



RIFFREFINE

LEVERAGE YOUR MUSIC!

OUR TEAM



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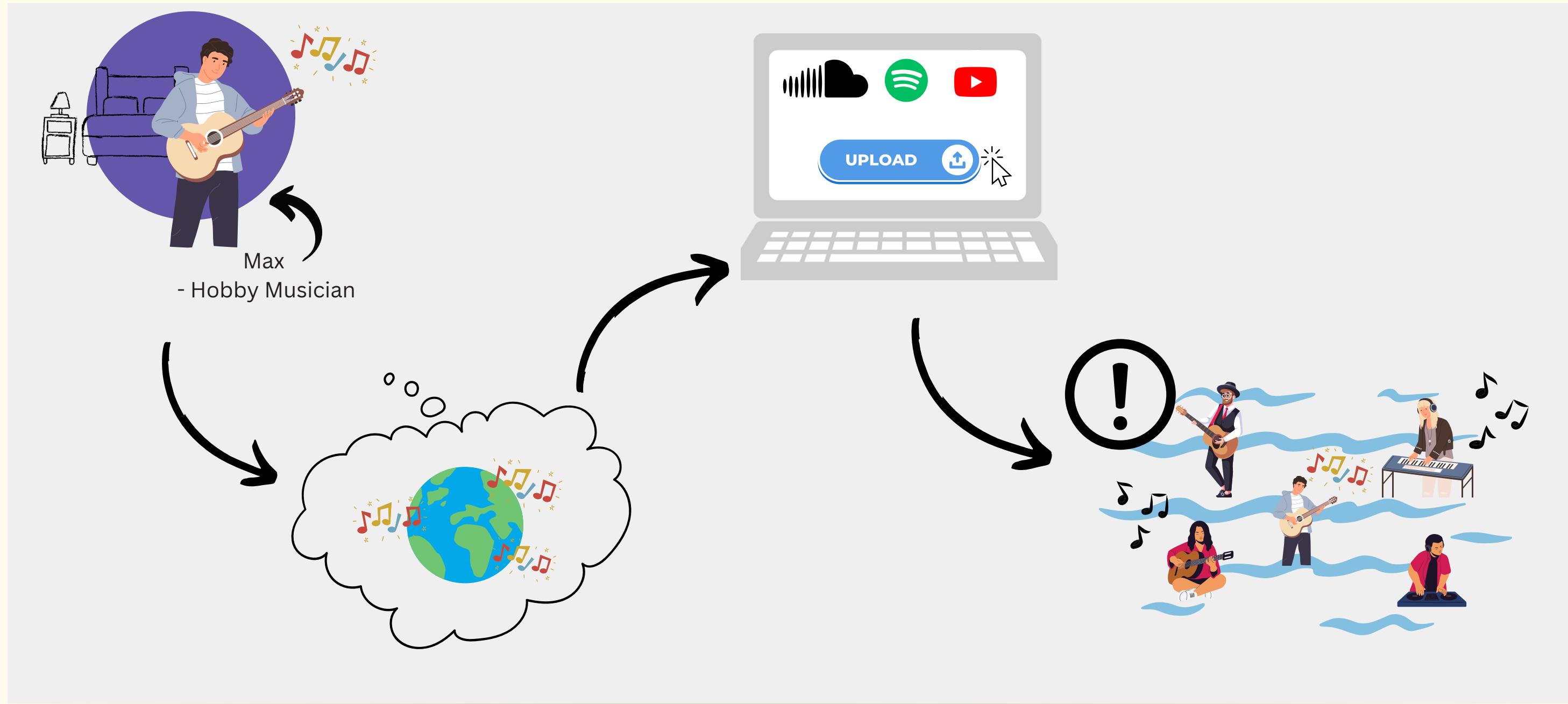
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Management

BACKGROUND



BUSINESS GOAL

Goal



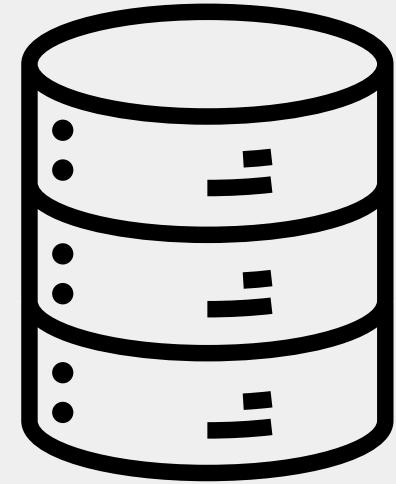
- Predict potential listener range for new music track and identify key drivers for larger outreach

- Provide a feedback app to music artists reflecting which listener range they might reach with their track given certain metadata

Product



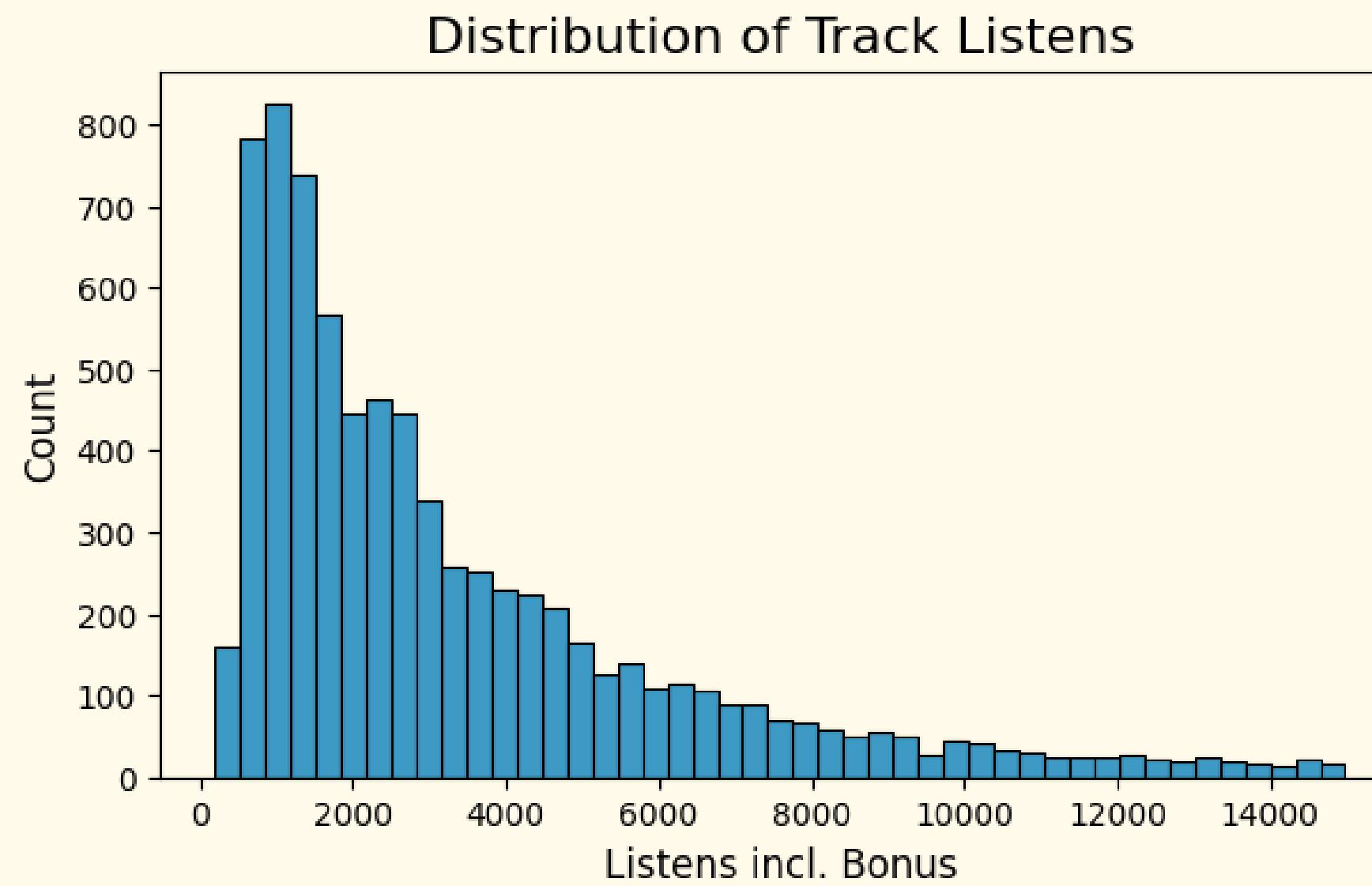
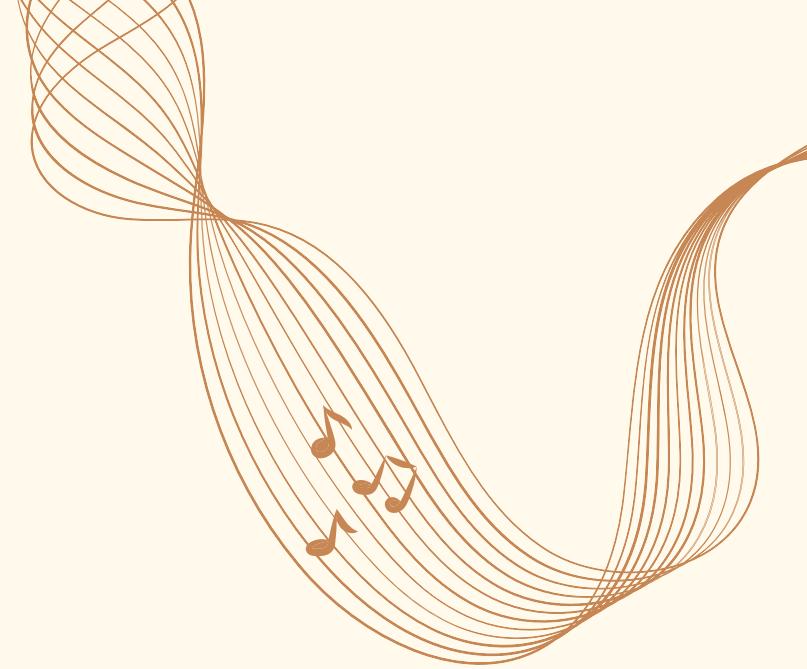
THE DATASET



