5)
memory usage: 89.5+ MB

In [52]: df.describe()
df.isnull().sum()

Out[52]:
id                    0
name                  0
popularity            0
duration_ms          0
explicit             0
artists              0
id_artists           0
release_date         0
energy              0
key                  0
loudness             0
mode                0
speechiness         0
acousticness        0
instrumentality     0
liveness            0
valence             0
tempo               0
time_signature       0
dtype: int64

In [53]: df.sort_values('popularity', ascending=True).head(10)
sorted_df

Out[55]:
```

	id	name	popularity	duration_ms	explicit	artists	id_artists	release_date	danceability	energy	key	loudness	mode	speechiness	acousticness
546130	11fPRHCocgPwP7tUuVgm	Newspaper Reports On Axe, 20 February 1935	0	696575	0	[Norm Goff, Cherrie Cannon, Carlton Rice]	[3WCwCPCMaGzGmQ2q4uamr, 7y48uApM8jG5ge7RGG...	1935-02-20	0.595	0.262	8	-17.746	1		
546222	0yC2z3wKMB18TBEF8D	ae "a" ae "a", R's	0	188440	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.418	0.388	0	-8.580	1		
546221	0y48Hwe120P9UyqyPCO	55 "W" c a x	0	173467	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.642	0.178	5	-11.700	1		
546220	0nCr0ghK9a7Kzq3D6Pav	ã ã aã aã ã ã ã (EL CHOCLO)	0	205280	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.695	0.467	0	-12.236	0		
546219	08X3Z3wKPC9XNwJHfZmms	ae "a" ae "a", R's	0	185733	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.389	0.388	2	-8.221	1		
546218	08X3Z3wKPC9XNwJHfZmms	ã ã aã aã ã ã ã (EL CHOCLO)	0	183427	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.631	0.249	5	-11.883	1		
546217	08X3Z3wKPC9XNwJHfZmms	Screen Director's Playhouse, Music For Miles	0	1767071	0	[Twiss Herbert, June Alyson, Joseph Kear...	[2bndBQWmmvWwF4uE4EVMH, 4yW5a4Agj4HfFaL9L...	1949-04-10	0.533	0.317	7	-13.047	1		
546216	0K6Ea5VtYQ8M9Bcezt	ã ã aã aã ã aã	0	162147	0	[Hibei Mozart]	[1m5dMY59q3wkdJ7vQZuN]	1949	0.529	0.546	0	-6.462	0		
546215	08c3P3UzUzUxYX7yQDQq	Screen Director's Playhouse, Trade Winds dirc.	0	1776652	0	[Wally Mayer, Laurie Garnet, Tuffe...	[7Nh3TT7QyHqUwVW4RS3KT, 3kVeeP8Cp3k4QYDYv...	1949-05-19	0.599	0.321	0	-15.428	0		
546214	0Wmm5GyV3MWMW02uALE	Screen Director's Playhouse, Is A Wonderful ---	0	1767576	0	[Joseph Grady, Jimmy Shawm, Tuffe...	[6Gk59EC4L3zRRO0HAXZ53, 58B5aEzmxr89882y...	1949-05-08	0.645	0.341	8	-12.177	1		

```
In [56]: df.describe()
df.describe().transpose()

Out[56]:
```

		count	mean	std	min	25%	50%	75%	max
popularity	586672.0	27.57053	18.370642	0.0	13.0000	27.000000	41.00000	100.000	
duration_ms	586672.0	230051.167286	126526.087418	3344.0	175093.0000	214893.000000	253867.0000	5621218.000	
explicit	586672.0	0.044086	0.205286	0.0	0.0000	0.000000	0.00000	0.991	
danceability	586672.0	0.563594	0.156103	0.0	0.4530	0.549000	0.68600	0.991	
energy	586672.0	0.542036	0.251923	0.0	0.3430	0.549000	0.74900	1.000	
key	586672.0	5.221603	3.519423	0.0	2.0000	5.000000	8.00000	11.000	
loudness	586672.0	-10.206067	5.089328	-60.0	-12.8910	-9.243000	-6.48200	5.376	
mode	586672.0	0.668787	0.474114	0.0	0.0000	1.000000	1.00000	1.000	
speechiness	586672.0	0.104864	0.178893	0.0	0.0340	0.044300	0.07630	0.971	
acousticness	586672.0	0.449863	0.348837	0.0	0.0969	0.422000	0.78900	0.996	
instrumentality	586672.0	0.113451	0.266668	0.0	0.0003	0.000204	0.00955	1.000	
liveness	586672.0	0.213395	0.184326	0.0	0.0983	0.139000	0.27900	1.000	
valence	586672.0	0.552292	0.257671	0.0	0.3460	0.564000	0.76900	1.000	
tempo	586672.0	118.464857	29.764108	0.0	95.0000	117.384000	136.32100	246.381	
time_signature	586672.0	3.073382	0.473162	0.0	4.0000	4.000000	4.00000	5.000	

