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THANKS!



MUSIC Genre Classification

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Presentation

Yaser Zaidan

2:54



3:49



Yaser Zaidan

Fourth year Information Technology Engineering student
Artificial Intelligence major



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"If I were not a physicist, I would probably be a musician. I often think in music. I live my daydreams in music. I see my life in terms of music."

—Albert Einstein



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*Problem Vs
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01

Exploring

First impression of the data and some numerical calcs



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1. *Danceability.*
2. *Valence.*
3. *Energy.*
4. *Tempo.*
5. *Loudness.*
6. *Speechiness.*
7. *Instrumentalness.*
8. *Liveness.*

9. *Acousticness.*
10. *Key.*
11. *Mode.*
12. *Duration.*
13. *Time_signature.*
14. *Artist_name*
15. *Track_name*
16. *Popularity.*
17. *Class*

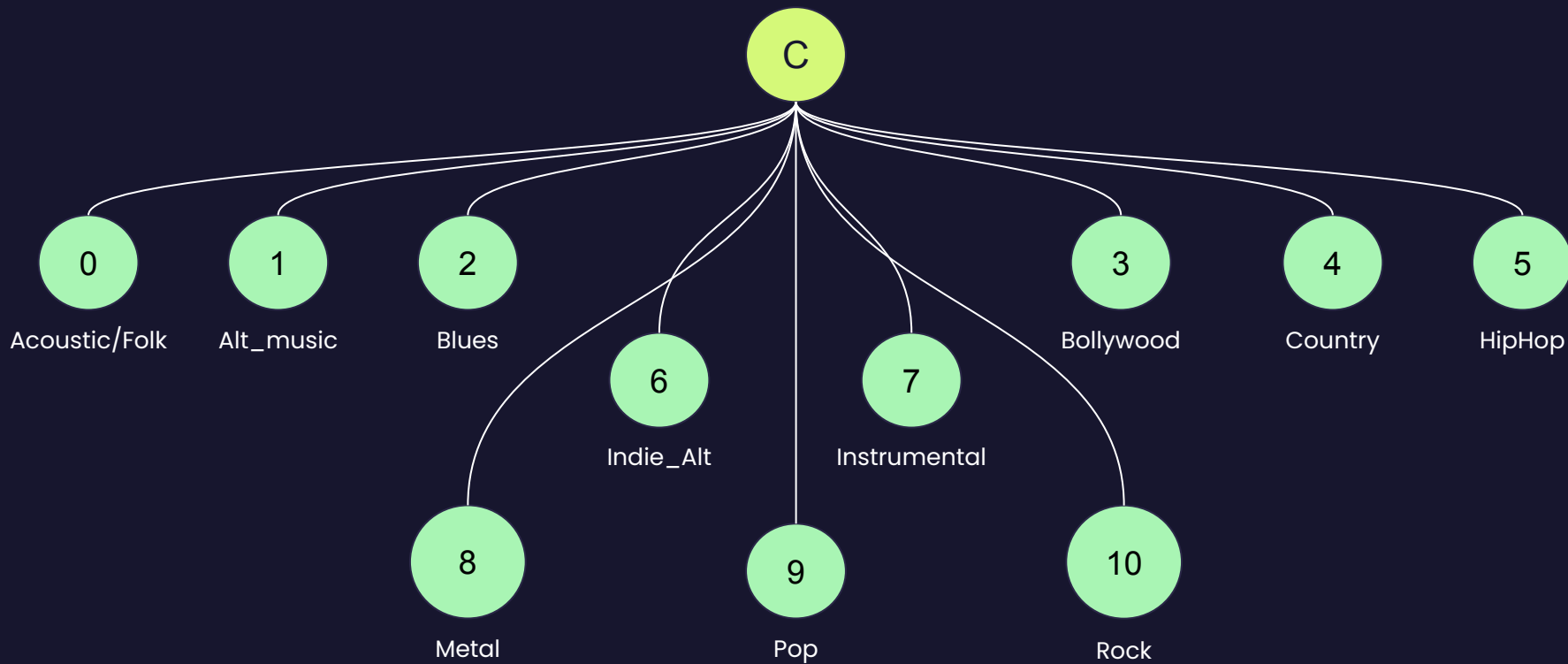
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Column Description



