

# HW3-classification

音頻特徵處理：

	danceability	energy	key	loudness	mode	speechiness	acousticness	instrumentalness	liveness	valence	tempo	duration_ms	time_signature
count	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000	42305.000000
mean	0.639364	0.762516	5.370240	-6.465442	0.549462	0.136561	0.096160	0.283048	0.214079	0.357101	147.474056	250865.846685	3.972580
std	0.156617	0.183823	3.666145	2.941165	0.497553	0.126168	0.170827	0.370791	0.175576	0.233200	23.844623	102957.713571	0.268342
min	0.065100	0.000243	0.000000	-33.357000	0.000000	0.022700	0.000001	0.000000	0.010700	0.018700	57.967000	25600.000000	1.000000
25%	0.524000	0.632000	1.000000	-8.161000	0.000000	0.049100	0.001730	0.000000	0.099600	0.161000	129.931000	179840.000000	4.000000
50%	0.646000	0.803000	6.000000	-6.234000	1.000000	0.075500	0.016400	0.005940	0.135000	0.322000	144.973000	224760.000000	4.000000
75%	0.766000	0.923000	9.000000	-4.513000	1.000000	0.193000	0.107000	0.722000	0.294000	0.522000	161.464000	301133.000000	4.000000
max	0.988000	1.000000	11.000000	3.148000	1.000000	0.946000	0.988000	0.989000	0.988000	0.988000	220.290000	913052.000000	5.000000

'danceability'：適合跳舞的， A value of 0.0 is least danceable and 1.0 is most danceable

'energy'：a perceptual measure of intensity and activity.

'key'：音調， If no key was detected, the value is -1.

'loudness'：音量， The overall loudness of a track in decibels (dB)

'mode'：modality (major or minor) of a track. Major is represented by 1 and minor is 0.

'speechiness'： the presence of spoken words in a track.(the closer to 1.0 the attribute value)

'acousticness'： 1.0 represents high confidence the track is acoustic.

'instrumentalness'： whether a track contains no vocals.The closer the instrumentalness value is to 1.0

'liveness'： Detects the presence of an audience in the recording

'valence'： 1.0 describing the musical positiveness conveyed by a track.=>sound more positive

'tempo'： The overall estimated tempo of a track in beats per minute (BPM).

'duration\_ms'：歌曲的持續時間

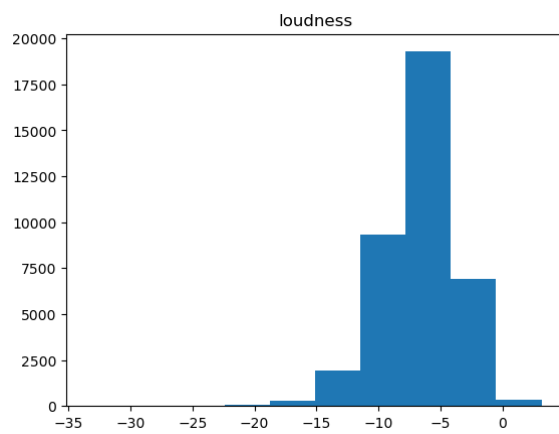
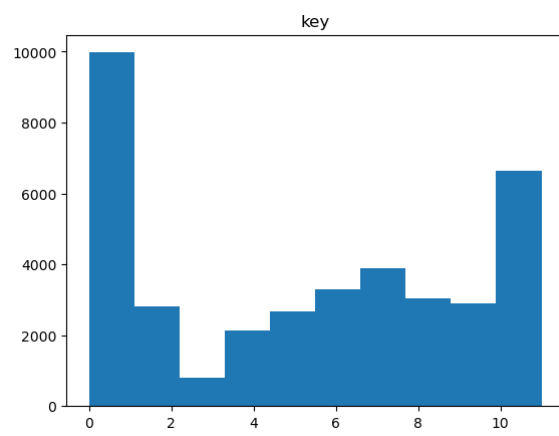
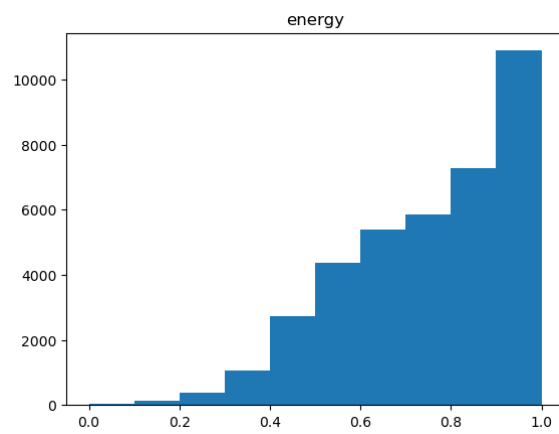
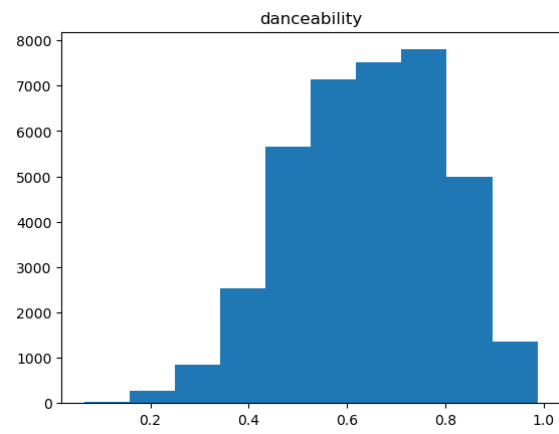
'time\_signature'：這種拍號表示以四分音符為一拍，每小節有四拍