```
In [57]: df[df.popularity > 90]
df.sort_values('popularity', ascending=False)

Out[57]:
```

	id	name	popularity	duration_ms	explicit	artists	id_artists	release_date	danceability	energy	key	loudness	mode	speechiness	acousticness
93802	4Lyx8bUd9kq3dP32qH3g	Peaches (feat. Daniel Cassia & Shaw)	100	198082	1	[Justin Bieber, Daniel Cassia, Shaw]	[3JnFzCZ4H8GfHrzznPC13r, 20w4VLuqYV0cYrCbKf...	2021-03-19	0.677	0.696	0	-6.181	1	0.1190	
93803	7fPNZM5ASw7g7gK0WfCICS	drivers license	99	242014	1	[Chloe Riding]	[3MCMrEEETtX3mmY4aRG]	2021-01-08	0.585	0.436	10	-8.761	1	0.0901	
93804	30MypH5U3u70HnEzB277	Astronaut in the Ocean	98	132700	0	[Masked Wolf]	[3JnFzCZ4H8GfHrzznPC13r, 20w4VLuqYV0cYrCbKf...	2021-01-06	0.778	0.695	4	-6.865	0	0.0913	
92810	5QOT9Hh1wacV47BgR3Jg	Save Your Teens	97	215627	1	[The Weeknd]	[3Xy4u8uXC12mMpfH65PJ]	2020-03-20	0.680	0.826	0	-5.487	1	0.0309	
92811	6D0xYhWMM1dG8F9CIB	Blinding Lights	97	160191	0	[The Weeknd]	[3JnFzCZ4H8GfHrzznPC13r, 20w4VLuqYV0cYrCbKf...	2020-12-04	0.653	0.524	11	-9.016	0	0.0502	
92813	0VjW8G1U2AZWYdYdYdYdY	Blinding Lights	96	200040	0	[The Weeknd]	[3Xy4u8uXC12mMpfH65PJ]	2020-03-20	0.514	0.730	1	-5.934	1	0.0598	
93805	7M4BdTH4H8GfHrzznPC13r	Leave The Door Open	96	242096	0	[Bruno Mars, Anderson Paak, Silk Son]	[70b5E5VhY7YQ5mW4BACC, 3K9MCA4Z4AJM8GU...	2021-03-05	0.586	0.616	5	-7.964	1	0.0324	
92814	65SIO8dA2B2P2d0wXFN	The Business	95	154000	0	[Tina Turner]	[205D6E4VH4Pv3k3EQ9B2]	2020-09-16	0.798	0.620	8	-7.079	0	0.2320	
92816	6yMvPSK6d03d3wRvR8R	Streets	94	226987	1	[Drake Cul]	[50pJdR7YV05mW4BACC, 3K9MCA4Z4AJM8GU...	2019-11-07	0.749	0.463	11	-8.433	1	0.0828	
92818	3FAJ3GONCHQV8M5R6R6P	Heartbreak Anniversary	94	198371	0	[Gwen Sofie]	[4hdE5eU7uM04CUXgWJ7P]	2020-03-27	0.449	0.465	0	-8.964	1	0.0791	

```
In [58]: df.set_index("release_date", inplace=True)
df.index = df.index.to_datetime(df.index)
df.head()
```

