Московский государственный технический университет им. Н.Э. Баумана
Кафедра «Системы обработки информации и управления»

Лабораторная работа №1
по дисциплине
«Методы машинного обучения»
на тему
«Разведочный анализ данных. Исследование и визуализация данных»

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1. Цель лабораторной работы

Изучение различных методов визуализация данных.

2. Задание

Выбрать набор данных (датасет).
Для лабораторных работ не рекомендуется выбирать датасеты большого размера.
Создать ноутбук, который содержит следующие разделы:

- Текстовое описание выбранного Вами набора данных.
- Основные характеристики датасета.
- Визуальное исследование датасета.
- Информация о корреляции признаков.

3. Ход работы

In [1]:
```
import pandas as pd
import seaborn as sn
```

In [3]:
```
dt = pd.read_csv('data/top_spotify_tracks.csv', header=0)
```

In [4]:
```
dt
```

Out[4]:

	id	na
0	6DCZcSspjsKoFjzjrWoCd	God's Pl
1	3ee8Jmje8o58CHK66QrVC	S
2	0e7ipj03S05BNilyu5bRz	rockstar (feat. 21 Savag
3	3swc6WTsr7rl9DqQKQA55	Psycho (feat. Ty Dolla $ig
4	2G7V7zsVDxg1yRsu7Ew9R	In My Feelin
5	7dt6x5M1jzdTEt8oCbisT	Better
6	58q2HKrzhC3ozto2nDdN4	I Like
7	7ef4DlsgrMEH11cDZd32M	One Kiss (with Dua Li
8	76cy1WJvNGJTj78UqeA5z	ID
9	08bNPGLD8AhKpnnERrAc6	FRIE
10	1rfofaqEpACxVEHIZBJe6	Hav
11	0s3nnoMeVWz3989MkNQiR	Lucid Dre
12	3CA9pLiwRIGtUBiMjbZmR	Nice For W
13	7fa9MBXhVfQ8P8Df9OEbD	Girls Like You (feat. Cardi
14	09IStsImFySgyp0pIQdqA	The Mid
15	3GCdLUSnKSMJhs4Tj6CV3	All The Stars (with S
16	2qT1uLXPVPzGgFOx4jtEu	no tears left to
17	39N9RPD9MRb5WmoLzNzPe	
18	0JP9xo3adEtGSdUEISisz	Moonli
19	4qKcDkK6siZ7Jp1Jb4m0a	Look Alive (feat. Dra
20	5CLGzJsGqhCEECcpnFQA8	These Days (feat. Jess Glynne, Macklemore & Da
21	3V8UKqhEK5zBkBb6d6ub8	Te Bot? - Re
22	7uzmGiiJyRfuViKKK3lVm	M
23	2iUXsYOEPhVqEBwsqP7Or	Youngbl
24	2xJCMIJfcNYDc5iR0sAm2	New Ru

```
25  7qiZfU4dY1lWllzX7mPBI                                         Shape of Y
26  45Egmo7icyopuzJN0oMEd                               Love Lies (with Normar
27  4e4fqjx0Izh4svvTef1z7            Meant to Be (feat. Florida Georgia Lir
28  7m9OqQk4RVRkw9JJdeAw9                                       Jocelyn Flor
29  0tgVpDi06FyKpA1z0VMD4                                              Perfe
..                      …                                                  …
70  5Gu0PDLN4YJeW75PpBSg9  Let Me Go (with Alesso, Florida Georgia Line &
71  6QgjcU0zLnzq5OrUoSZ3O                                        Feel It Sti
72  77UjLW8j5UAGAGVGhR5oU                        Pray For Me (with Kendrick Lama
73  6n4U3TlzUGhdSFbUUhTvL                                       Walk It Talk
74  5k38wzpLb15YgncyWdTZE                                  Him & I (with Halse
75  32lItqlMi4LBhb4k0BaSa                                          Candy Pai
76  3a1lNhkSLSkpJE4MSHpDu                                       Congratulatic
77  4QtiVmuA88tPQiC0HZuQ5           1, 2, 3 (feat. Jason Derulo & De La Ghett
78  6Za3190Sbw39BBC77WSS1                                             Crimir
79  1ZAyjvIk9YiD76yYy0TEG                                            Plug Wa
80  0u2P5u6lvoDfwTYjAADbn                                 lovely (with Khali
81  2UVbBKQ0dFAekPTRsnkzc                                             Stir I
82  7KXjTSCq5nL1LoYtL7XAw                                              HUMBI
83  48zFZh27QU5qsrBjn4C2F                                           Vaina Lo
84  1bhUWB0zJMIKr9yVPrkEu                     Perfect Duet (Ed Sheeran & Beyonc
85  5cepAtqnEQ6yVG6088zMM                           Coraz?n (feat. Nego do Bore
86  5Z3GHaZ6ec9bsiI5Benrb                                     Young Dumb & Bro
87  5Y9fnynLlIvqtM710MHzf                                       S?guelo Bailar
88  3Ga6eKrUFf12ouh9Yw3v2                                             Downto
89  3xcCix7Jv1Rp90YVmgo35                                                Bel
90  5N5k9nd479b1xpDZ4usjr                                Promises (with Sam Smit
91  6vN77lE9LK6HP2DewaN6H                                          Yes Inde
92  2P91MQbaiQ0fbiz9VqhqK                                      I Like Me Bett
93  2xGjteMU3E1tkEPVFBO08                                            This Is
94  3GVkPk8mqxz0itaAriG1L                     Everybody Dies In Their Nightmar
95  630sXRhIcfwr2e4RdNtjK                                       Rewrite The Sta
96  2xmrfQpmS2iJExTlklLoA                     I Miss You (feat. Julia Michael
97  5WvAo7DNuPRmk4APhdPzi                                           No Brair
98  1j4kHkkpqZRBwE0A4CN4Y                          Dusk Till Dawn - Radio Ec
99  3EPXxR3ImUwfayaurPi3c                                           Be Alrig

              artists  danceability  energy   key  loudness  mode  \
0               Drake         0.754   0.449   7.0    -9.211   1.0
1        XXXTENTACION         0.740   0.613   8.0    -4.880   1.0
2         Post Malone         0.587   0.535   5.0    -6.090   0.0
3         Post Malone         0.739   0.559   8.0    -8.011   1.0
4               Drake         0.835   0.626   1.0    -5.833   1.0
5         Post Malone         0.680   0.563  10.0    -5.843   1.0
6             Cardi B         0.816   0.726   5.0    -3.998   0.0
7       Calvin Harris         0.791   0.862   9.0    -3.240   0.0
8            Dua Lipa         0.836   0.544   7.0    -5.975   1.0
9          Marshmello         0.626   0.880   9.0    -2.384   0.0
10     Camila Cabello         0.765   0.523   2.0    -4.333   1.0
11         Juice WRLD         0.511   0.566   6.0    -7.230   0.0
```