- Source: Free Music Archive (FMA)
- 8000 tracks from 2008 – 2017
- 8 genres, equally distributed
- total of 500+ columns
 - metadata (e.g. track duration, track license)
 - audio features (e.g. loudness, ZCR)

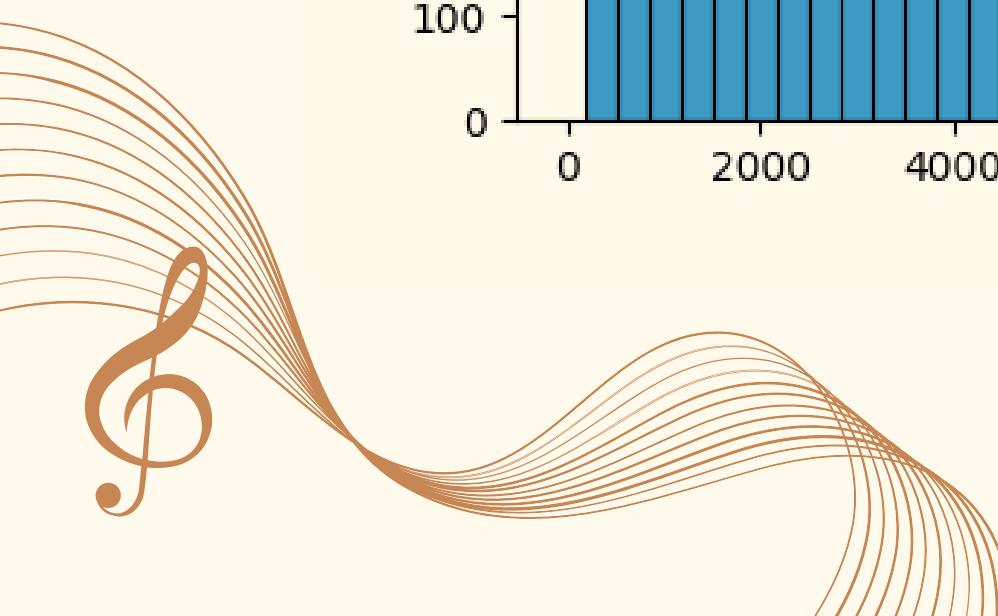


DATA: TRACK LISTENS

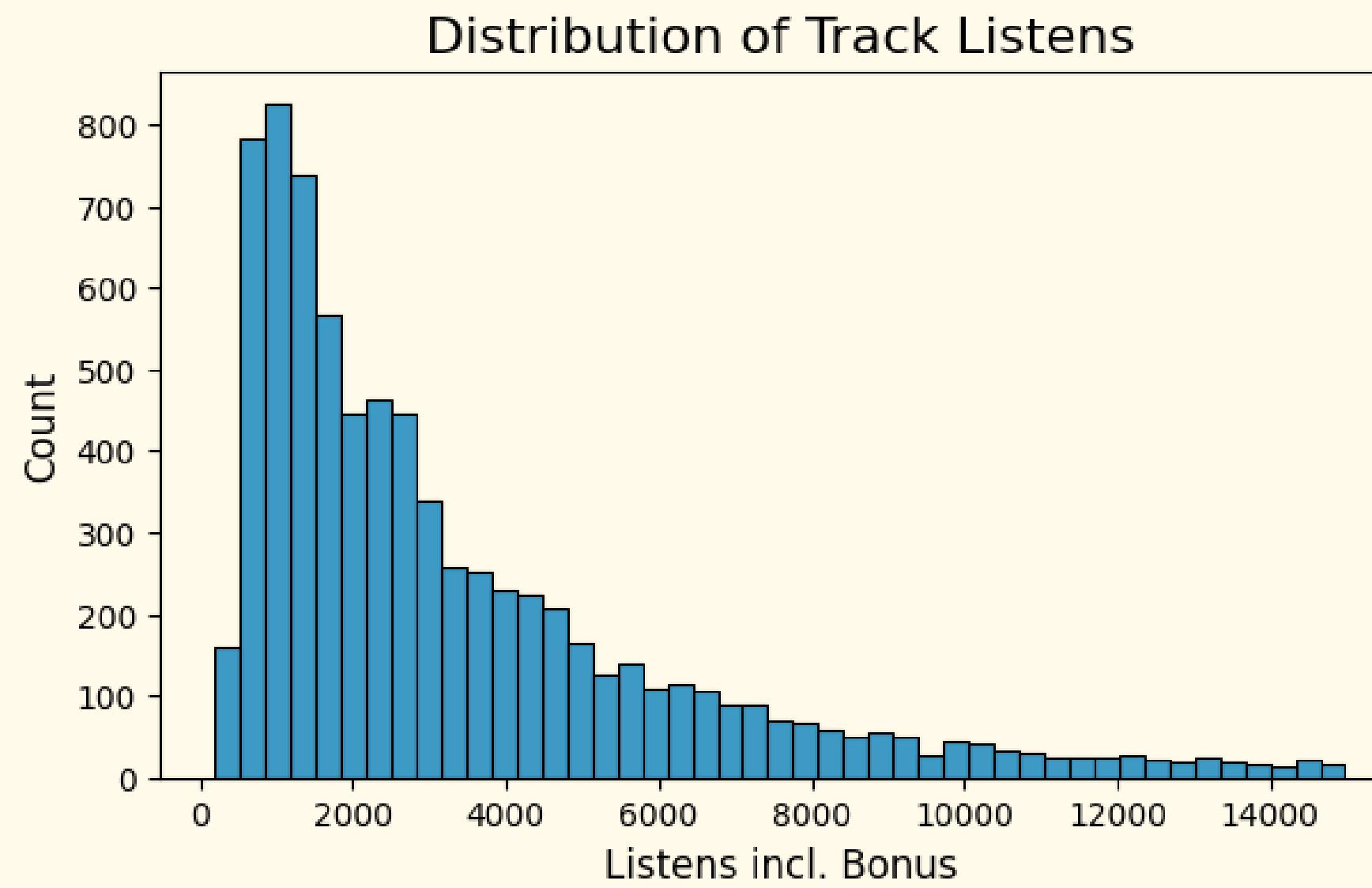
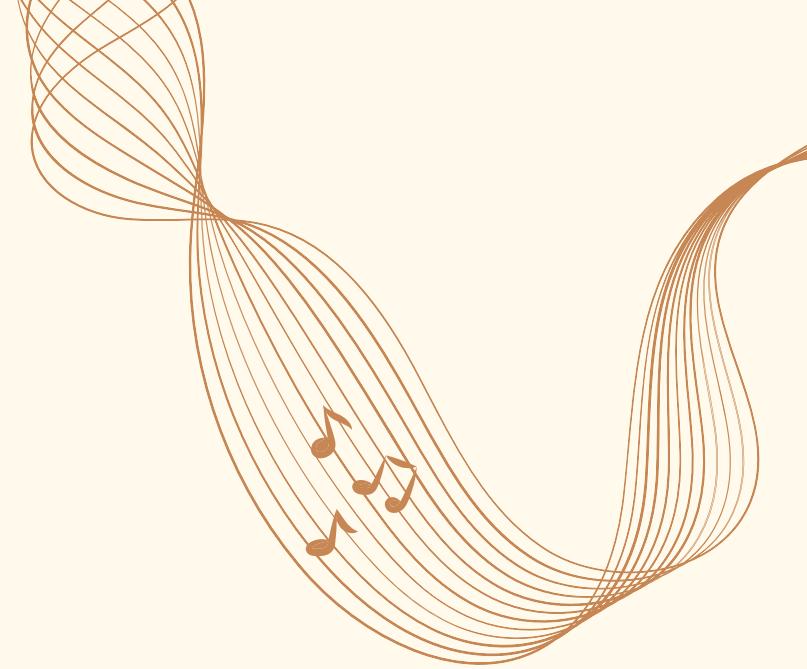