	count	mean	std	min	25%	50%	75%	max
Id	14396.0	7198.500000	4155.911573	1.000000	3599.750000	7198.50000	10797.25000	14396.000
Popularity	14063.0	44.525208	17.418940	1.000000	33.000000	44.00000	56.00000	100.000
danceability	14396.0	0.543105	0.165517	0.059600	0.432000	0.54500	0.65800	0.989
energy	14396.0	0.662422	0.235967	0.001210	0.508000	0.69900	0.86100	1.000
key	12787.0	5.953781	3.200013	1.000000	3.000000	6.00000	9.00000	11.000
loudness	14396.0	-7.900852	4.057362	-39.952000	-9.538000	-7.01350	-5.16200	1.342
mode	14396.0	0.640247	0.479944	0.000000	0.000000	1.00000	1.00000	1.000
speechiness	14396.0	0.080181	0.085157	0.022500	0.034800	0.04710	0.08310	0.955
acousticness	14396.0	0.246746	0.310922	0.000000	0.004280	0.08145	0.43225	0.996
instrumentalness	10855.0	0.178129	0.304266	0.000001	0.000088	0.00392	0.20100	0.996
liveness	14396.0	0.195782	0.159258	0.011900	0.097275	0.12900	0.25600	0.992
valence	14396.0	0.486379	0.239476	0.021500	0.299000	0.48050	0.67200	0.986
tempo	14396.0	122.695372	29.538490	30.557000	99.799000	120.06000	141.98825	217.416
duration_in min/ms	14396.0	200094.222824	111689.098211	0.501650	165445.750000	208941.00000	252247.00000	1477187.000
time_signature	14396.0	3.924354	0.359520	1.000000	4.000000	4.00000	4.00000	5.000
Class	14396.0	6.695679	3.206170	0.000000	5.000000	8.00000	10.00000	10.000