12	Drake	0.586	0.909	8.0	-6.474	1.0
13	Maroon 5	0.851	0.541	0.0	-6.825	1.0
14	Zedd	0.753	0.657	7.0	-3.061	1.0
15	Kendrick Lamar	0.698	0.633	8.0	-4.946	1.0
16	Ariana Grande	0.699	0.713	9.0	-5.507	0.0
17	Nicky Jam	0.595	0.773	9.0	-4.736	0.0
18	XXXTENTACION	0.921	0.537	9.0	-5.723	0.0
19	BlocBoy JB	0.922	0.581	10.0	-7.495	1.0
20	Rudimental	0.653	0.809	0.0	-4.057	1.0
21	Nio Garcia	0.903	0.675	11.0	-3.445	0.0
22	Bazzi	0.710	0.789	4.0	-3.874	1.0
23	5 Seconds of Summer	0.596	0.854	7.0	-5.114	0.0
24	Dua Lipa	0.762	0.700	9.0	-6.021	0.0
25	Ed Sheeran	0.825	0.652	1.0	-3.183	0.0
26	Khalid	0.708	0.648	6.0	-5.626	1.0
27	Bebe Rexha	0.642	0.772	10.0	-6.610	1.0
28	XXXTENTACION	0.872	0.391	0.0	-9.144	0.0
29	Ed Sheeran	0.599	0.448	8.0	-6.312	1.0
..	…	… …	…		…	…
70	Hailee Steinfeld	0.663	0.708	8.0	-4.154	1.0
71	Portugal. The Man	0.801	0.795	1.0	-5.115	0.0
72	The Weeknd	0.735	0.677	2.0	-4.979	1.0
73	Migos	0.909	0.628	2.0	-5.456	1.0
74	G-Eazy	0.589	0.731	2.0	-6.343	1.0
75	Post Malone	0.670	0.654	4.0	-5.944	1.0
76	Post Malone	0.630	0.804	6.0	-4.183	1.0
77	Sofia Reyes	0.792	0.895	1.0	-3.112	0.0
78	Natti Natasha	0.814	0.813	2.0	-3.023	0.0
79	Rich The Kid	0.876	0.519	11.0	-6.531	1.0
80	Billie Eilish	0.351	0.296	4.0	-10.109	0.0
81	Migos	0.815	0.816	2.0	-5.474	1.0
82	Kendrick Lamar	0.908	0.621	1.0	-6.638	0.0
83	Ozuna	0.754	0.805	6.0	-4.249	1.0
84	Ed Sheeran	0.587	0.299	8.0	-7.365	1.0
85	Maluma	0.722	0.738	9.0	-6.073	0.0
86	Khalid	0.798	0.539	1.0	-6.351	1.0
87	Ozuna	0.855	0.664	9.0	-7.110	0.0
88	Anitta	0.775	0.679	4.0	-4.985	0.0
89	Wolfine	0.909	0.493	3.0	-6.688	1.0
90	Calvin Harris	0.781	0.768	11.0	-5.991	1.0
91	Lil Baby	0.964	0.346	5.0	-9.309	0.0
92	Lauv	0.752	0.505	9.0	-7.621	1.0
93	Keala Settle	0.284	0.704	2.0	-7.276	1.0
94	XXXTENTACION	0.734	0.570	7.0	-7.066	0.0
95	Zac Efron	0.684	0.619	10.0	-7.005	1.0
96	Clean Bandit	0.638	0.658	3.0	-6.318	1.0
97	DJ Khaled	0.552	0.760	0.0	-4.706	1.0
98	ZAYN	0.258	0.437	11.0	-6.593	0.0
99	Dean Lewis	0.553	0.586	11.0	-6.319	1.0

	speechiness	acousticness	instrumentalness	liveness	valence	temp
0	0.1090	0.033200	0.000083	0.5520	0.3570	77.16
1	0.1450	0.258000	0.003720	0.1230	0.4730	75.02
2	0.0898	0.117000	0.000066	0.1310	0.1400	159.84
3	0.1170	0.580000	0.000000	0.1120	0.4390	140.12
4	0.1250	0.058900	0.000060	0.3960	0.3500	91.03
5	0.0454	0.354000	0.000000	0.1360	0.3740	145.02
6	0.1290	0.099000	0.000000	0.3720	0.6500	136.04
7	0.1100	0.037000	0.000022	0.0814	0.5920	123.99
8	0.0943	0.040300	0.000000	0.0824	0.5100	97.02
9	0.0504	0.205000	0.000000	0.1280	0.5340	95.07
10	0.0300	0.184000	0.000036	0.1320	0.3940	104.98
11	0.2000	0.349000	0.000000	0.3400	0.2180	83.90
12	0.0705	0.089100	0.000109	0.1190	0.7570	93.39
13	0.0505	0.568000	0.000000	0.1300	0.4480	124.95
14	0.0449	0.171000	0.000000	0.1120	0.4370	107.01
15	0.0597	0.060500	0.000194	0.0926	0.5520	96.92
16	0.0594	0.040000	0.000003	0.2940	0.3540	121.99
17	0.0549	0.036400	0.001080	0.3340	0.7110	180.07
18	0.0804	0.556000	0.004040	0.1020	0.7110	128.00
19	0.2700	0.001040	0.000059	0.1050	0.5950	140.02
20	0.0474	0.194000	0.000000	0.1650	0.5500	92.21
21	0.2140	0.542000	0.000013	0.0595	0.4420	96.50
22	0.0722	0.016100	0.000003	0.4510	0.7170	142.92
23	0.4630	0.016900	0.000000	0.1240	0.1520	120.27
24	0.0694	0.002610	0.000016	0.1530	0.6080	116.07
25	0.0802	0.581000	0.000000	0.0931	0.9310	95.97
26	0.0449	0.095600	0.000000	0.1340	0.3380	143.95
27	0.0848	0.047600	0.000000	0.0646	0.5890	153.99
28	0.2420	0.469000	0.000004	0.2970	0.4370	134.02
29	0.0232	0.163000	0.000000	0.1060	0.1680	95.05
..	…	…	…	… …	…	
70	0.0473	0.033700	0.000000	0.0841	0.7420	103.07
71	0.0504	0.041700	0.000113	0.0717	0.7540	79.02
72	0.0930	0.076200	0.000022	0.1110	0.1880	100.58
73	0.2010	0.073900	0.000000	0.1080	0.4060	145.90
74	0.0868	0.053400	0.000000	0.3080	0.1910	87.90
75	0.1530	0.627000	0.000001	0.0710	0.4380	180.02
76	0.0363	0.215000	0.000000	0.2530	0.4920	123.14
77	0.0589	0.165000	0.000000	0.0501	0.7940	94.96
78	0.0561	0.030000	0.000093	0.2550	0.8390	79.99
79	0.1430	0.202000	0.000000	0.1080	0.1580	94.98
80	0.0333	0.934000	0.000000	0.0950	0.1200	115.28
81	0.2690	0.002990	0.000000	0.1590	0.4980	181.96
82	0.1020	0.000282	0.000054	0.0958	0.4210	150.01
83	0.0752	0.315000	0.000000	0.2030	0.5550	93.98
84	0.0263	0.779000	0.000000	0.1230	0.3560	94.99
85	0.2470	0.328000	0.000015	0.1980	0.7480	198.07
86	0.0421	0.199000	0.000017	0.1650	0.3940	136.94
87	0.0607	0.165000	0.000040	0.0937	0.6260	98.01

```
88      0.1350    0.180000         0.000073    0.0680    0.6190  166.00
89      0.0735    0.128000         0.000147    0.1270    0.8440   94.01
90      0.0394    0.011900         0.000005    0.3250    0.4860  123.07
91      0.5300    0.035000         0.000000    0.1080    0.5620  119.95
92      0.2530    0.535000         0.000003    0.1040    0.4190   91.97
93      0.1860    0.005830         0.000115    0.0424    0.1000  191.70
94      0.1330    0.847000         0.000021    0.1120    0.6890  129.95
95      0.0386    0.071600         0.000000    0.1220    0.2840  125.04
96      0.0456    0.245000         0.000004    0.0919    0.3300  105.07
97      0.3420    0.073300         0.000000    0.0865    0.6390  135.70
98      0.0390    0.101000         0.000001    0.1060    0.0967  180.04
99      0.0362    0.697000         0.000000    0.0813    0.4430  126.68

    duration_ms  time_signature
0      198973.0             4.0
1      166606.0             4.0
2      218147.0             4.0
3      221440.0             4.0
4      217925.0             4.0
5      231267.0             4.0
6      253390.0             4.0
7      214847.0             4.0
8      217947.0             4.0
9      202621.0             4.0
10     217307.0             4.0
11     239836.0             4.0
12     210747.0             4.0
13     235545.0             4.0
14     184732.0             4.0
15     232187.0             4.0
16     205920.0             4.0
17     173628.0             4.0
18     135090.0             4.0
19     181263.0             4.0
20     210773.0             4.0
21     417920.0             4.0
22     131064.0             4.0
23     203418.0             4.0
24     209320.0             4.0
25     233713.0             4.0
26     201707.0             4.0
27     164205.0             4.0
28     119133.0             4.0
29     263400.0             3.0
..          …             …
70     174800.0             4.0
71     163253.0             4.0
72     211440.0             4.0
73     276147.0             4.0
74     268867.0             4.0
```

```
75     227533.0             4.0
76     220293.0             4.0
77     201526.0             4.0
78     232550.0             4.0
79     175230.0             4.0
80     200186.0             4.0
81     190288.0             4.0
82     177000.0             4.0
83     176133.0             4.0
84     259550.0             3.0
85     184720.0             4.0
86     202547.0             4.0
87     226800.0             4.0
88     193456.0             4.0
89     197120.0             4.0
90     213309.0             4.0
91     142273.0             4.0
92     197437.0             4.0
93     234707.0             4.0
94      95467.0             4.0
95     217440.0             4.0
96     205748.0             4.0
97     260000.0             5.0
98     239000.0             4.0
99     196373.0             4.0

[100 rows x 16 columns]
```

```
In [5]: dt.shape
```

```
Out[5]: (100, 16)
```

```
In [7]: dt.dtypes
```

```
Out[7]: id                   object
        name                 object
        artists              object
        danceability        float64
        energy              float64
        key                 float64
        loudness            float64
        mode                float64
        speechiness         float64
        acousticness        float64
        instrumentalness    float64
        liveness            float64
        valence             float64
        tempo               float64
        duration_ms         float64
        time_signature      float64
        dtype: object
```