- right skewed range from 200 – 550k listens

(*) outliers not included in graph

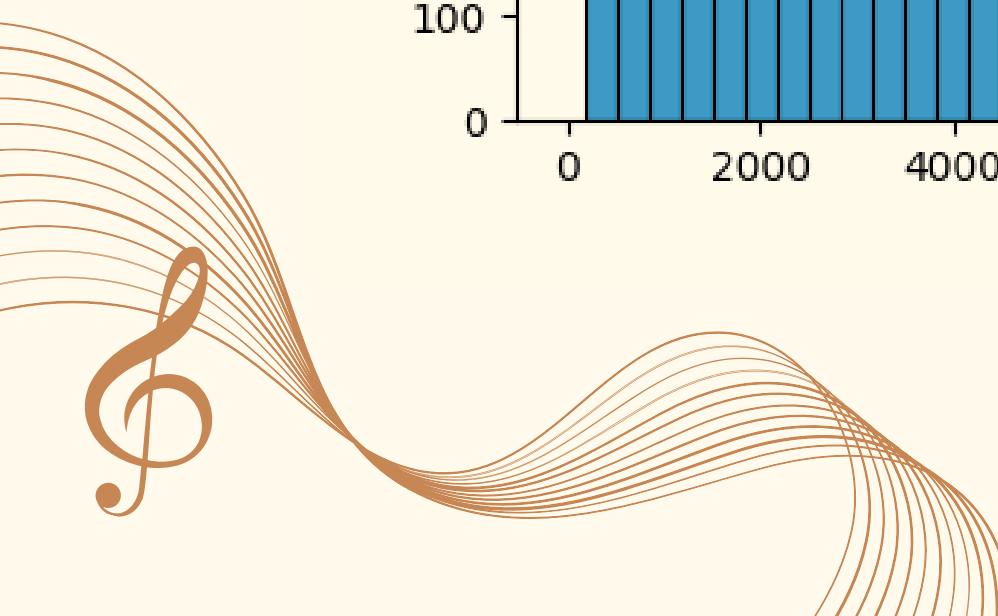


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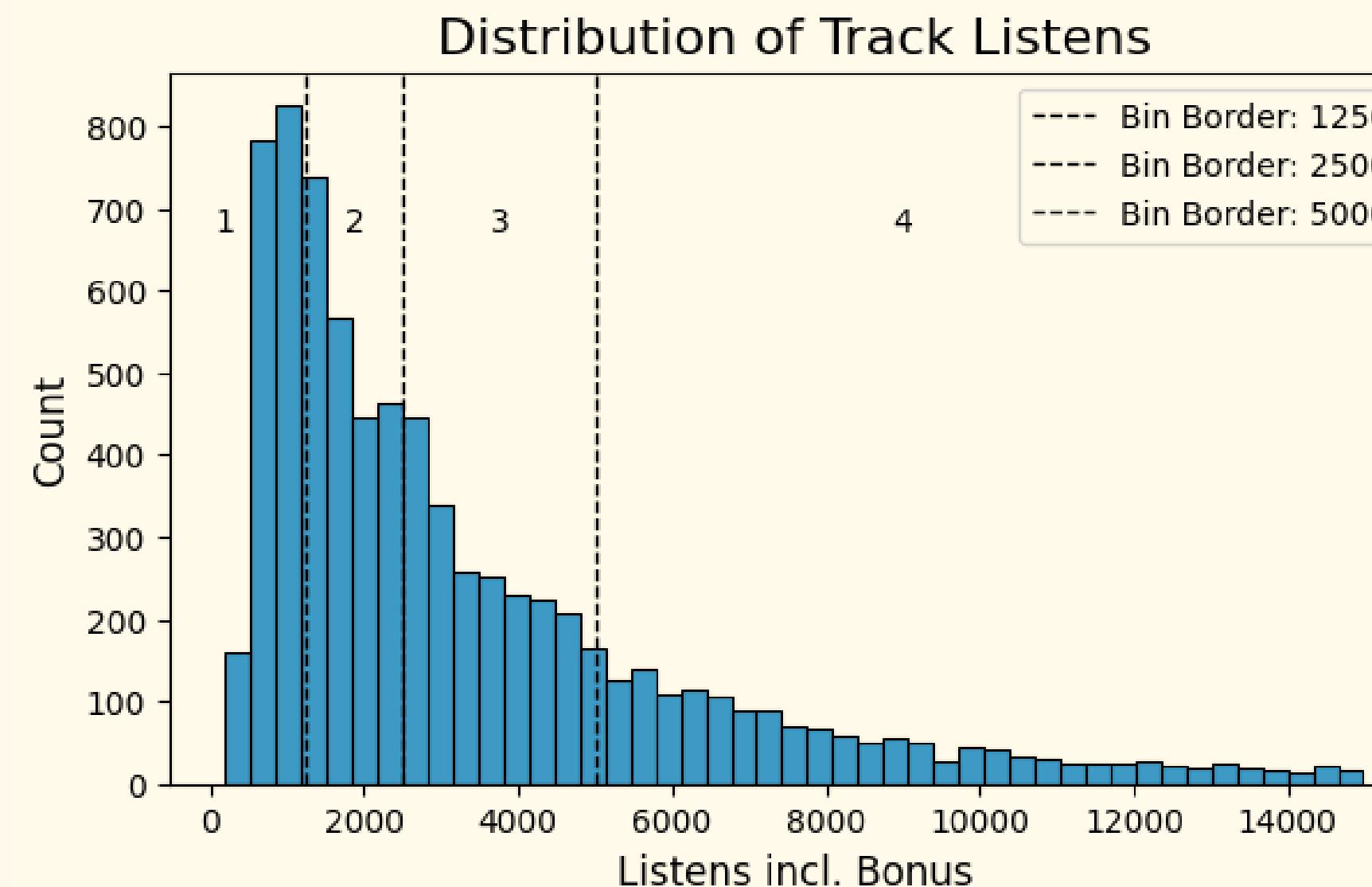