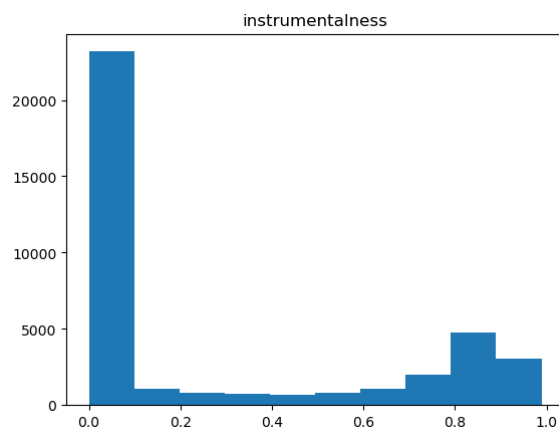
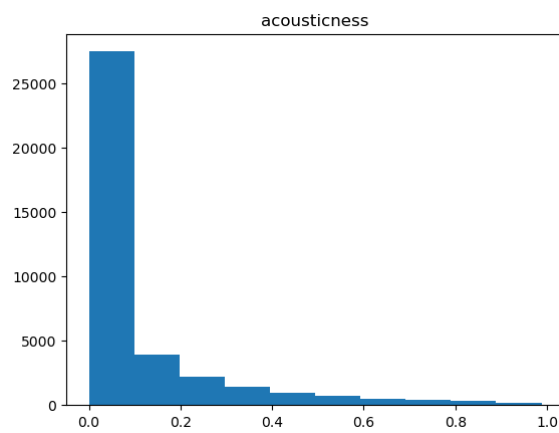
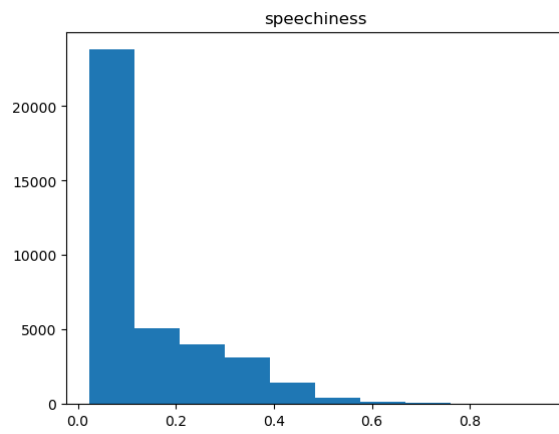
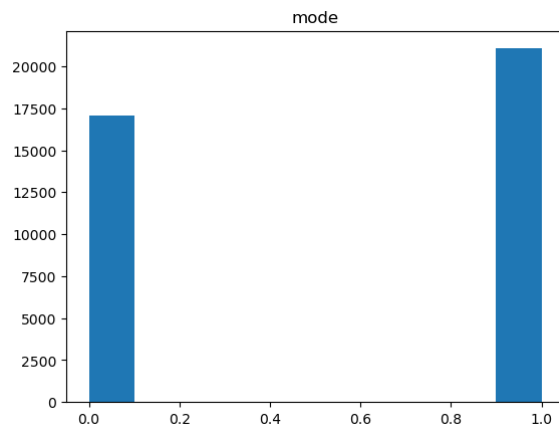
遺失值：