In [8]:
```
dt.describe()
```

Out[8]:
```
       danceability      energy         key    loudness        mode  \
count     100.00000  100.000000  100.000000  100.000000  100.000000
mean        0.71646    0.659060    5.330000   -5.677640    0.590000
std         0.13107    0.145067    3.676447    1.777577    0.494311
min         0.25800    0.296000    0.000000  -10.109000    0.000000
25%         0.63550    0.562000    1.750000   -6.650500    0.000000
50%         0.73300    0.678000    5.000000   -5.566500    1.000000
75%         0.79825    0.772250    8.250000   -4.363750    1.000000
max         0.96400    0.909000   11.000000   -2.384000    1.000000

       speechiness  acousticness  instrumentalness    liveness     valenc
count   100.000000    100.000000        100.000000  100.000000  100.00000
mean      0.115569      0.195701          0.001584    0.158302    0.48444
std       0.104527      0.220946          0.013449    0.111662    0.20614
min       0.023200      0.000282          0.000000    0.021500    0.07960
25%       0.045350      0.040225          0.000000    0.094675    0.34100
50%       0.074950      0.109000          0.000000    0.118500    0.47050
75%       0.137000      0.247750          0.000031    0.170750    0.64150
max       0.530000      0.934000          0.134000    0.636000    0.93100

            tempo    duration_ms  time_signature
count  100.000000     100.000000          100.00
mean   119.904180  205206.780000            3.98
std     28.795984   40007.893404            0.20
min     64.934000   95467.000000            3.00
25%     95.730750  184680.000000            4.00
50%    120.116000  205047.500000            4.00
75%    140.022750  221493.250000            4.00
max    198.075000  417920.000000            5.00
```

In [9]:
```
dt['id'] = dt['id'].astype('category')
dt['name'] = dt['name'].astype('category')
dt['artists'] = dt['artists'].astype('category')
```

In [10]:
```
dt['id'] = dt['id'].cat.codes
dt['name'] = dt['name'].cat.codes
dt['artists'] = dt['artists'].cat.codes
```