- right skewed range from 200 – 550k listens
- newer tracks receive bonus listens

(*) outliers not included in graph



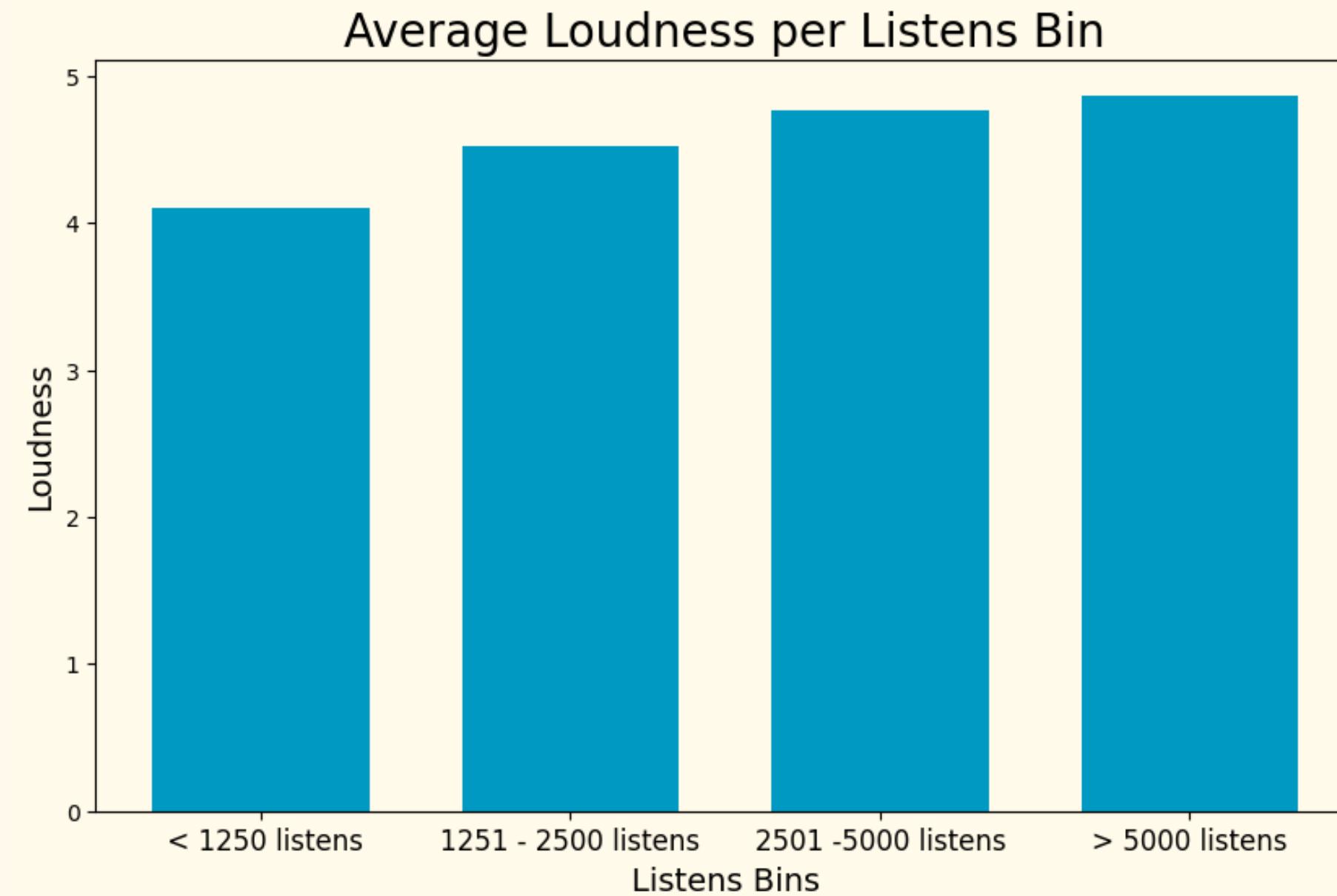
DATA: TRACK LISTENS



→ binned into 4 balanced classes:

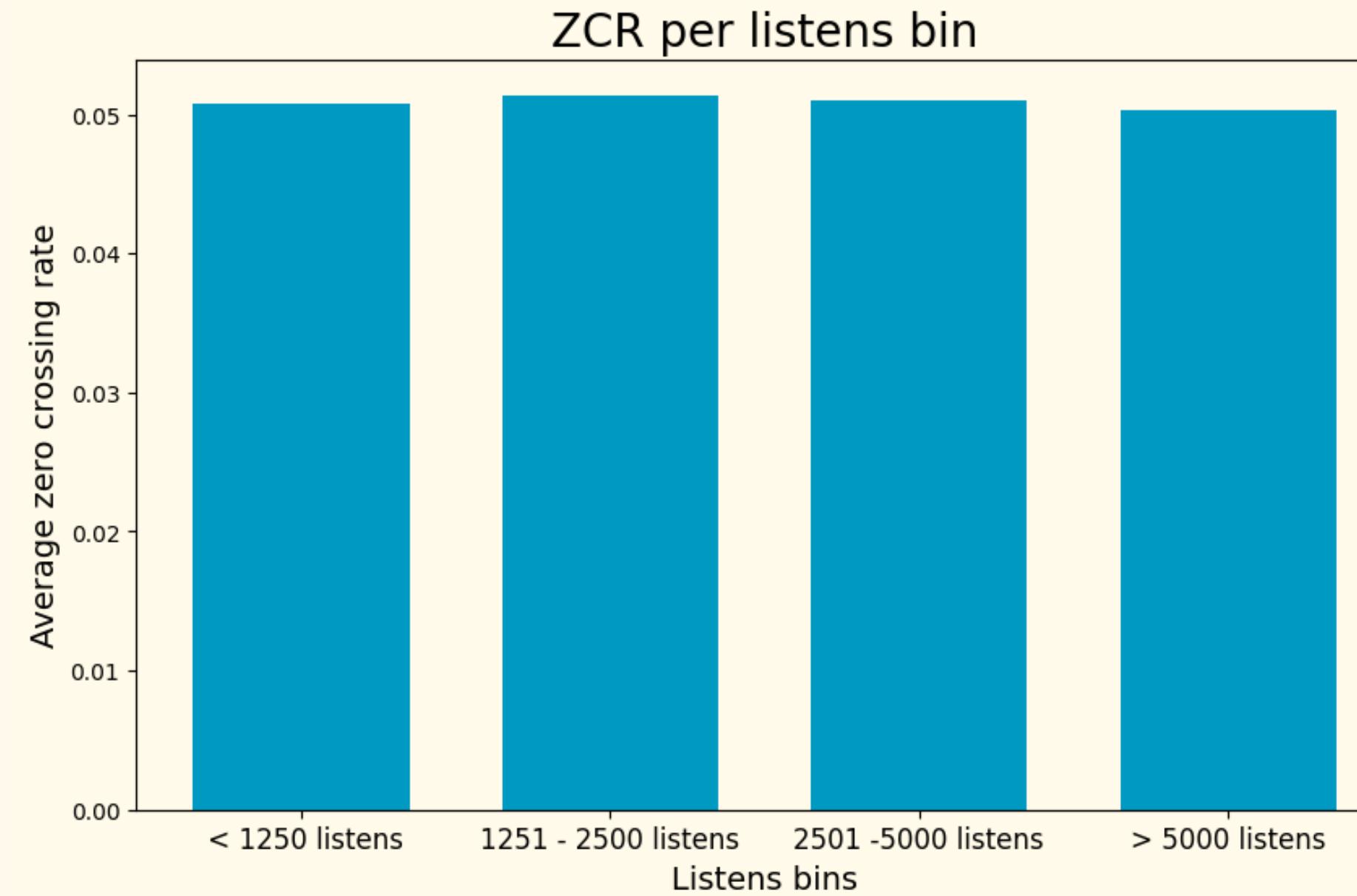
1	Up to 1250 listens
2	1251 - 2500 listens
3	2501 - 5000 listens
4	Over 5000 listens