```
Out[58]:
```

	id	name	popularity	duration_ms	explicit	artists	id_artists	release_date	danceability	energy	key	loudness	mode	speechiness	acousticness
1922-02-22	35wq3dKx1tjEWEs4tQ	CapAduo 2.16 - Banguero Atmosfera	6	126903	0	[LUI]	[45H0X5oR0i04LBEVys]	1922-02-22	0.645	0.4450	0	-13.338	1	0.4510	0.674
1922-06-01	02H1s4dPc0rG5KJ7TKY	Vivo para Quererte - Remasterizado	0	181640	0	[Ignacio Carrara]	[5L0oOb3wSVAMkBS2Um3X2]	1922-06-01	0.695	0.2630	0	-22.136	1	0.0570	0.797
1922-03-21	07A5y5He9e0eVJAZh3nc	El Prisionero - Remasterizado	0	181640	0	[Ignacio Carrara]	[5L0oOb3wSVAMkBS2Um3X2]	1922-03-21	0.434	0.1770	1	-21.180	1	0.0512	0.994
1922-03-21	08f0r0BhUy1tjEWEs4tQ	Lady of the Evening	0	176907	0	[Ignacio Carrara]	[5L0oOb3wSVAMkBS2Um3X2]	1922-03-21	0.321	0.0946	7	-27.961	1	0.0504	0.995
1922-01-01	0y48Hwe120P9UyqyPCO	Lady of the Evening	0	163080	0	[Dick Haymes]	[3BLUG2zYx9s3chTq5SAT5u]	1922-01-01	0.402	0.1580	3	-16.900	0	0.0390	0.985

```
In [60]: df[["artists"]].iloc[18] #artist present at 18th row location

Out[60]:
artists      [Victor Brucher]
Name: 1922-01-01 00:00:00, dtype: object

In [65]: df["duration_ms"] = df["duration_ms"].apply(lambda x: round(x/1000))
df.drop("duration_ms", inplace=True, axis=1)

KeyError: 'duration_ms'
The above exception was the direct cause of the following exception:

KeyError: 'duration_ms'
Traceback (most recent call last):
  Cell In [65], line 2
    ----> 2 df["duration_ms"] = df["duration_ms"].apply(lambda x: round(x/1000))
           ^
KeyError: 'duration_ms'