In [14]:
```
dt.describe()
```

Out[14]:
```
               id        name    artists  danceability      energy  \
count  100.000000  100.000000  100.000000    100.00000  100.000000
mean    49.500000   49.500000   36.010000      0.71646    0.659060
std     29.011492   29.011492   19.977004      0.13107    0.145067
min      0.000000    0.000000    0.000000      0.25800    0.296000
25%     24.750000   24.750000   20.750000      0.63550    0.562000
50%     49.500000   49.500000   36.500000      0.73300    0.678000
75%     74.250000   74.250000   52.000000      0.79825    0.772250
max     99.000000   99.000000   69.000000      0.96400    0.909000
```

```
             key    loudness        mode  speechiness  acousticness  \
count  100.000000  100.000000  100.000000   100.000000    100.000000
mean     5.330000   -5.677640    0.590000     0.115569      0.195701
std      3.676447    1.777577    0.494311     0.104527      0.220946
min      0.000000  -10.109000    0.000000     0.023200      0.000282
25%      1.750000   -6.650500    0.000000     0.045350      0.040225
50%      5.000000   -5.566500    1.000000     0.074950      0.109000
75%      8.250000   -4.363750    1.000000     0.137000      0.247750
max     11.000000   -2.384000    1.000000     0.530000      0.934000

       instrumentalness    liveness     valence       tempo    duration_
count        100.000000  100.000000  100.000000  100.000000     100.0000
mean           0.001584    0.158302    0.484443  119.904180  205206.7800
std            0.013449    0.111662    0.206145   28.795984   40007.8934
min            0.000000    0.021500    0.079600   64.934000   95467.0000
25%            0.000000    0.094675    0.341000   95.730750  184680.0000
50%            0.000000    0.118500    0.470500  120.116000  205047.5000
75%            0.000031    0.170750    0.641500  140.022750  221493.2500
max            0.134000    0.636000    0.931000  198.075000  417920.0000

       time_signature
count          100.00
mean             3.98
std              0.20
min              3.00
25%              4.00
50%              4.00
75%              4.00
max              5.00
```

```
In [15]: dt
```

```
Out[15]:     id  name  artists  danceability  energy   key  loudness  mode  \
         0   76    30       21         0.754   0.449   7.0    -9.211   1.0
         1   49    72       65         0.740   0.613   8.0    -4.880   1.0
         2    7    99       52         0.587   0.535   5.0    -6.090   0.0
         3   50    66       52         0.739   0.559   8.0    -8.011   1.0
         4   25    41       21         0.835   0.626   1.0    -5.833   1.0
         5   92     8       52         0.680   0.563  10.0    -5.843   1.0
         6   62    36       13         0.816   0.726   5.0    -3.998   0.0
         7   93    60       11         0.791   0.862   9.0    -3.240   0.0
         8   85    39       22         0.836   0.544   7.0    -5.975   1.0
         9    0    22       42         0.626   0.880   9.0    -2.384   0.0
         10  21    33       12         0.765   0.523   2.0    -4.333   1.0
         11   9    49       30         0.511   0.566   6.0    -7.230   0.0
         12  40    57       21         0.586   0.909   8.0    -6.474   1.0
         13  94    28       41         0.851   0.541   0.0    -6.825   1.0
         14   1    82       68         0.753   0.657   7.0    -3.061   1.0
         15  42     3       32         0.698   0.633   8.0    -4.946   1.0
         16  33    98        4         0.699   0.713   9.0    -5.507   0.0
```

17	39	91	46	0.595	0.773	9.0	-4.736	0.0
18	3	53	65	0.921	0.537	9.0	-5.723	0.0
19	59	47	9	0.922	0.581	10.0	-7.495	1.0
20	63	83	55	0.653	0.809	0.0	-4.057	1.0
21	46	81	47	0.903	0.675	11.0	-3.445	0.0
22	98	52	5	0.710	0.789	4.0	-3.874	1.0
23	31	95	0	0.596	0.854	7.0	-5.114	0.0
24	35	56	22	0.762	0.700	9.0	-6.021	0.0
25	96	74	24	0.825	0.652	1.0	-3.183	0.0
26	52	48	33	0.708	0.648	6.0	-5.626	1.0
27	55	51	6	0.642	0.772	10.0	-6.610	1.0
28	95	44	65	0.872	0.391	0.0	-9.144	0.0
29	11	61	24	0.599	0.448	8.0	-6.312	1.0
..	..	…	…	… …	…	…	… …	
70	64	45	27	0.663	0.708	8.0	-4.154	1.0
71	78	23	51	0.801	0.795	1.0	-5.115	0.0
72	86	64	60	0.735	0.677	2.0	-4.979	1.0
73	82	88	43	0.909	0.628	2.0	-5.456	1.0
74	72	34	26	0.589	0.731	2.0	-6.343	1.0
75	38	11	52	0.670	0.654	4.0	-5.944	1.0
76	48	12	52	0.630	0.804	6.0	-4.183	1.0
77	54	0	59	0.792	0.895	1.0	-3.112	0.0
78	79	14	45	0.814	0.813	2.0	-3.023	0.0
79	14	63	54	0.876	0.519	11.0	-6.531	1.0
80	12	97	8	0.351	0.296	4.0	-10.109	0.0
81	28	78	43	0.815	0.816	2.0	-5.474	1.0
82	91	31	32	0.908	0.621	1.0	-6.638	0.0
83	53	87	49	0.754	0.805	6.0	-4.249	1.0
84	15	62	24	0.587	0.299	8.0	-7.365	1.0
85	71	13	40	0.722	0.738	9.0	-6.073	0.0
86	70	94	33	0.798	0.539	1.0	-6.351	1.0
87	69	71	49	0.855	0.664	9.0	-7.110	0.0
88	44	16	2	0.775	0.679	4.0	-4.985	0.0
89	51	7	64	0.909	0.493	3.0	-6.688	1.0
90	66	65	11	0.781	0.768	11.0	-5.991	1.0
91	83	93	35	0.964	0.346	5.0	-9.309	0.0
92	26	37	34	0.752	0.505	9.0	-7.621	1.0
93	34	84	31	0.284	0.704	2.0	-7.276	1.0
94	43	20	65	0.734	0.570	7.0	-7.066	0.0
95	73	67	67	0.684	0.619	10.0	-7.005	1.0
96	37	38	14	0.638	0.658	3.0	-6.318	1.0
97	68	58	15	0.552	0.760	0.0	-4.706	1.0
98	18	18	66	0.258	0.437	11.0	-6.593	0.0
99	41	5	19	0.553	0.586	11.0	-6.319	1.0

	speechiness	acousticness	instrumentalness	liveness	valence	te
0	0.1090	0.033200	0.000083	0.5520	0.3570	77.
1	0.1450	0.258000	0.003720	0.1230	0.4730	75.0
2	0.0898	0.117000	0.000066	0.1310	0.1400	159.8
3	0.1170	0.580000	0.000000	0.1120	0.4390	140.