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Visualization

Dive deeper in the data by plots and grams



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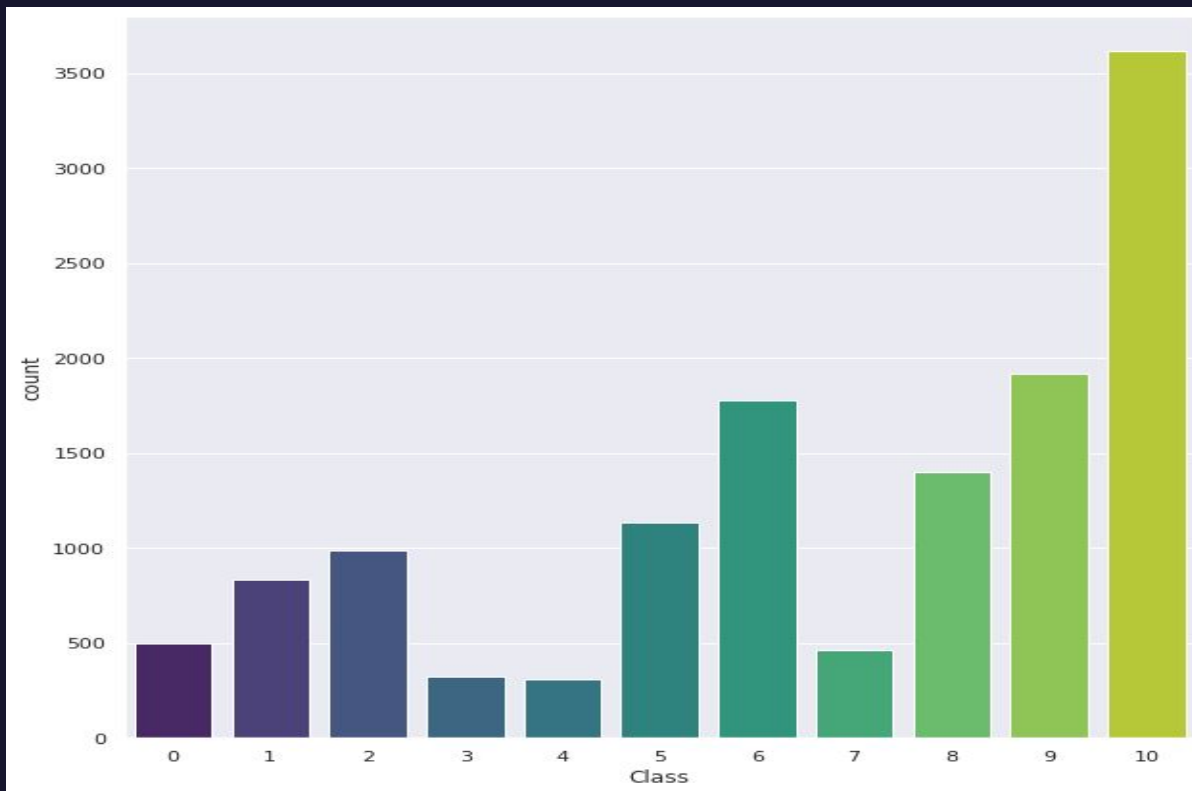