File ~\Downloads\lib\site-packages\pandas\core\frame.py:3884, in DataFrame._getitem(self, key)
 3883     return self._getitem_multilevel(key)
 3884     return self._getitem_multilevel(key)
 3885     raise KeyError(key) from err
 3886     raise KeyError(key) from err
 3887     raise KeyError(key) from err
 3888     raise KeyError(key) from err
 3889     raise KeyError(key) from err
 3890     raise KeyError(key) from err
 3891     raise KeyError(key) from err
 3892     raise KeyError(key) from err
 3893     raise KeyError(key) from err
 3894     raise KeyError(key) from err
 3895     raise KeyError(key) from err
 3896     raise KeyError(key) from err
 3897     raise KeyError(key) from err
 3898     raise KeyError(key) from err
 3899     raise KeyError(key) from err
 3900     raise KeyError(key) from err
 3901     raise KeyError(key) from err
 3902     raise KeyError(key) from err
 3903     raise KeyError(key) from err
 3904     raise KeyError(key) from err
 3905     raise KeyError(key) from err
 3906     raise KeyError(key) from err
 3907     raise KeyError(key) from err
 3908     raise KeyError(key) from err
 3909     raise KeyError(key) from err
 3910     raise KeyError(key) from err
 3911     raise KeyError(key) from err
 3912     raise KeyError(key) from err
 3913     raise KeyError(key) from err
 3914     raise KeyError(key) from err
 3915     raise KeyError(key) from err
 3916     raise KeyError(key) from err
 3917     raise KeyError(key) from err
 3918     raise KeyError(key) from err
 3919     raise KeyError(key) from err
 3920     raise KeyError(key) from err
 3921     raise KeyError(key) from err
 3922     raise KeyError(key) from err
 3923     raise KeyError(key) from err
 3924     raise KeyError(key) from err
 3925     raise KeyError(key) from err
 3926     raise KeyError(key) from err
 3927     raise KeyError(key) from err
 3928     raise KeyError(key) from err
 3929     raise KeyError(key) from err
 3930     raise KeyError(key) from err
 3931     raise KeyError(key) from err
 3932     raise KeyError(key) from err
 3933     raise KeyError(key) from err
 3934     raise KeyError(key) from err
 3935     raise KeyError(key) from err
 3936     raise KeyError(key) from err
 3937     raise KeyError(key) from err
 3938     raise KeyError(key) from err
 3939     raise KeyError(key) from err
 3940     raise KeyError(key) from err
 3941     raise KeyError(key) from err
 3942     raise KeyError(key) from err
 3943     raise KeyError(key) from err
 3944     raise KeyError(key) from err
 3945     raise KeyError(key) from err
 3946     raise KeyError(key) from err
 3947     raise KeyError(key) from err
 3948     raise KeyError(key) from err
 3949     raise KeyError(key) from err
 3950     raise KeyError(key) from err
 3951     raise KeyError(key) from err
 3952     raise KeyError(key) from err
 3953     raise KeyError(key) from err
 3954     raise KeyError(key) from err
 3955     raise KeyError(key) from err
 3956     raise KeyError(key) from err
 3957     raise KeyError(key) from err
 3958     raise KeyError(key) from err
 3959     raise KeyError(key) from err
 3960     raise KeyError(key) from err
 3961     raise KeyError(key) from err
 3962     raise KeyError(key) from err
 3963     raise KeyError(key) from err
 3964     raise KeyError(key) from err
 3965     raise KeyError(key) from err
 3966     raise KeyError(key) from err
 3967     raise KeyError(key) from err
 3968     raise KeyError(key) from err
 3969     raise KeyError(key) from err
 3970     raise KeyError(key) from err
 3971     raise KeyError(key) from err
 3972     raise KeyError(key) from err
 3973     raise KeyError(key) from err
 3974     raise KeyError(key) from err
 3975     raise KeyError(key) from err
 3976     raise KeyError(key) from err
 3977     raise KeyError(key) from err
 3978     raise KeyError(key) from err
 3979     raise KeyError(key) from err
 3980     raise KeyError(key) from err
 3981     raise KeyError(key) from err
 3982     raise KeyError(key) from err
 3983     raise KeyError(key) from err
 3984     raise KeyError(key) from err
 3985     raise KeyError(key) from err
 3986     raise KeyError(key) from err
 3987     raise KeyError(key) from err
 3988     raise KeyError(key) from err
 3989     raise KeyError(key) from err
 3990     raise KeyError(key) from err
 3991     raise KeyError(key) from err
 3992     raise KeyError(key) from err
 3993     raise KeyError(key) from err
 3994     raise KeyError(key) from err
 3995     raise KeyError(key) from err
 3996     raise KeyError(key) from err
 3997     raise KeyError(key) from err
 3998     raise KeyError(key) from err
 3999     raise KeyError(key) from err
 4000     raise KeyError(key) from err
 4001     raise KeyError(key) from err
 4002     raise KeyError(key) from err
 4003     raise KeyError(key) from err
 4004     raise KeyError(key) from err
 4005     raise KeyError(key) from err
 4006     raise KeyError(key) from err
 4007     raise KeyError(key) from err
 4008     raise KeyError(key) from err
 4009     raise KeyError(key) from err
 4010     raise KeyError(key) from err
 4011     raise KeyError(key) from err
 4012     raise KeyError(key) from err
 4013     raise KeyError(key) from err
 4014     raise KeyError(key) from err
 4015     raise KeyError(key) from err
 4016     raise KeyError(key) from err
 4017     raise KeyError(key) from err
 4018     raise KeyError(key) from err
 4019     raise KeyError(key) from err