4	0.1250	0.058900	0.000060	0.3960	0.3500	91.0
5	0.0454	0.354000	0.000000	0.1360	0.3740	145.0
6	0.1290	0.099000	0.000000	0.3720	0.6500	136.0
7	0.1100	0.037000	0.000022	0.0814	0.5920	123.9
8	0.0943	0.040300	0.000000	0.0824	0.5100	97.0
9	0.0504	0.205000	0.000000	0.1280	0.5340	95.0
10	0.0300	0.184000	0.000036	0.1320	0.3940	104.9
11	0.2000	0.349000	0.000000	0.3400	0.2180	83.9
12	0.0705	0.089100	0.000109	0.1190	0.7570	93.3
13	0.0505	0.568000	0.000000	0.1300	0.4480	124.9
14	0.0449	0.171000	0.000000	0.1120	0.4370	107.0
15	0.0597	0.060500	0.000194	0.0926	0.5520	96.9
16	0.0594	0.040000	0.000003	0.2940	0.3540	121.9
17	0.0549	0.036400	0.001080	0.3340	0.7110	180.0
18	0.0804	0.556000	0.004040	0.1020	0.7110	128.0
19	0.2700	0.001040	0.000059	0.1050	0.5950	140.0
20	0.0474	0.194000	0.000000	0.1650	0.5500	92.2
21	0.2140	0.542000	0.000013	0.0595	0.4420	96.5
22	0.0722	0.016100	0.000003	0.4510	0.7170	142.9
23	0.4630	0.016900	0.000000	0.1240	0.1520	120.2
24	0.0694	0.002610	0.000016	0.1530	0.6080	116.0
25	0.0802	0.581000	0.000000	0.0931	0.9310	95.9
26	0.0449	0.095600	0.000000	0.1340	0.3380	143.9
27	0.0848	0.047600	0.000000	0.0646	0.5890	153.9
28	0.2420	0.469000	0.000004	0.2970	0.4370	134.0
29	0.0232	0.163000	0.000000	0.1060	0.1680	95.0
..	…	…	… …	…	…	
70	0.0473	0.033700	0.000000	0.0841	0.7420	103.0
71	0.0504	0.041700	0.000113	0.0717	0.7540	79.0
72	0.0930	0.076200	0.000022	0.1110	0.1880	100.5
73	0.2010	0.073900	0.000000	0.1080	0.4060	145.9
74	0.0868	0.053400	0.000000	0.3080	0.1910	87.9
75	0.1530	0.627000	0.000001	0.0710	0.4380	180.0
76	0.0363	0.215000	0.000000	0.2530	0.4920	123.1
77	0.0589	0.165000	0.000000	0.0501	0.7940	94.9
78	0.0561	0.030000	0.000093	0.2550	0.8390	79.9
79	0.1430	0.202000	0.000000	0.1080	0.1580	94.9
80	0.0333	0.934000	0.000000	0.0950	0.1200	115.2
81	0.2690	0.002990	0.000000	0.1590	0.4980	181.9
82	0.1020	0.000282	0.000054	0.0958	0.4210	150.0
83	0.0752	0.315000	0.000000	0.2030	0.5550	93.9
84	0.0263	0.779000	0.000000	0.1230	0.3560	94.9
85	0.2470	0.328000	0.000015	0.1980	0.7480	198.0
86	0.0421	0.199000	0.000017	0.1650	0.3940	136.9
87	0.0607	0.165000	0.000040	0.0937	0.6260	98.0
88	0.1350	0.180000	0.000073	0.0680	0.6190	166.0
89	0.0735	0.128000	0.000147	0.1270	0.8440	94.0
90	0.0394	0.011900	0.000005	0.3250	0.4860	123.0
91	0.5300	0.035000	0.000000	0.1080	0.5620	119.9
92	0.2530	0.535000	0.000003	0.1040	0.4190	91.9

93	0.1860	0.005830	0.000115	0.0424	0.1000	191.7
94	0.1330	0.847000	0.000021	0.1120	0.6890	129.9
95	0.0386	0.071600	0.000000	0.1220	0.2840	125.0
96	0.0456	0.245000	0.000004	0.0919	0.3300	105.0
97	0.3420	0.073300	0.000000	0.0865	0.6390	135.7
98	0.0390	0.101000	0.000001	0.1060	0.0967	180.0
99	0.0362	0.697000	0.000000	0.0813	0.4430	126.6

	duration_ms	time_signature
0	198973.0	4.0
1	166606.0	4.0
2	218147.0	4.0
3	221440.0	4.0
4	217925.0	4.0
5	231267.0	4.0
6	253390.0	4.0
7	214847.0	4.0
8	217947.0	4.0
9	202621.0	4.0
10	217307.0	4.0
11	239836.0	4.0
12	210747.0	4.0
13	235545.0	4.0
14	184732.0	4.0
15	232187.0	4.0
16	205920.0	4.0
17	173628.0	4.0
18	135090.0	4.0
19	181263.0	4.0
20	210773.0	4.0
21	417920.0	4.0
22	131064.0	4.0
23	203418.0	4.0
24	209320.0	4.0
25	233713.0	4.0
26	201707.0	4.0
27	164205.0	4.0
28	119133.0	4.0
29	263400.0	3.0
..	…	…
70	174800.0	4.0
71	163253.0	4.0
72	211440.0	4.0
73	276147.0	4.0
74	268867.0	4.0
75	227533.0	4.0
76	220293.0	4.0
77	201526.0	4.0
78	232550.0	4.0
79	175230.0	4.0

```
80      200186.0             4.0
81      190288.0             4.0
82      177000.0             4.0
83      176133.0             4.0
84      259550.0             3.0
85      184720.0             4.0
86      202547.0             4.0
87      226800.0             4.0
88      193456.0             4.0
89      197120.0             4.0
90      213309.0             4.0
91      142273.0             4.0
92      197437.0             4.0
93      234707.0             4.0
94       95467.0             4.0
95      217440.0             4.0
96      205748.0             4.0
97      260000.0             5.0
98      239000.0             4.0
99      196373.0             4.0

[100 rows x 16 columns]
```