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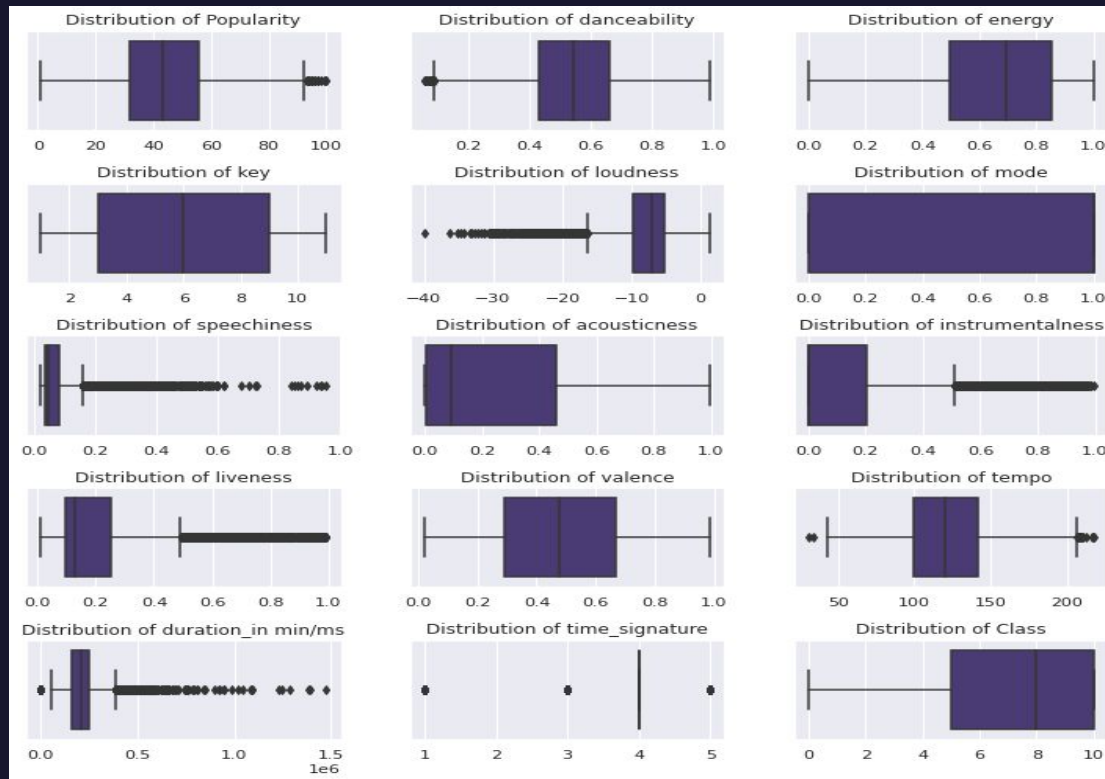
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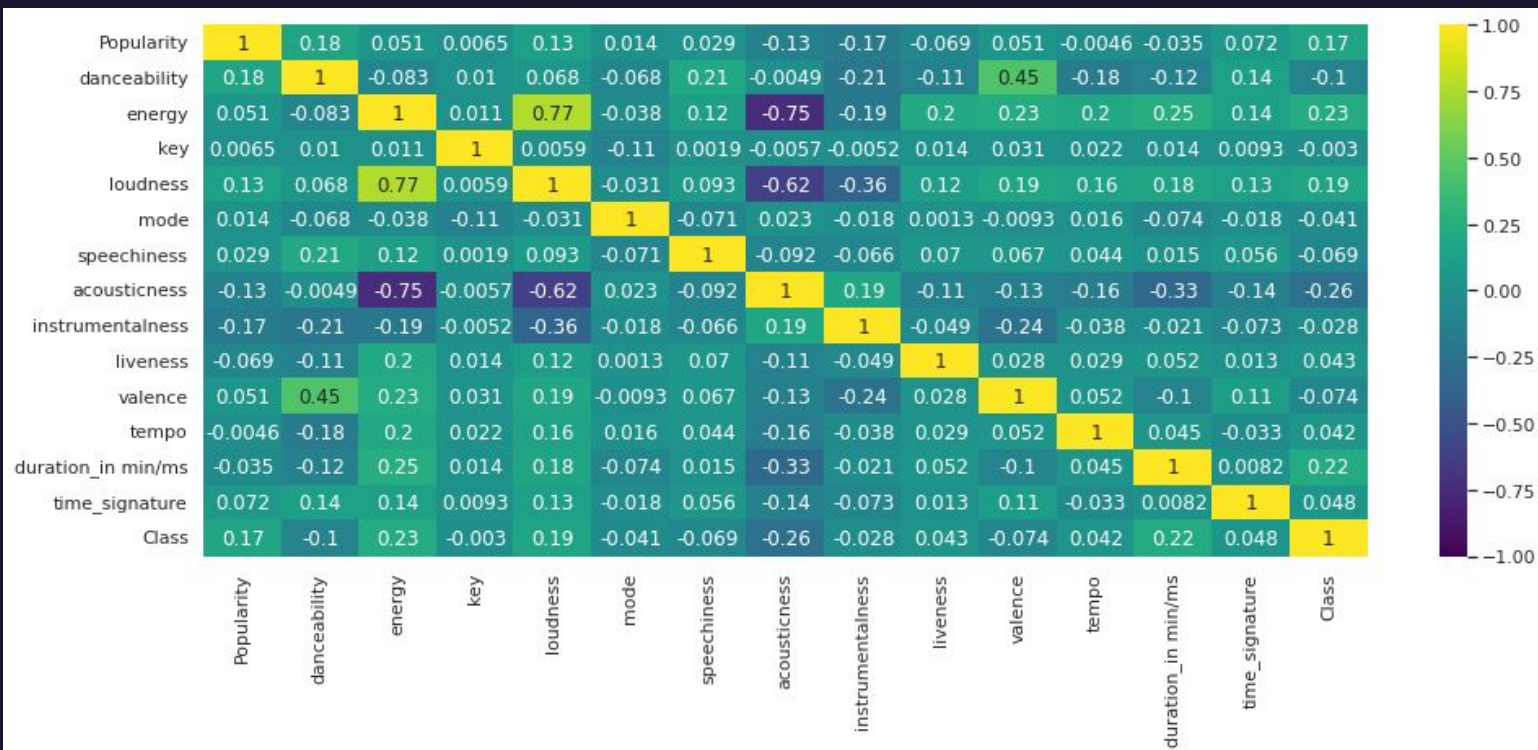
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Columns Heatmap