 4020     raise KeyError(key) from err
 4021     raise KeyError(key) from err
 4022     raise KeyError(key) from err
 4023     raise KeyError(key) from err
 4024     raise KeyError(key) from err
 4025     raise KeyError(key) from err
 4026     raise KeyError(key) from err
 4027     raise KeyError(key) from err
 4028     raise KeyError(key) from err
 4029     raise KeyError(key) from err
 4030     raise KeyError(key) from err
 4031     raise KeyError(key) from err
 4032     raise KeyError(key) from err
 4033     raise KeyError(key) from err
 4034     raise KeyError(key) from err
 4035     raise KeyError(key) from err
 4036     raise KeyError(key) from err
 4037     raise KeyError(key) from err
 4038     raise KeyError(key) from err
 4039     raise KeyError(key) from err
 4040     raise KeyError(key) from err
 4041     raise KeyError(key) from err
 4042     raise KeyError(key) from err
 4043     raise KeyError(key) from err
 4044     raise KeyError(key) from err
 4045     raise KeyError(key) from err
 4046     raise KeyError(key) from err
 4047     raise KeyError(key) from err
 4048     raise KeyError(key) from err
 4049     raise KeyError(key) from err
 4050     raise KeyError(key) from err
 4051     raise KeyError(key) from err
 4052     raise KeyError(key) from err
 4053     raise KeyError(key) from err
 4054     raise KeyError(key) from err
 4055     raise KeyError(key) from err
 4056     raise KeyError(key) from err
 4057     raise KeyError(key) from err
 4058     raise KeyError(key) from err
 4059     raise KeyError(key) from err
 4060     raise KeyError(key) from err
 4061     raise KeyError(key) from err
 4062     raise KeyError(key) from err
 4063     raise KeyError(key) from err
 4064     raise KeyError(key) from err
 4065     raise KeyError(key) from err
 4066     raise KeyError(key) from err
 4067     raise KeyError(key) from err
 4068     raise KeyError(key) from err
 4069     raise KeyError(key) from err
 4070     raise KeyError(key) from err
 4071     raise KeyError(key) from err
 4072     raise KeyError(key) from err
 4073     raise KeyError(key) from err
 4074     raise KeyError(key) from err
 4075     raise KeyError(key) from err
 4076     raise KeyError(key) from err
 4077     raise KeyError(key) from err
 4078     raise KeyError(key) from err
 4079     raise KeyError(key) from err
 4080     raise KeyError(key) from err
 4081     raise KeyError(key) from err
 4082     raise KeyError(key) from err
 4083     raise KeyError(key) from err
 4084     raise KeyError(key) from err
 4085     raise KeyError(key) from err
 4086     raise KeyError(key) from err
 4087     raise KeyError(key) from err
 4088     raise KeyError(key) from err
 4089     raise KeyError(key) from err
 4090     raise KeyError(key) from err
 4091     raise KeyError(key) from err
 4092     raise KeyError(key) from err
 4093     raise KeyError(key) from err
 4094     raise KeyError(key) from err
 4095     raise KeyError(key) from err
 4096     raise KeyError(key) from err
 4097     raise KeyError(key) from err
 4098     raise KeyError(key) from err
 4099     raise KeyError(key) from err
 4100     raise KeyError(key) from err
 4101     raise KeyError(key) from err
 4102     raise KeyError(key) from err
 4103     raise KeyError(key) from err
 4104     raise KeyError(key) from err
 4105     raise KeyError(key) from err
 4106     raise KeyError(key) from err
 4107     raise KeyError(key) from err
 4108     raise KeyError(key) from err
 4109     raise KeyError(key) from err
 4110     raise KeyError(key) from err
 4111     raise KeyError(key) from err
 4112     raise KeyError(key) from err
 4113     raise KeyError(key) from err
 4114     raise KeyError(key) from err
 4115     raise KeyError(key) from err
 4116     raise KeyError(key) from err
 4117     raise KeyError(key) from err
 4118     raise KeyError(key) from err
 4119     raise KeyError(key) from err
 4120     raise KeyError(key) from err
 4121     raise KeyError(key) from err
 4122     raise KeyError(key) from err
 4123     raise KeyError(key) from err
 4124     raise KeyError(key) from err
 4125     raise KeyError(key) from err
 4126     raise KeyError(key) from err
 4127     raise KeyError(key) from err
 4128     raise KeyError(key) from err
 4129     raise KeyError(key) from err
 4130     raise KeyError(key) from err
 4131     raise KeyError(key) from err
 4132     raise KeyError(key) from err
 4133     raise KeyError(key) from err
 4134     raise KeyError(key) from err
 4135     raise KeyError(key) from err
 4136     raise KeyError(key) from err
 4137     raise KeyError(key) from err
 4138     raise KeyError(key) from err
 4139     raise KeyError(key) from err
 4140     raise KeyError(key) from err
 4141     raise KeyError(key) from err
 4142     raise KeyError(key) from err
 4143     raise KeyError(key) from err
 4144     raise KeyError(key) from err
 4145     raise KeyError(key) from err
 4146     raise KeyError(key) from err
 4147     raise KeyError(key) from err
 4148     raise KeyError(key) from err
 4149     raise KeyError(key) from err
 4150     raise KeyError(key) from err
 4151     raise KeyError(key) from err
 4152     raise KeyError(key) from err
 4153     raise KeyError(key) from err
 4154     raise KeyError(key) from err
 4155     raise KeyError(key) from err
 4156     raise KeyError(key) from err
 4157     raise KeyError(key) from err
 4158     raise KeyError(key) from err
 4
```