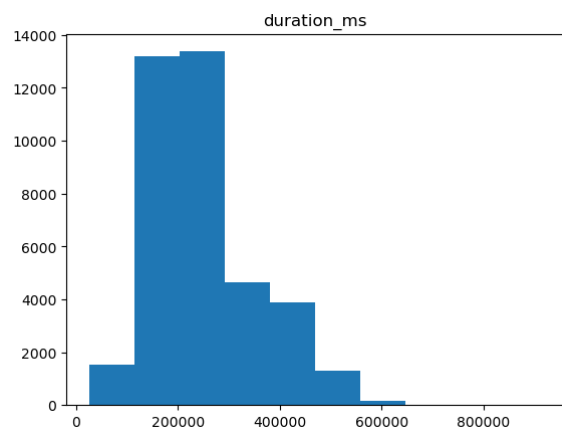
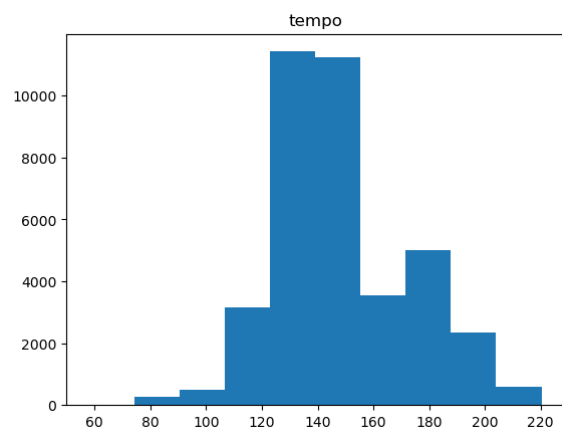
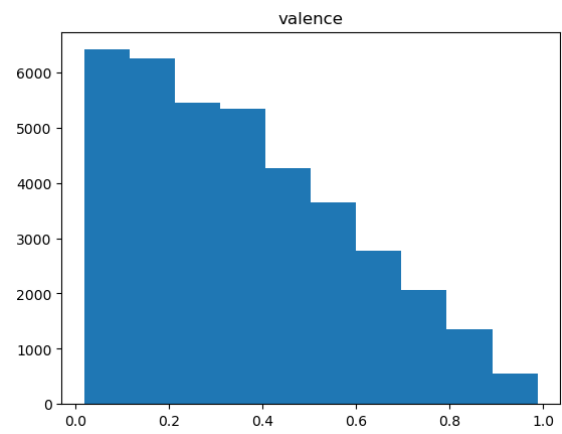
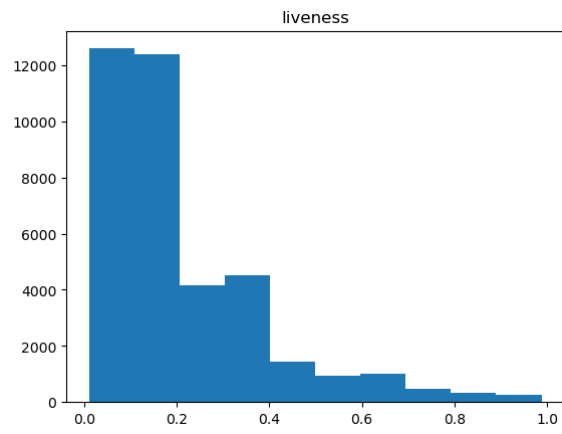
song\_name：20786、Unnamed: 0：21525、title：21525