In [16]:
```
dt.corr()
```

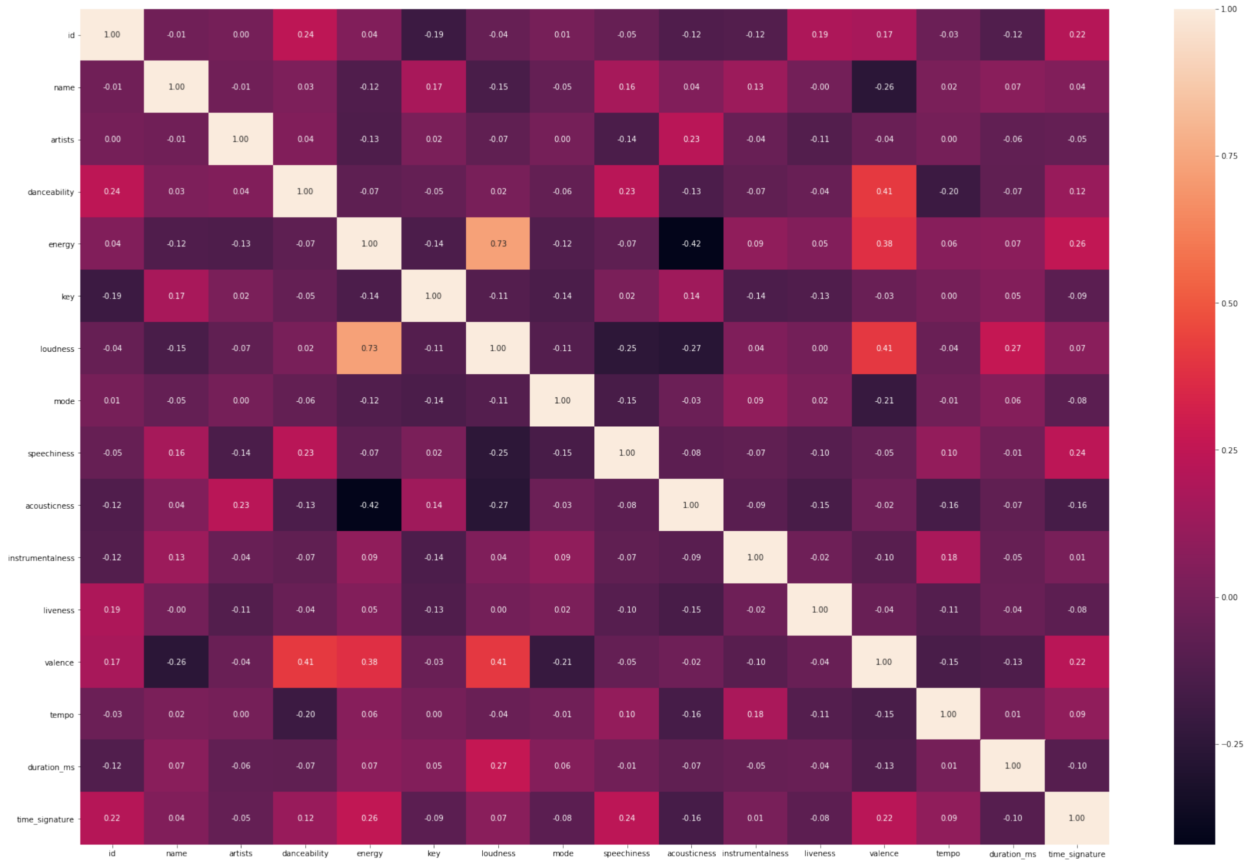
Out[16]:
```
                        id      name   artists  danceability    energy  \
id                1.000000 -0.010441  0.002588      0.241274  0.044253
name             -0.010441  1.000000 -0.014997      0.032230 -0.123184
artists           0.002588 -0.014997  1.000000      0.040227 -0.128267
danceability      0.241274  0.032230  0.040227      1.000000 -0.072582
energy            0.044253 -0.123184 -0.128267     -0.072582  1.000000
key              -0.194095  0.171177  0.021410     -0.051759 -0.136345
loudness         -0.044764 -0.147399 -0.067940      0.015517  0.732719
mode              0.010918 -0.051770  0.003488     -0.058019 -0.117555
speechiness      -0.047514  0.162297 -0.140299      0.227075 -0.073591
acousticness     -0.122739  0.044537  0.227147     -0.134374 -0.421209
instrumentalness -0.115325  0.129523 -0.039444     -0.066592  0.093684
liveness          0.189145 -0.002064 -0.113832     -0.038761  0.050542
valence           0.168740 -0.256872 -0.035551      0.413855  0.382434
tempo            -0.032354  0.017379  0.002093     -0.195012  0.062272
duration_ms      -0.119480  0.067608 -0.063217     -0.068368  0.073017
time_signature    0.215867  0.041781 -0.053041      0.119421  0.255235

                       key  loudness      mode  speechiness  acousticness
id               -0.194095 -0.044764  0.010918    -0.047514     -0.122739
name              0.171177 -0.147399 -0.051770     0.162297      0.044537
artists           0.021410 -0.067940  0.003488    -0.140299      0.227147
danceability     -0.051759  0.015517 -0.058019     0.227075     -0.134374
energy           -0.136345  0.732719 -0.117555    -0.073591     -0.421209
key               1.000000 -0.105309 -0.141568     0.019583      0.141590
loudness         -0.105309  1.000000 -0.110178    -0.252037     -0.269742
```

```
mode             -0.141568 -0.110178  1.000000    -0.150076     -0.03002
speechiness       0.019583 -0.252037 -0.150076     1.000000     -0.08153
acousticness      0.141590 -0.269742 -0.030028    -0.081536      1.00000
instrumentalness -0.136607  0.036248  0.089667    -0.069543     -0.08958
liveness         -0.125443  0.000006  0.024428    -0.099379     -0.15017
valence          -0.032622  0.407760 -0.210599    -0.051054     -0.02080
tempo             0.003737 -0.035156 -0.011911     0.102999     -0.15801
duration_ms       0.046144  0.265310  0.055411    -0.009856     -0.06962
time_signature   -0.087096  0.072301 -0.083782     0.235615     -0.15893

                  instrumentalness  liveness   valence     tempo  durati
id                       -0.115325  0.189145  0.168740 -0.032354    -0.1
name                      0.129523 -0.002064 -0.256872  0.017379     0.0
artists                  -0.039444 -0.113832 -0.035551  0.002093    -0.0
danceability             -0.066592 -0.038761  0.413855 -0.195012    -0.0
energy                    0.093684  0.050542  0.382434  0.062272     0.0
key                      -0.136607 -0.125443 -0.032622  0.003737     0.0
loudness                  0.036248  0.000006  0.407760 -0.035156     0.2
mode                      0.089667  0.024428 -0.210599 -0.011911     0.0
speechiness              -0.069543 -0.099379 -0.051054  0.102999    -0.0
acousticness             -0.089583 -0.150177 -0.020800 -0.158013    -0.0
instrumentalness          1.000000 -0.016249 -0.095123  0.178142    -0.0
liveness                 -0.016249  1.000000 -0.042612 -0.107652    -0.0
valence                  -0.095123 -0.042612  1.000000 -0.148423    -0.1
tempo                     0.178142 -0.107652 -0.148423  1.000000     0.0
duration_ms              -0.045873 -0.042942 -0.131901  0.005493     1.0
time_signature            0.011894 -0.079558  0.223410  0.090191    -0.1

                  time_signature
id                      0.215867
name                    0.041781
artists                -0.053041
danceability            0.119421
energy                  0.255235
key                    -0.087096
loudness                0.072301
mode                   -0.083782
speechiness             0.235615
acousticness           -0.158935
instrumentalness        0.011894
liveness               -0.079558
valence                 0.223410
tempo                   0.090191
duration_ms            -0.102138
time_signature          1.000000
```