AUDIO FEATURES



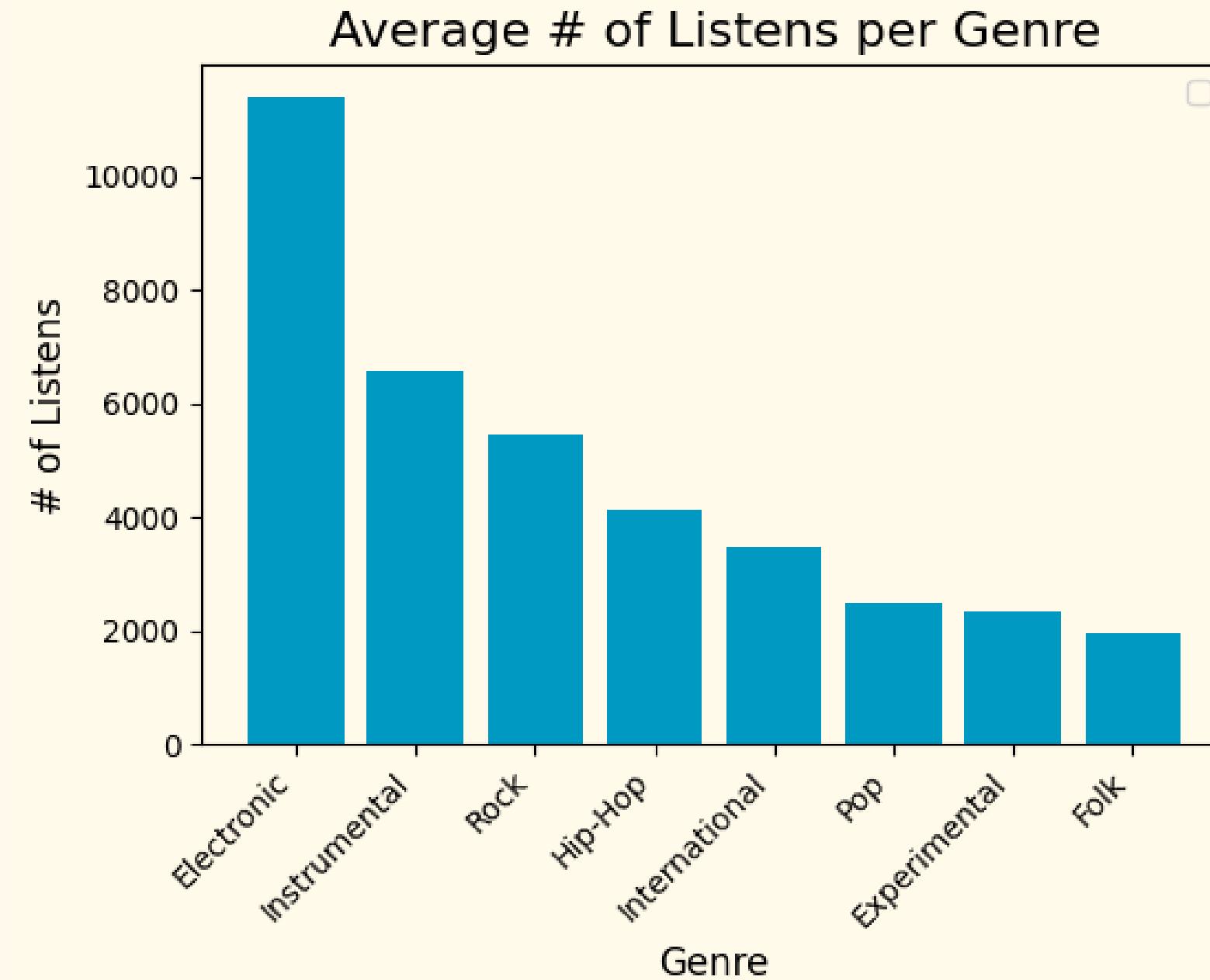
Minor relationship
between audio features
and listens..

AUDIO FEATURES



..no relationship between
audio features and
listens!

METADATA



**Genre drives how often
a track is listened!**

BASELINE MODEL

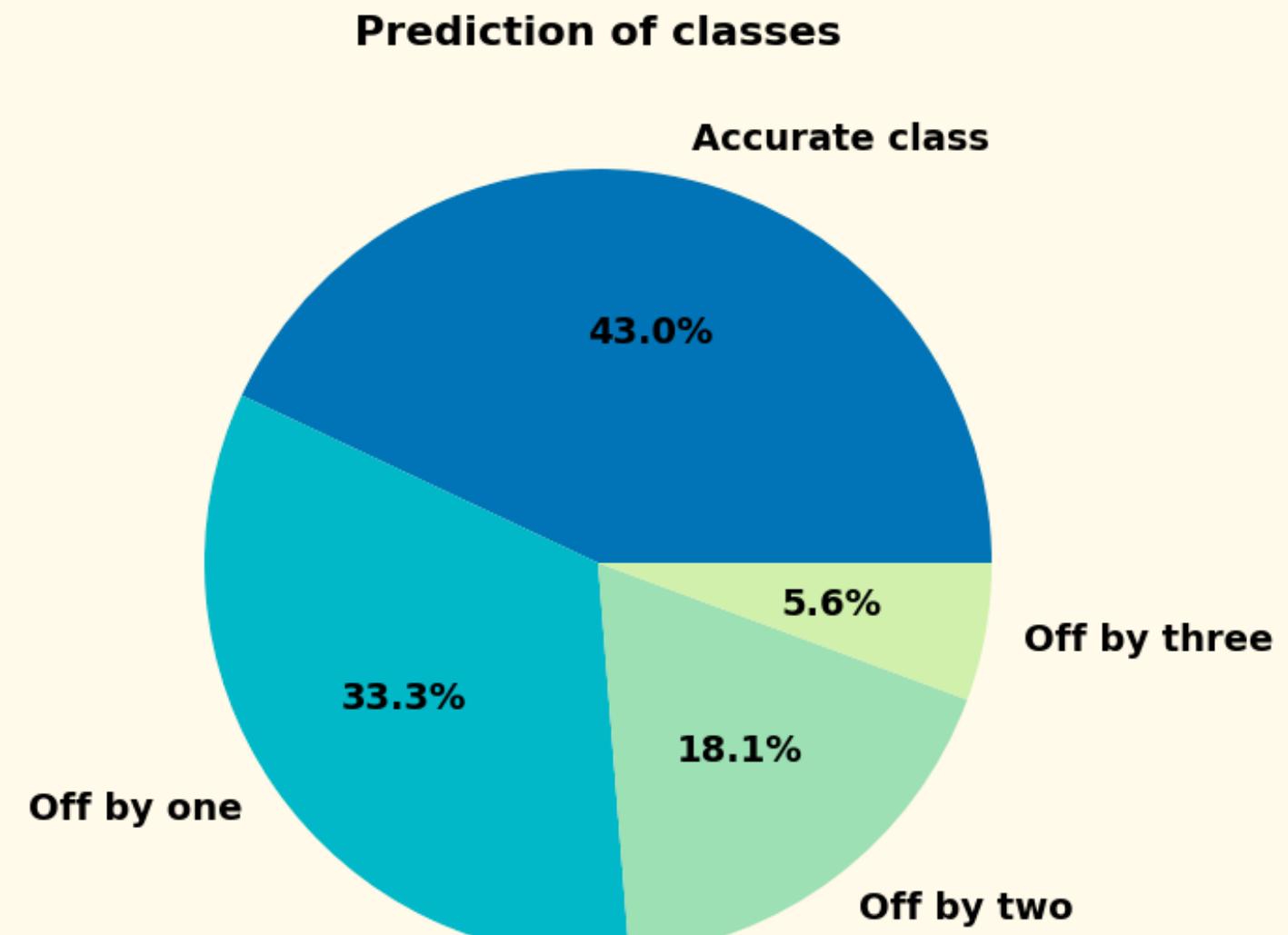
Hypothesis: Genre impacts #of listens!