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Duplicates

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Null Values

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Skewness & Outliers

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scaling



03

PreProcessing

Cleaning and applying some transformations on the data



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- Searching for duplicates we found:

1131

Duplicated rows

- They were removed from the dataset.



- Searching for Null values we found:



- After some experiments we found:
 - Popularity and Instrumentalness best imputed by the median.
 - Key best imputed by a constant value = -1.



- We noticed earlier some skewness on some of the columns so we applied the following transformations on the columns.

Square Root

On duration.



Logarithm

On liveness and Instrumentalness

Cube Root

On loudness, acoustiveness and tempo

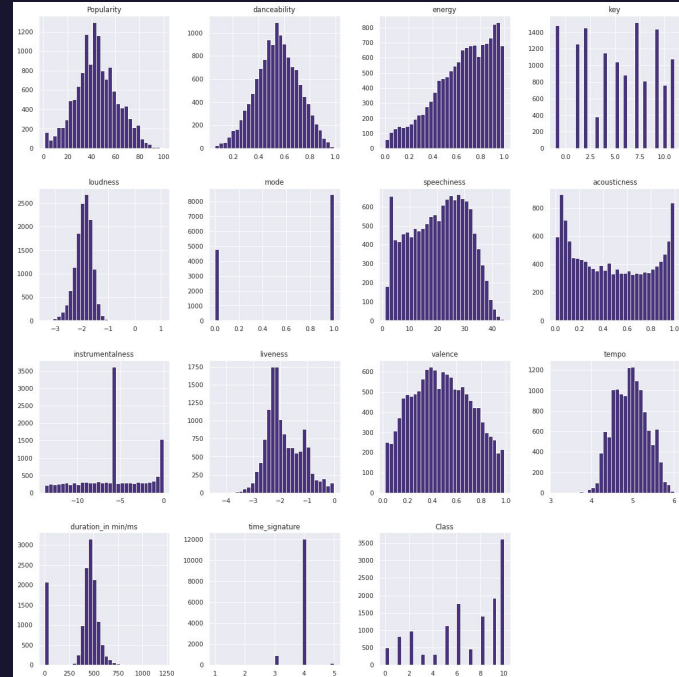
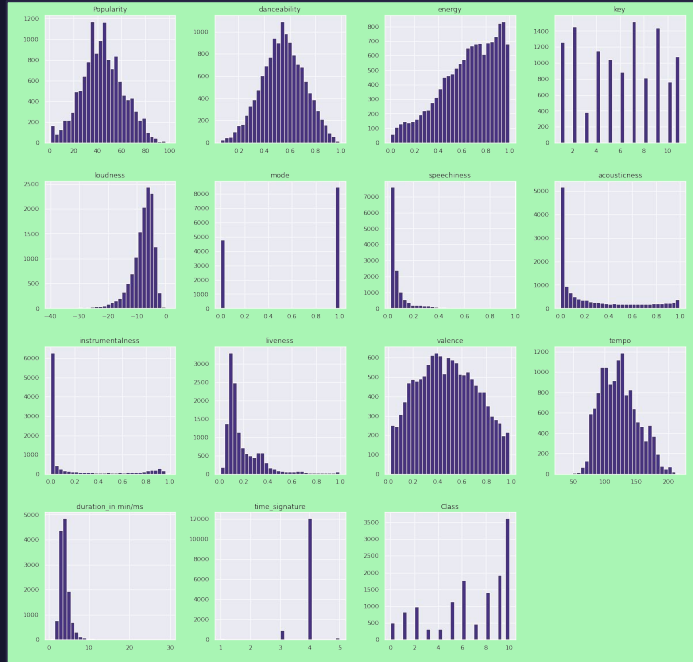