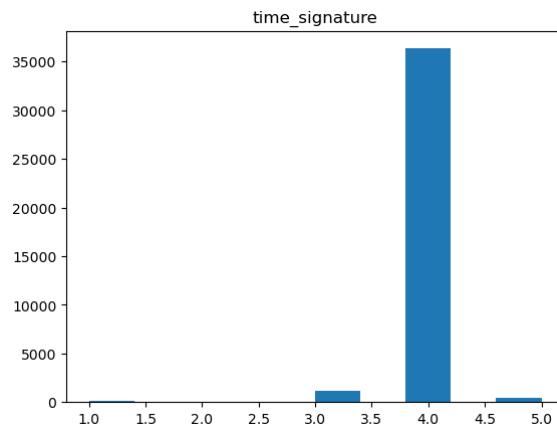
移除資料中重複值後，剩下的資料不存在遺失值。

# EDA









數據預處理：

One-Hot Encoding (將 time\_signature,mode 轉成數值化)

genre 轉成 Label

smote 處理資料不平衡

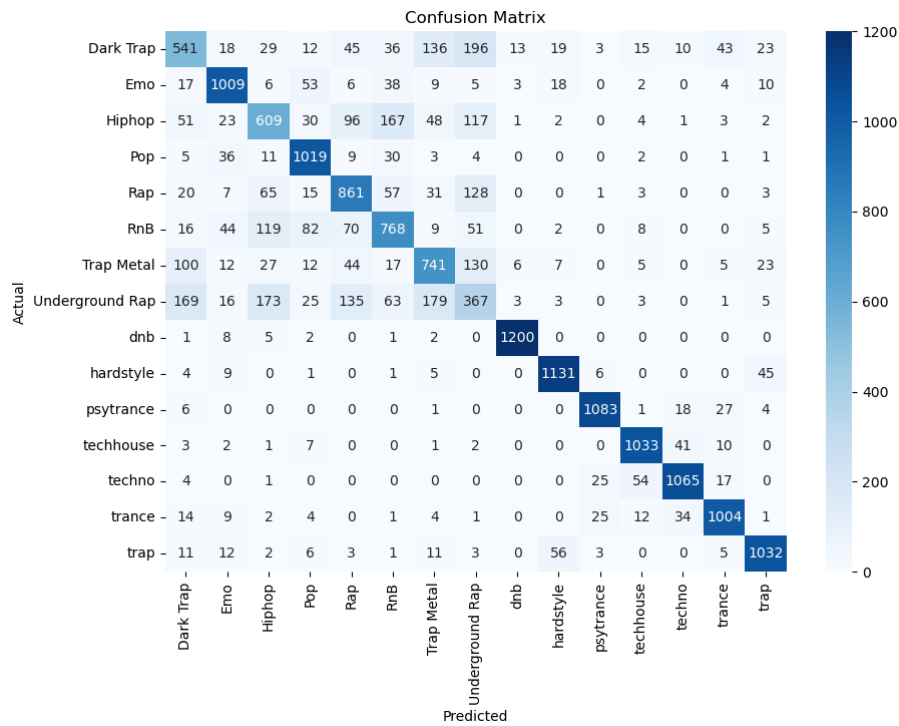
類別	原始數據數量	SMOTE 後數量
Underground Rap	5771	5771
Dark Trap	4518	5771
Hiphop	2960	5771
trance	2734	5771
techno	2632	5771
psytrance	2610	5771
dnb	2407	5771
hardstyle	2277	5771
trap	2226	5771
techhouse	2192	5771
RnB	2039	5771
Trap Metal	1897	5771
Rap	1809	5771
Emo	1601	5771
Pop	452	5771

## 1. Random Forest分析：

- Cross-Validation：use k = 5
  - Cross-Validation average Accuracy: 0.7567
- Random Forest
  - parameters：n\_estimators=100、max\_depth=30
  - Train Accuracy: 0.9700
  - Cross-Validation Accuracy: [0.75720165 0.76398816 0.76086643 0.76375451 0.76245487]  
Cross-Validation Accuracy: 0.7804
  - classification report