- Folk / Pop / Experimental / International → 1
(less than 1,250 listens)
- Rock/ Instrumental/ Electronic/Hip-Hop → 4
(more than 5,000 listens)

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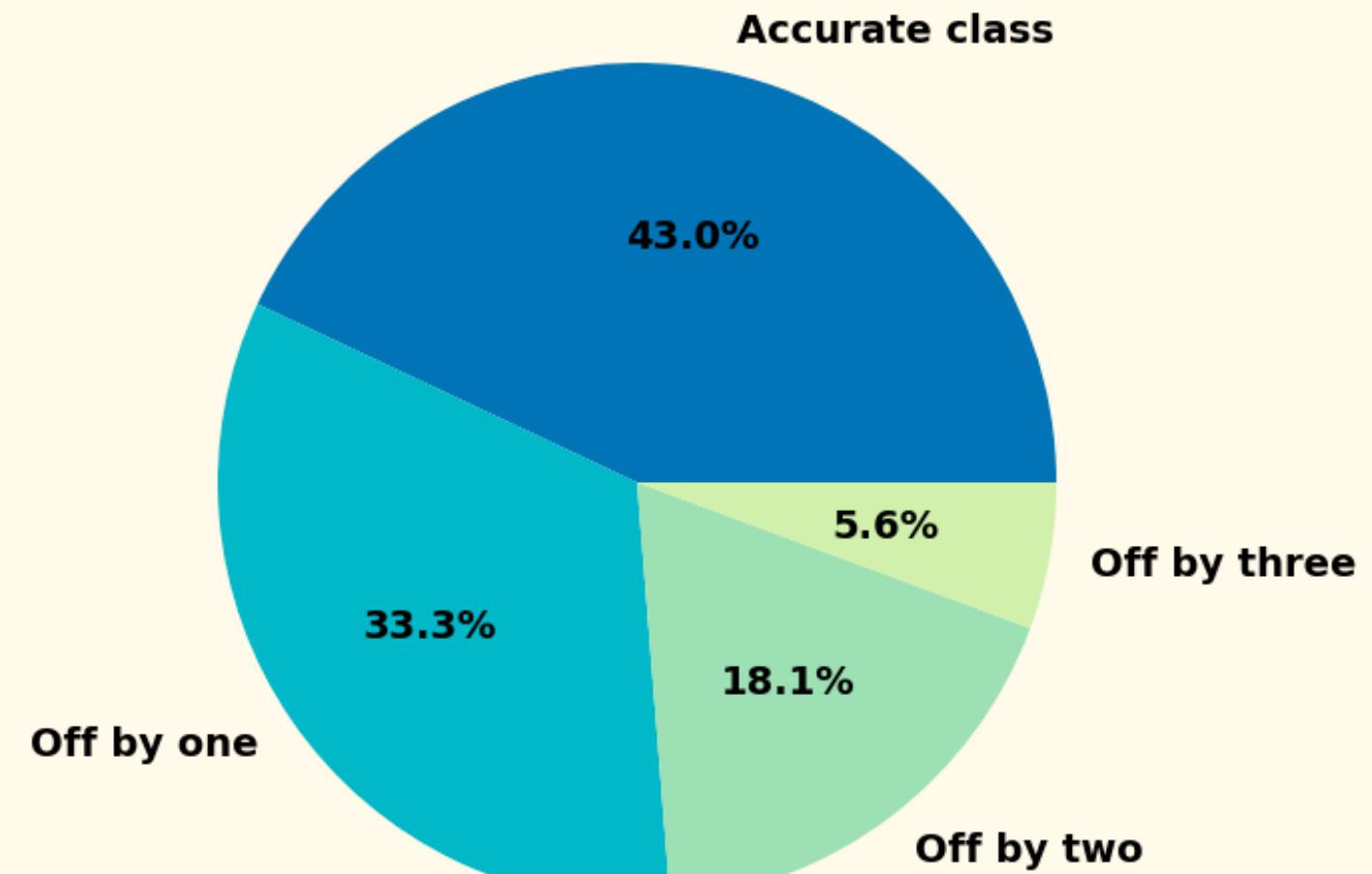


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- Baseline model achieves a
Cohen's Kappa of 0.42

Prediction of classes



COHEN'S KAPPA

- also called **Kappa score**: evaluation metric for **multi-class** classification problems, measuring agreement of predictions and actual classes
- weighted Cohen's Kappa applicable for **ordinally** scaled samples
- penalizes greater deviations between classes