Reciprocal

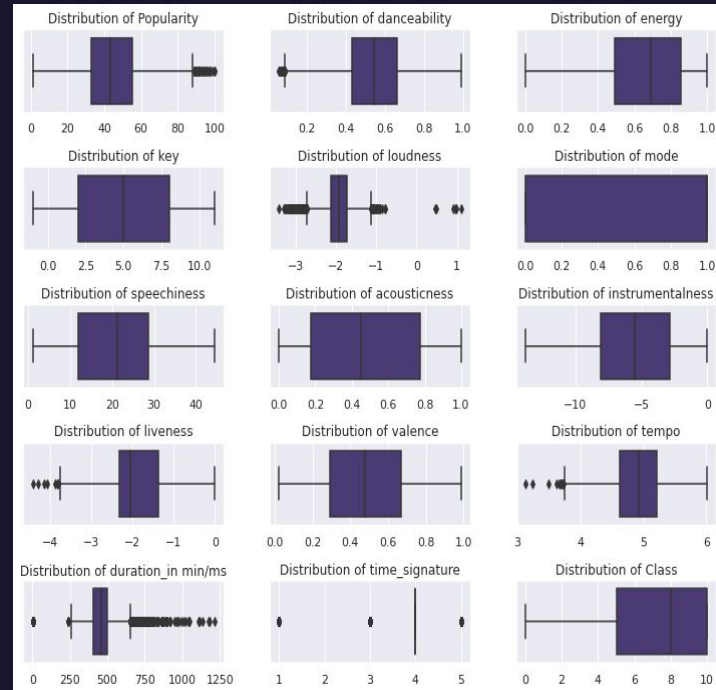
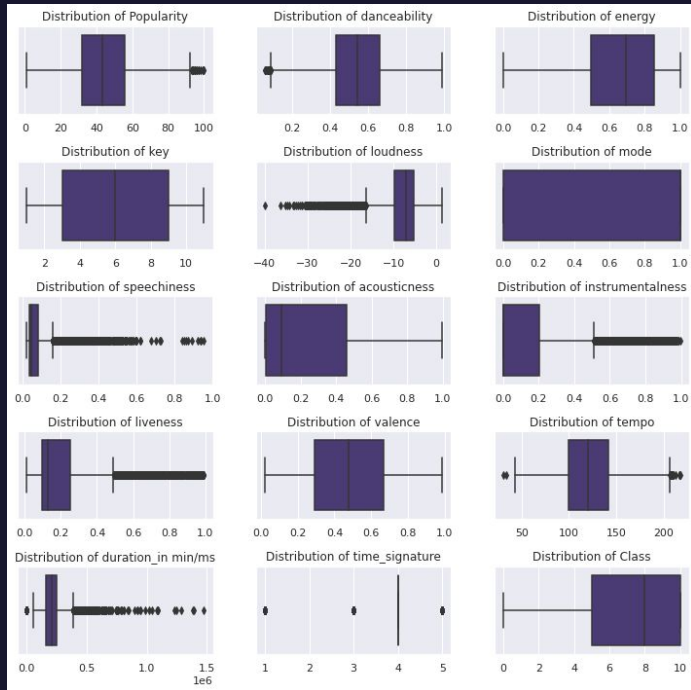
On speechiness



Before and after transformations:



- Before and after transformations.:



- After trying both Standard Scaler and Min Max Scaler, the first method gave better accuracy so the data got Scaled using Standard Scaler.





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Model Trial

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*Hyperparameter
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*Final Model
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Ensemble

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Modelling

Choosing the right model and hyperparameter tuning



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**Light Gradient
Boosting Machine**

0.5701



**Extreme Gradient
Boosting**

0.5625



Random Forest

0.5701



**K-Nearest
Neighbor**

0.4438



**Support Vector
Machine**

0.5479



**Gaussian Naive
Bayes**

0.4677



**Bernoulli Naive
Bayes**

0.3951



Logistic Regression

0.5102



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0.5641



Random Forest

Randomized Search

Max depth = 100
Max feature = sqrt
Min samples leaf = 4
Min samples split = 10
Estimators = 800