In [18]:
```
%pylab inline
pylab.rcParams['figure.figsize'] = (30, 20)
```

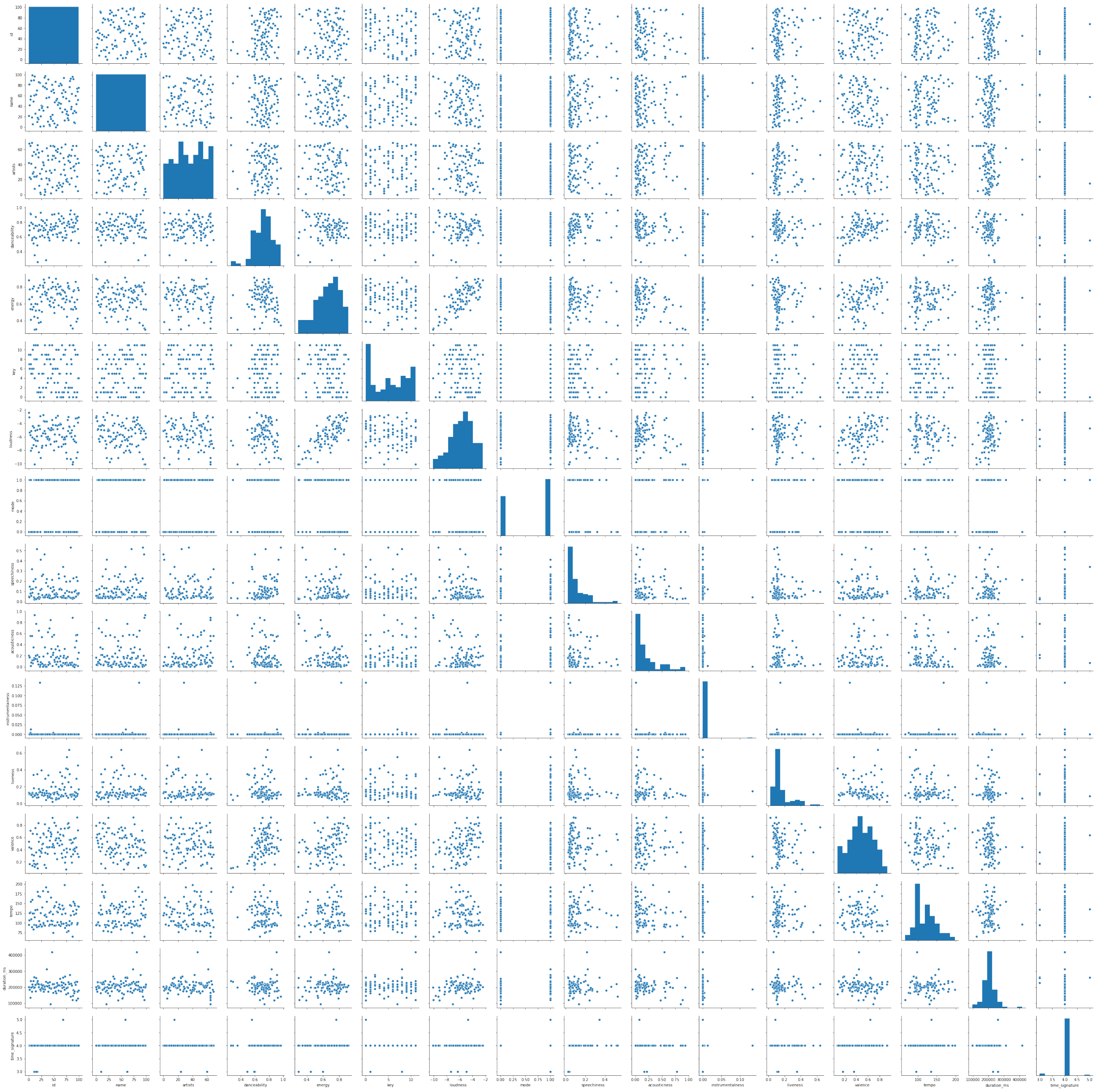
```
Populating the interactive namespace from numpy and matplotlib
```

In [19]:
```
sn.heatmap(data=dt.corr(), annot=True, fmt='.2f');
```

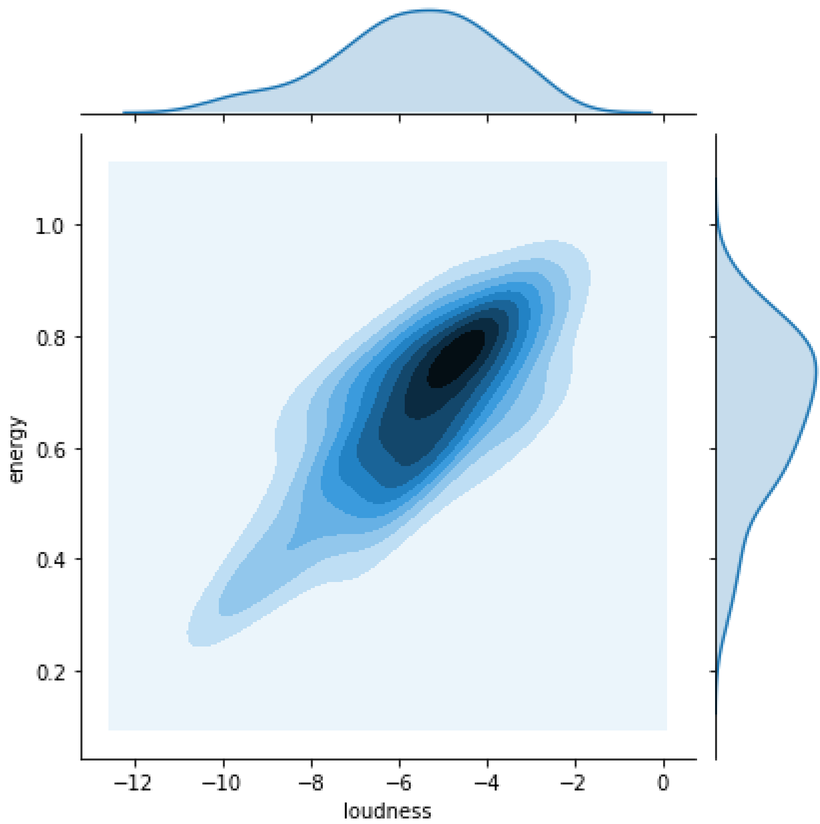


In [20]:
```
sn.pairplot(dt)
```

Out[20]: <seaborn.axisgrid.PairGrid at 0x7f8c9819b550>

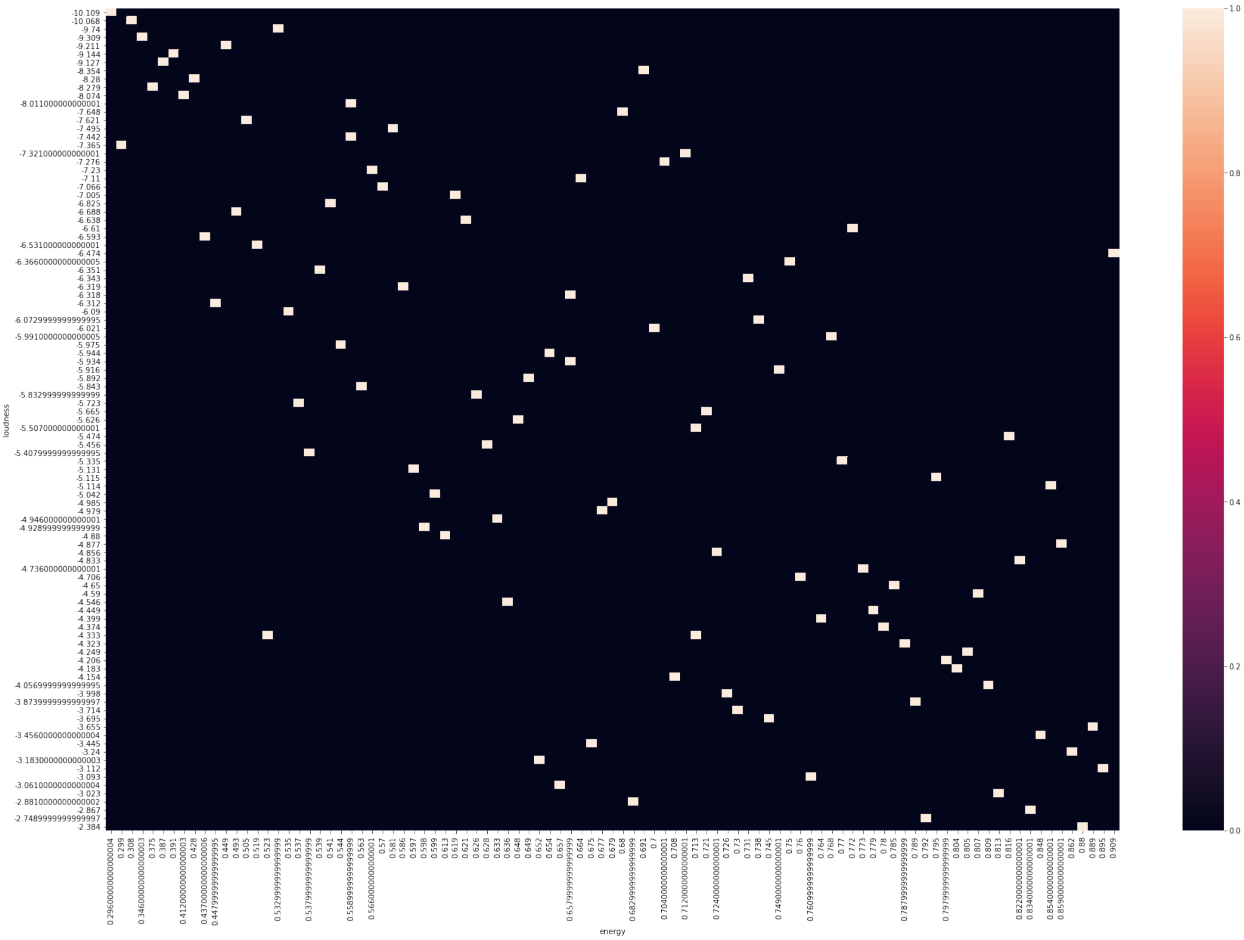


```
In [21]: sn.jointplot(data=dt, x='loudness', y='energy', kind='kde')

Out[21]: <seaborn.axisgrid.JointGrid at 0x7f8c8dfcbfd0>
```

