BUILDING A MODEL THAT CAN PREDICT SONG STREAMS

Exploring the 'Most Streamed Spotify Songs of 2023' dataset to find streaming trends and developing a supervised regression model to predict the streams for a song based on selected features.

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Introduction

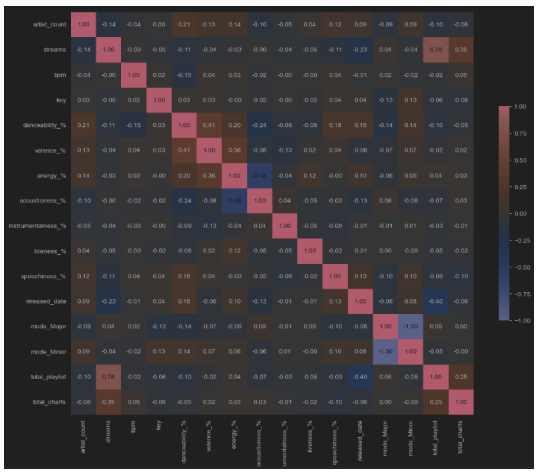
We aim to create a model predicting the number of streams a song is likely to receive using a dataset that includes artist information, release details, and audio features. Our goal is to explore how these features influence a song's popularity and build a regression model for stream prediction.

We want to see if it is possible to see how popular a song will be. If possible, could this be beneficial for the music industry?

Materials and methods

We have chosen a dataset of the most streamed songs in 2023. The list doesn't only contain songs that are released in the year 2023. The list also contains songs that have been released going back to the 1960's and thereby provides us with a little broader variety of songs.

After cleaning the initial dataset we had a look at a heatmap for the many features, to see if any might have correlation. We notice a weak to medium correlation between the valence_% and energy_% as well as danceability_%, but the only strong correlation is with streams and total playlists. This is cool because we want to predict the streams feature!



This is a regression problem, so we picked five regressors to train on, that where then evaluated on their R2 value.

Name	R2 (rounded)	MSE
GradientBoosting	**0.81**	4.73e+16
RandomForrest	**0.80**	4.90+e16
DecisionTree	**0.61**	9.63e+16
Linear	**0.58**	1.02e+17
SVR	**0.44**	1.37e+17

Table 1: Result of testing each model

We picked the Gradient boosting regressor to capture the correlation between a song's characteristics and its streaming figures. We opted for this method due to its resilience to outliers and its capacity to manage non-linear associations. To optimize the model's performance, we applied Grid Search for hyperparameter tuning. See more in results.

Literature Cited

Géron, A. (2023). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (3rd ed.). O'Reilly Media.

Datasource: https://www.kaggle.com/datasets/nelgiriyewithana/top-spotify-songs-2023/data

Results

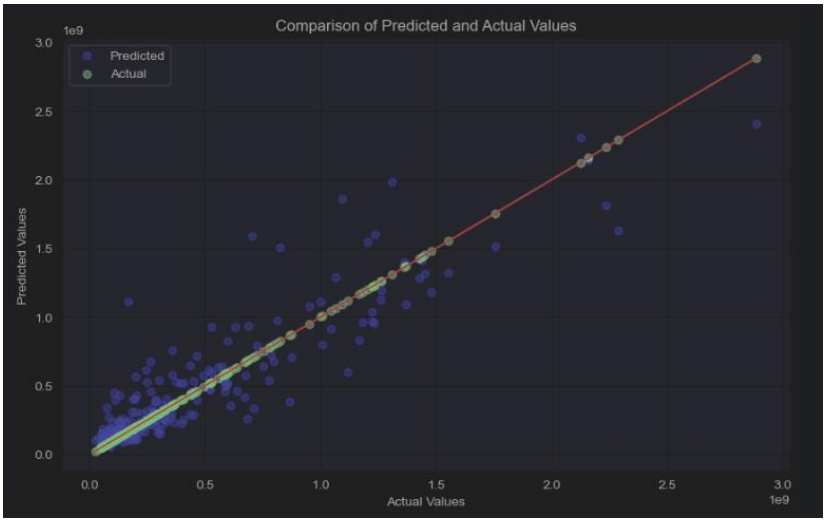
Feature importance:

total_playlist	0.763064
released_date	0.113723
total_charts	0.031351
energy_%	0.015127
liveness_%	0.014673
acousticness_%	0.013492
bpm	0.012481
danceability_%	0.009967

valence_%	0.008595
key	0.005249
speechiness_%	0.004381
instrumentalness_%	0.004290
artist_count	0.002905
mode_Major	0.000582
mode_Minor	0.000118

Optimizing the hyperparameters with GridSearchCV (took forever)

```
Fitting 5 folds for each of 729 candidates, totalling 3645 fits
Best Parameters Found:  {'learning_rate': 0.1, 'max_depth': 4,
'min_samples_leaf': 1, 'min_samples_split': 5, 'n_estimators': 100,
'subsample': 0.8}
mse:  4.6133338254568 28e+16
r2:  0.8115412833052489
```



Conclusion

We found that there is a strong correlation between the number of streams a song gets, and the total amount of playlists its added to. Furthermore, a weaker correlation between the "release_date" and "total_streams" was also spotted.

After optimizing the Gradient boosting regressor we ended up with a model that when tested had a R2 of 0.811

For the other features in the dataset no significant correlation was found in relation to predicting streams.

Acknowledgements

🥹 ChatGPT 🥹