0.5646



LightGBM

Randomized Search

Max depth = 4
Learning rate = 0.01563
Objective = multi:softmax
gamma = 4
Estimators = 1467
Num leaves = 10
Feature fraction = 0.80219
Subsample = 0.19872
Boosting type = dart

0.5632



XGBoost

Bayesian Optimization

Max depth = 4
Learning rate = 0.06491
Objective = multi:softmax
gamma = 0.595053
Estimators = 119
Random state = 42
Eval metric = merror



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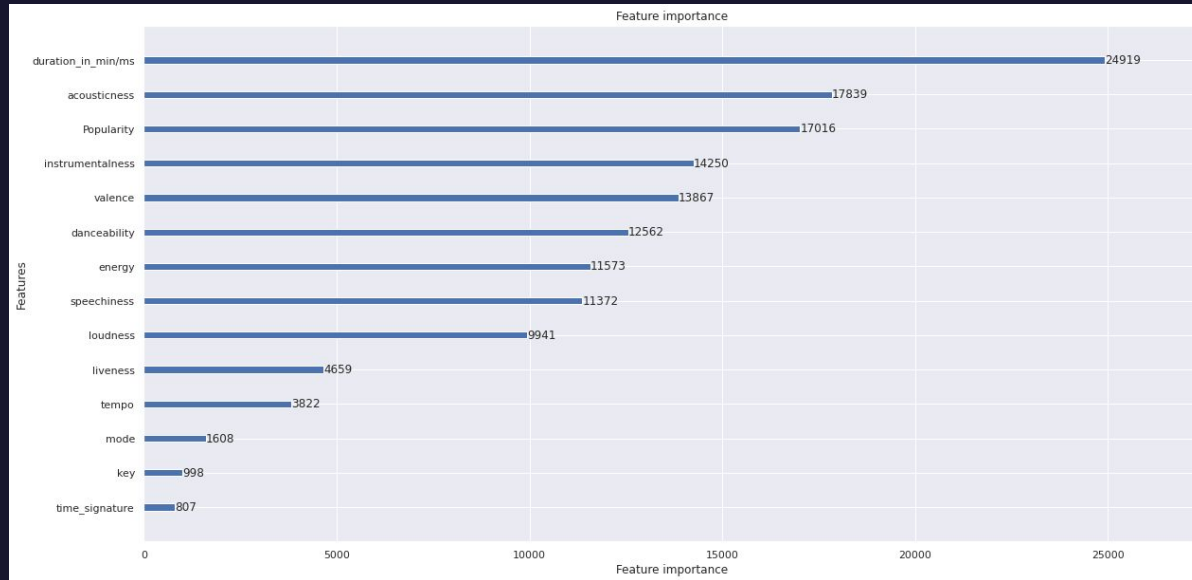
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- Feature Importance :



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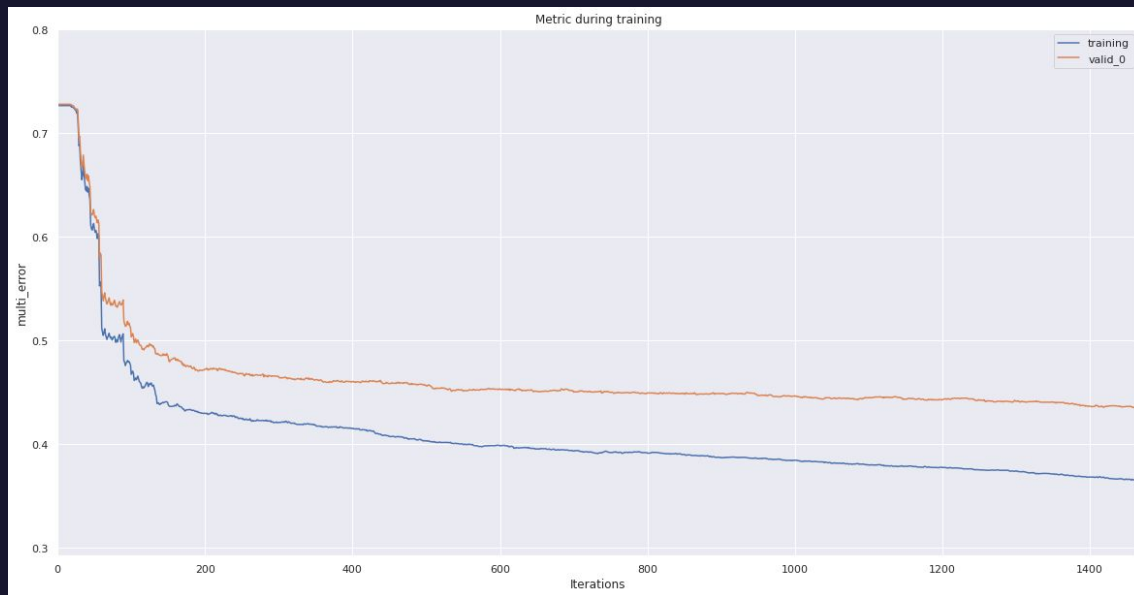
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- Learning Curve :