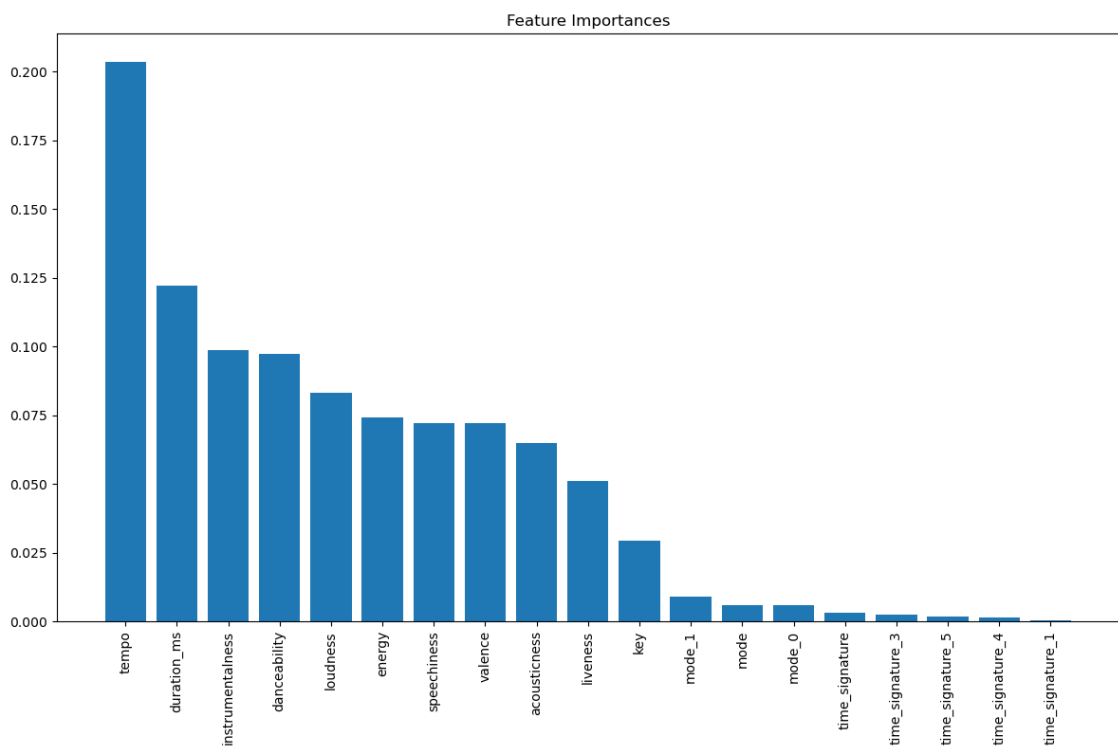
類別	Precision	Recall	F1-score	Support
Dark Trap	0.57	0.47	0.52	1139
Emo	0.87	0.89	0.88	1180
Hiphop	0.62	0.6	0.61	1154
Pop	0.84	0.95	0.89	1121
Rap	0.71	0.72	0.72	1191
RnB	0.7	0.7	0.7	1174
Trap Metal	0.65	0.72	0.68	1129
Underground Rap	0.35	0.3	0.32	1142
dnb	0.98	0.98	0.98	1219
hardstyle	0.93	0.95	0.94	1202
psytrance	0.95	0.95	0.95	1140
techhouse	0.91	0.94	0.93	1100
techno	0.91	0.91	0.91	1166
trance	0.91	0.92	0.91	1111
trap	0.91	0.92	0.92	1145
Accuracy			0.8	17313
Macro avg	0.79	0.8	0.79	17313
Weighted avg	0.79	0.8	0.79	17313

- 可看出 Underground Rap 的分類結果最差，f1 score 僅有 32 %
  - Underground Rap只一種饒舌音樂事業的面象，它不是一種style，它是聽不出來的( from ptt )
  - dnb 的分類結果最好，f1 score 為 98 %
- confusion matrix :
  - 附圖可看出 Dark Trap、Trap Metal 風格相近；Hiphop、RnB 風格較相近，易被分錯
  - Underground Rap 的風格較不明確
  - 其餘類別音樂特徵明確，準確率高



◦ feature selection :