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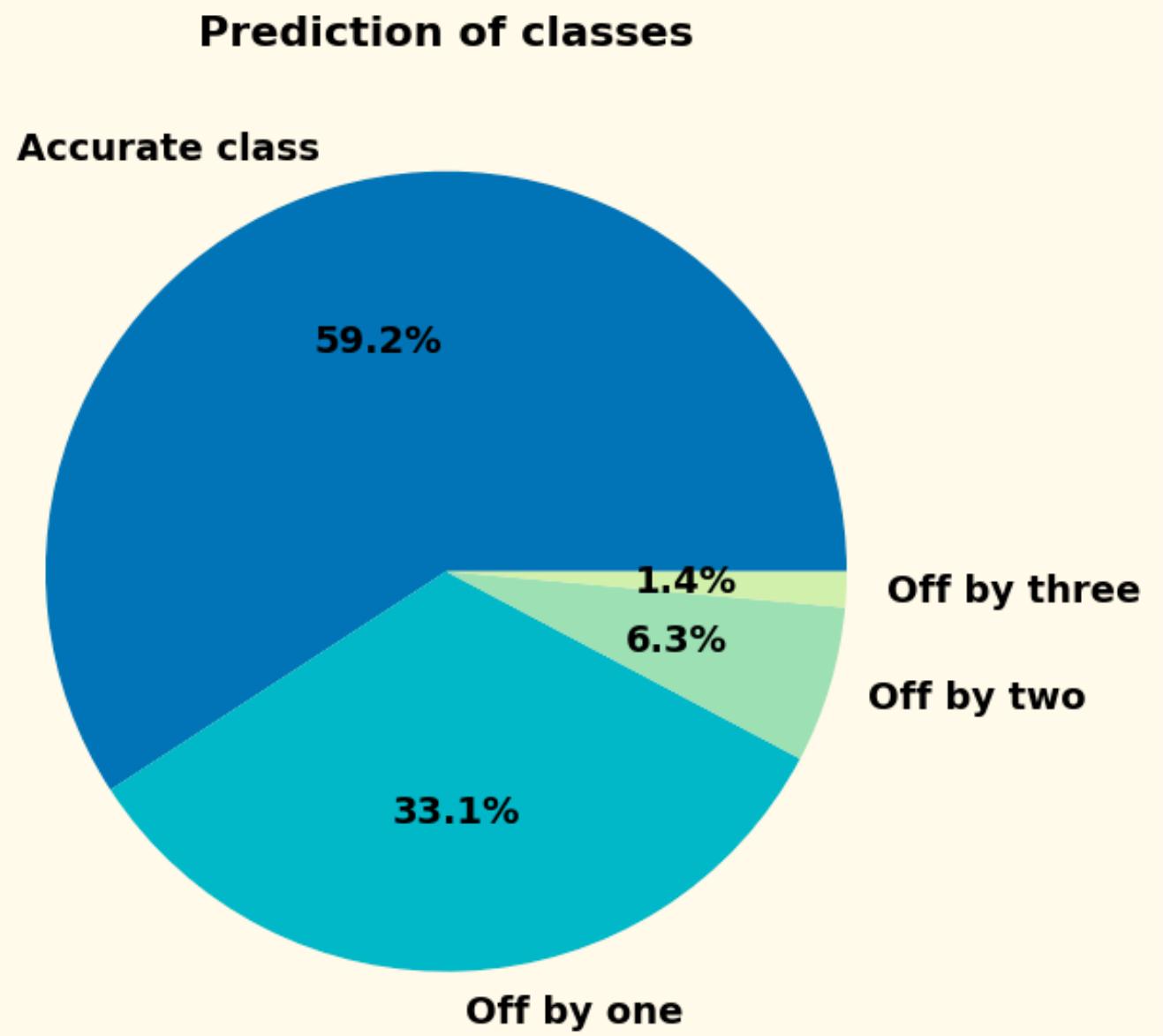
Cohen's Kappa	Agreement Level
0.01 - 0.25	slight
0.25 - 0.5	moderate
0.5 - 0.75	substantial
0.75 - 1.0	(almost) perfect