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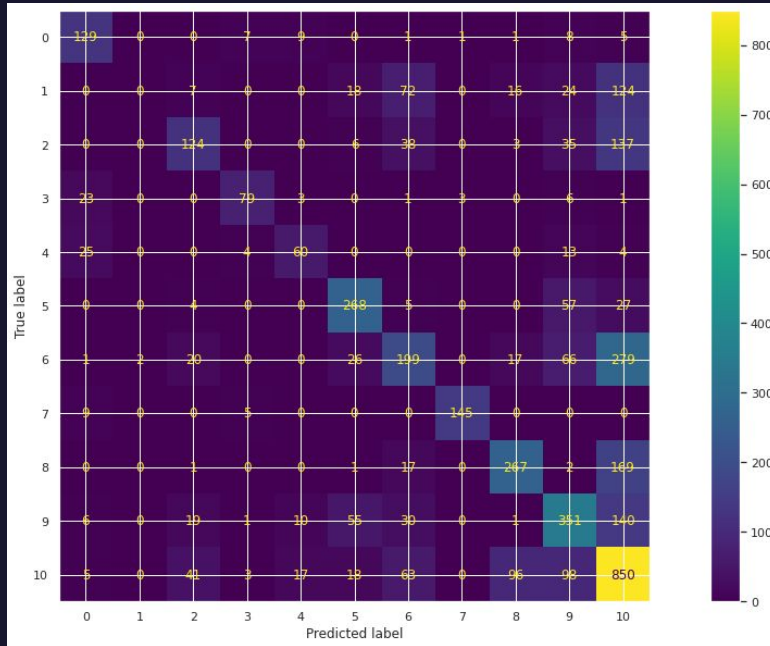
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- Confusion matrix :



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- Classification report :

	precision	recall	f1-score	support
0	0.65	0.80	0.72	161
1	0.00	0.00	0.00	261
2	0.57	0.36	0.44	343
3	0.80	0.68	0.73	116
4	0.61	0.57	0.59	106
5	0.68	0.74	0.71	361
6	0.47	0.33	0.38	610
7	0.97	0.91	0.94	159
8	0.67	0.58	0.62	457
9	0.53	0.57	0.55	613
10	0.49	0.71	0.58	1191
accuracy			0.56	4378
macro avg	0.59	0.57	0.57	4378
weighted avg	0.54	0.56	0.54	4378





Bagging

Bagging Classifier
with LGBM classifier
10 estimators

0.5589



One Vs Rest

One Vs Rest Classifier
with Random Forest
Classifier

0.5249



Voting

Voting Classifier with
XGB, LGBM and SVC
Classifiers

0.5612





Failed Attempts !!

Here's a couple of failed attempts at raising the accuracy.

- Trying to make the key and time signature columns one hot-encoded.
- Converting the values in duration column.
- Deleting weak columns.



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THANKS!



That's All!

Do you have any questions?

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