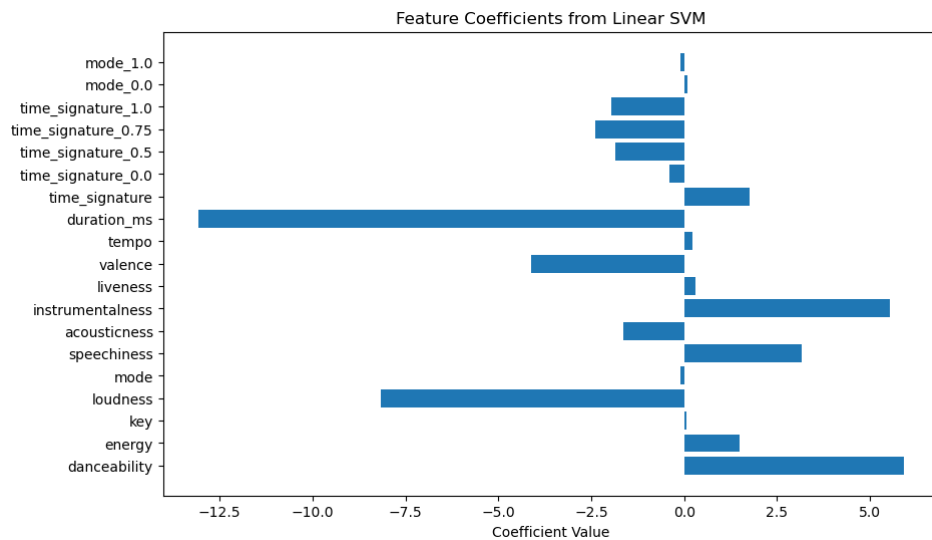
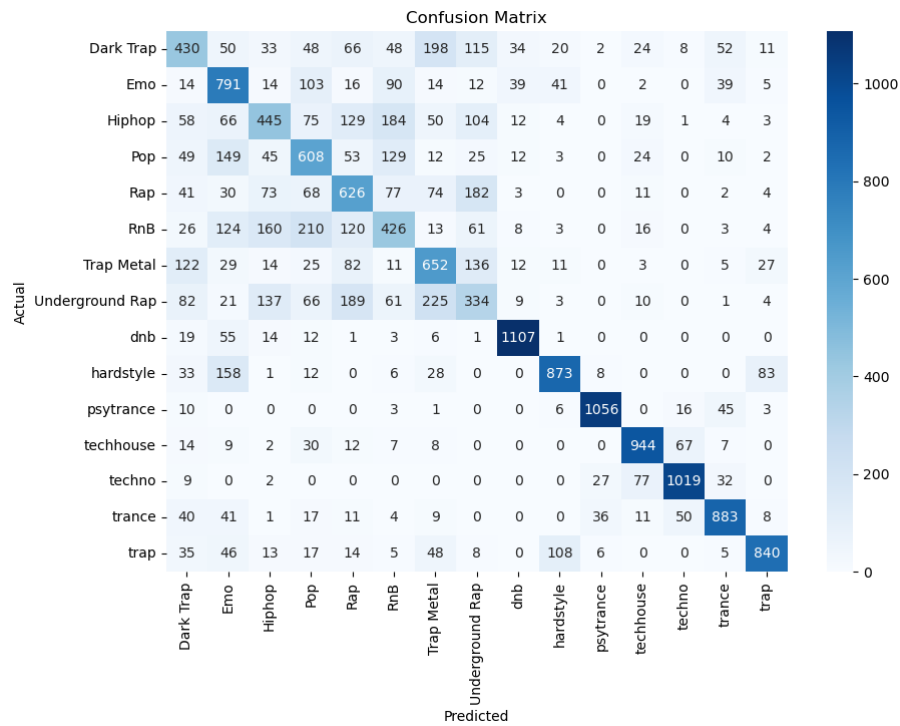
- 以 tempo、duration\_min、instrumentalness、danceability、loudness 為前五重要特徵



## 2.SVC

- Cross\_val Scores: [0.6374 0.6346 0.6357]
- Train Accuracy(average): 0.6359
- Test Accuracy: 0.6372





- classification report
  - psytrance 為分類結果最佳之類別，F1 score 達0.93；Underground Rap 仍為結果最差之音樂類別，F1 score 僅有0.32。
  - 平均而言，SVM 方法分類結果較隨機森林差。

	precision	recall	f1-score	support
Dark Trap	0.44	0.38	0.41	1139
Emo	0.50	0.67	0.58	1180
Hiphop	0.47	0.39	0.42	1154
Pop	0.47	0.54	0.50	1121
Rap	0.47	0.53	0.50	1191
RnB	0.40	0.36	0.38	1174
Trap Metal	0.49	0.58	0.53	1129
Underground Rap	0.34	0.29	0.32	1142
dnb	0.90	0.91	0.90	1219

hardstyle	0.81	0.73	0.77	1202
psytrance	0.93	0.93	0.93	1140
techhouse	0.83	0.86	0.84	1100
techno	0.88	0.87	0.88	1166
trance	0.81	0.79	0.80	1111
trap	0.85	0.73	0.79	1145
accuracy			0.64	17313
macro avg	0.64	0.64	0.64	17313
weighted avg	0.64	0.64	0.64	17313