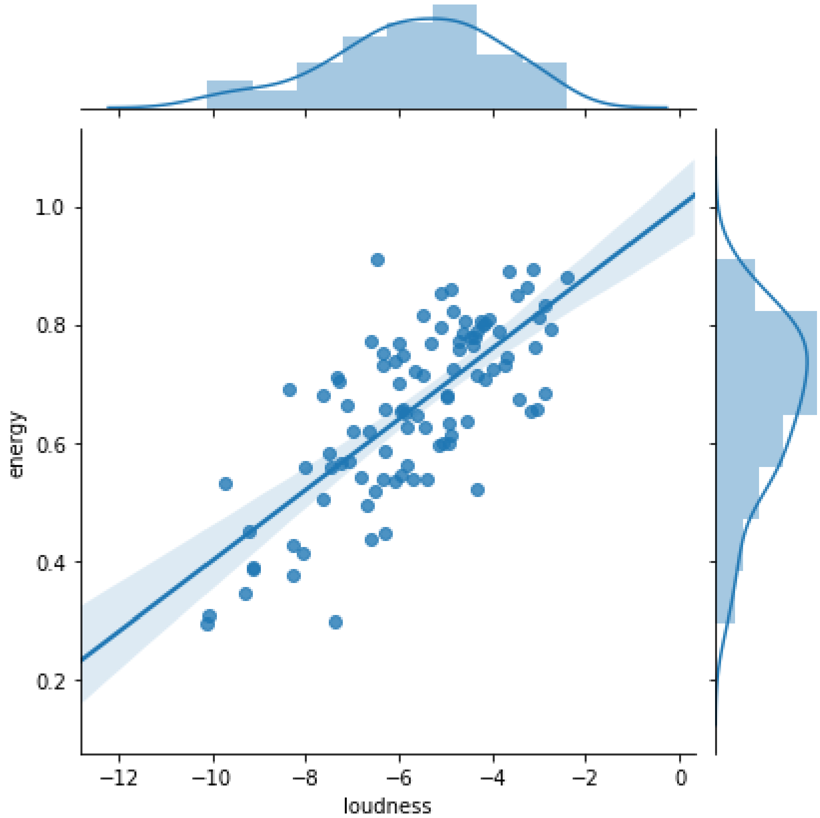



```
In [22]: sn.heatmap(pd.crosstab(dt['loudness'], dt['energy']))
```

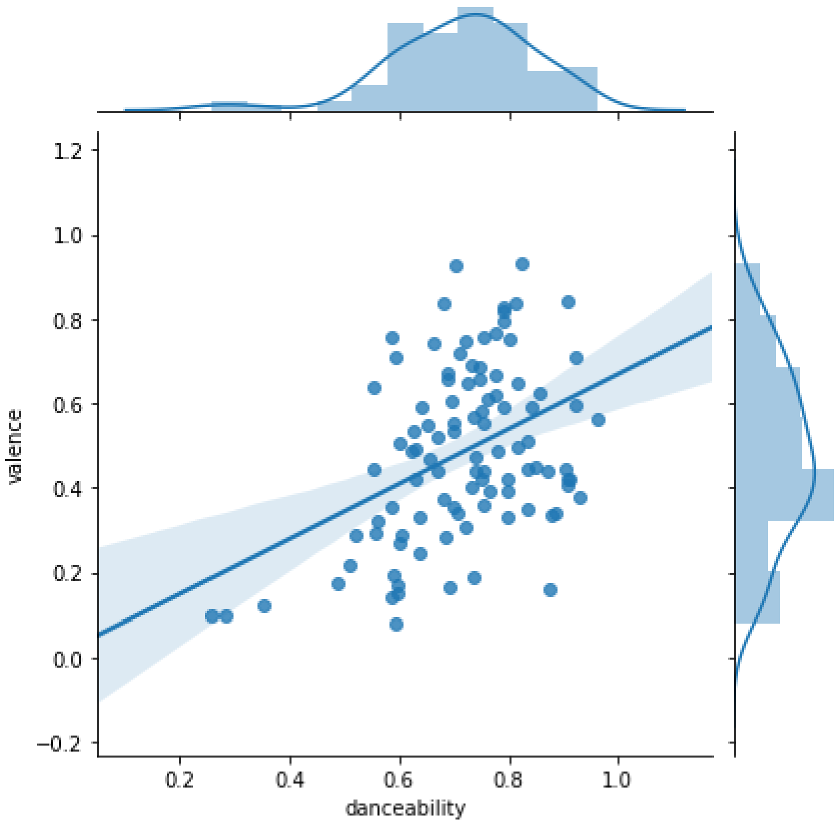
```
Out[22]: <matplotlib.axes._subplots.AxesSubplot at 0x7f8c880a3f98>
```




```
In [30]: sn.jointplot(data=dt, x='loudness', y='energy', kind='reg')

Out[30]: <seaborn.axisgrid.JointGrid at 0x7f8c871902e8>
```




```
In [31]: sn.jointplot(data=dt, x='danceability', y='valence', kind='reg')
Out[31]: <seaborn.axisgrid.JointGrid at 0x7f8c8707c208>
```



```
In [ ]:
```