BEST MODEL

- XGBoost based on trees
- Cohen's Kappa = 0.6

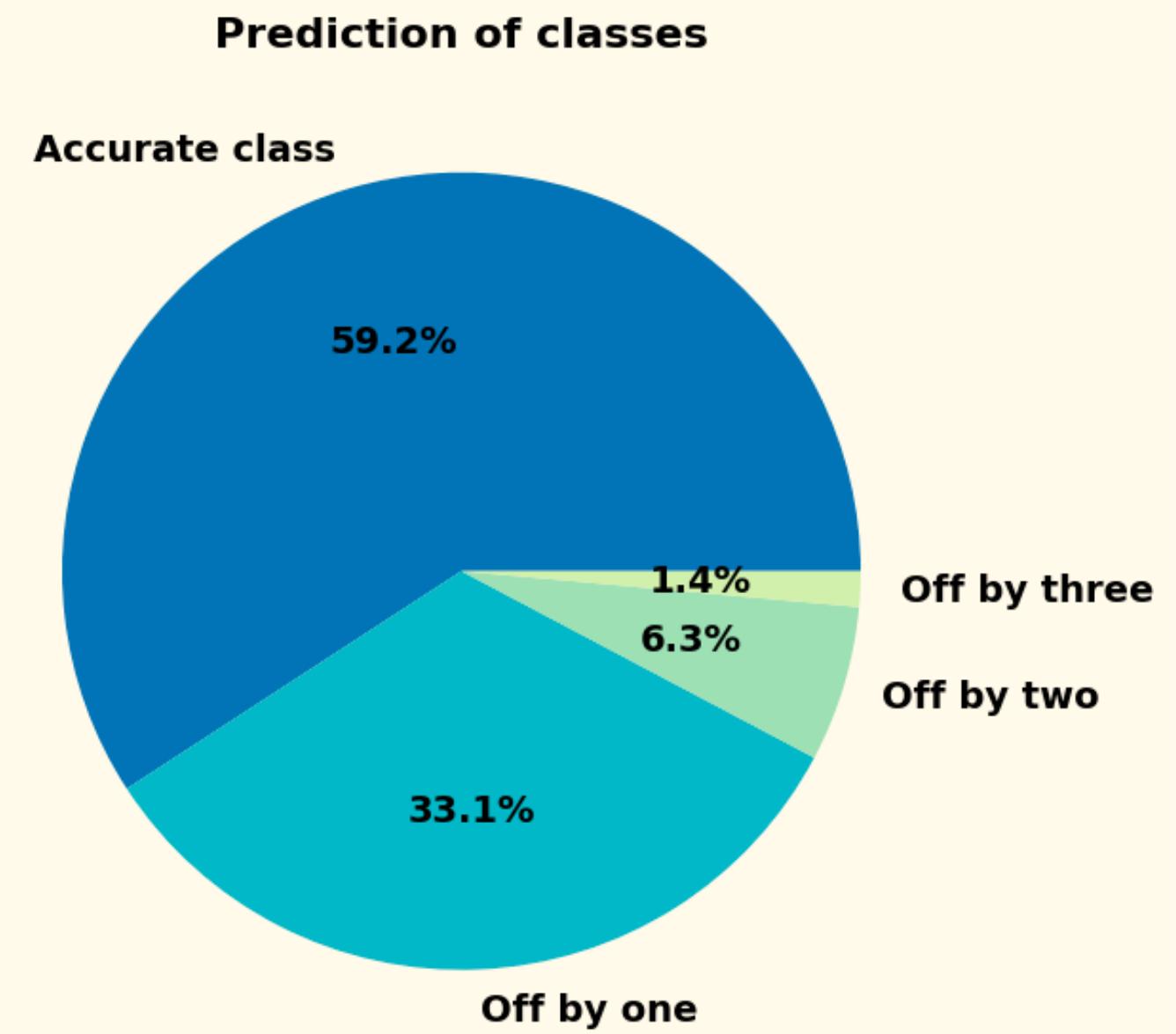
BEST MODEL

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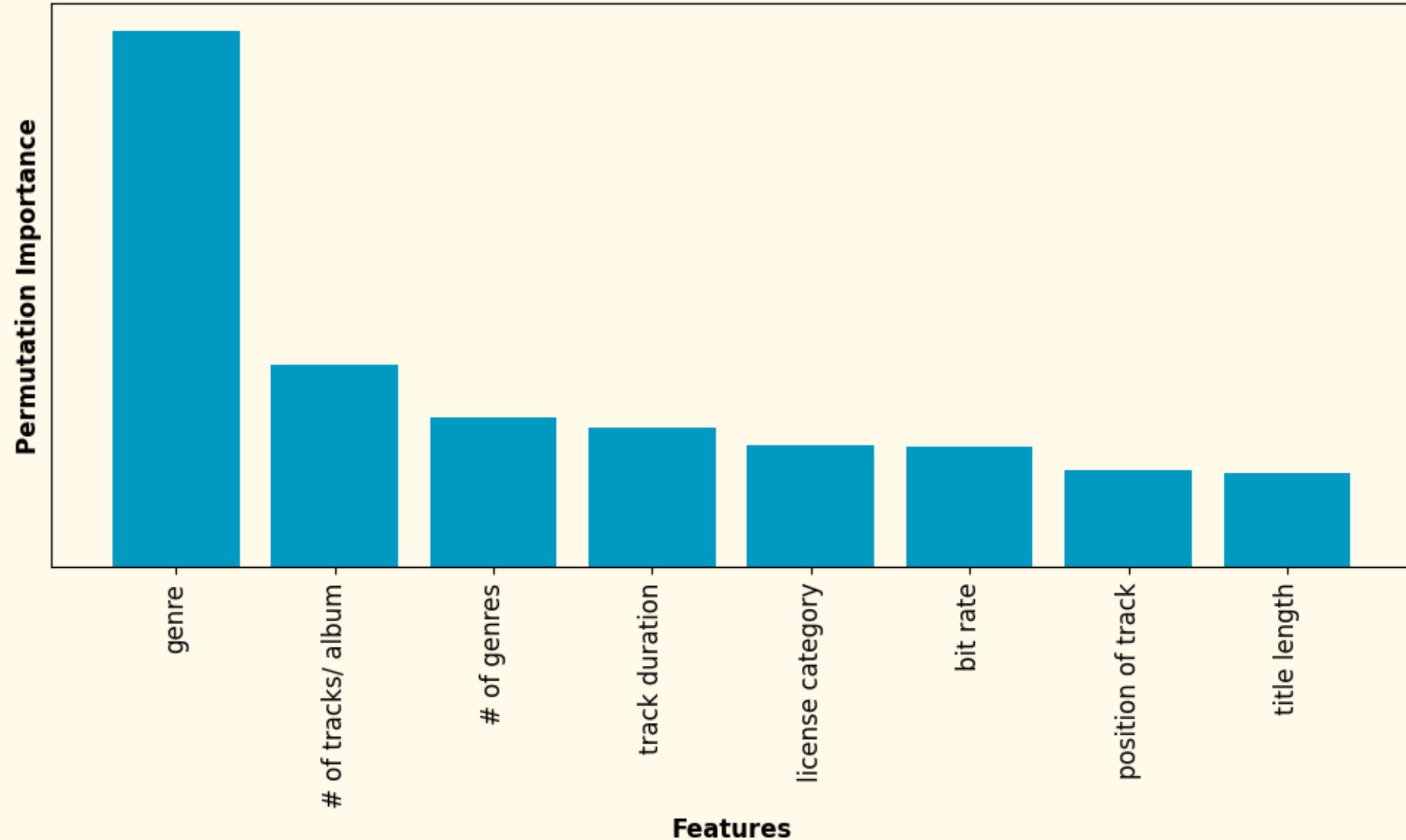
BEST MODEL

- XGBoost based on trees
- Cohen's Kappa = 0.6
- 92% of tracks are predicted accurate or just one class off
- Metadata are key for model performance
- Audio features are insignificant



FEATURE IMPORTANCE

Permutation Feature Importance of Top-8-Features



CONCLUSION

- audio features unexpectedly insignificant for amount of listeners
- key aspects to adjust by artist:
 - **genre**
 - **number of tracks on album**
 - **number of genres**
 - **duration**
 - **license**
- our App enables music artists to get a listener range prediction based on their defined input

OUTLOOK

- Echonest features might lead to significant increase of model performance
- CNNs for detailed analysis of audio features as images (spectrograms)
- conduct whole analysis on recently released and top-chart tracks
- transform model into regression problem to achieve more precise listener prediction

APP - FIRST PROTOTYPE

Select the metrics for your song

Wich is your genre?

Rock

How is the bit rate?

320000

How long is the duration of your song in sec?

249

Do you have information about your album? (YES=1 / No=0)

1

How much album tracks?

21

How much listens is your song going to reach?

Your Input:

- Genre: Rock
- Bit Rate: 320000
- Duration: 249 seconds
- Album Information Bin: 1
- Album Tracks: 21
- Artist Bio Bin: 1
- Title Character Count: 4
- Track Number: 3
- License Category: 3
- Website: True
- Soundcloud Website: True
- Genres Bins: (0.0, 4.0]

Predict

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Predict

You might have a range between 2501 - 5000 listens!



THANK YOU





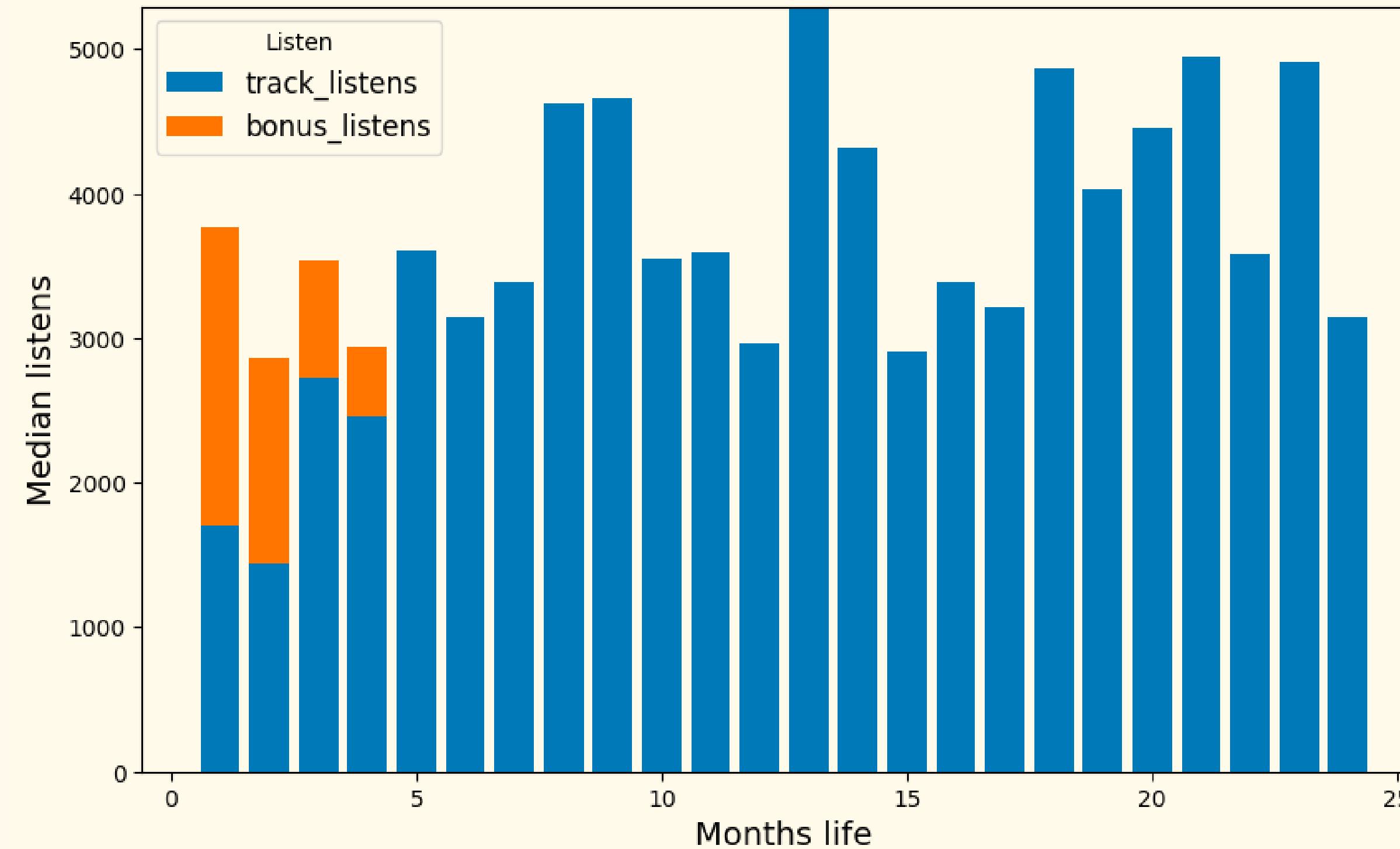
RIFFREFINE

LEVERAGE YOUR MUSIC!

BACKUP SLIDES

COMPENSATION FOR YOUNGER TRACKS

Compensation for new tracks



MODELS

Model	Cohen's Kappa (metadata only)	Cohen's Kappa (metadata & audio features)
KNN	0.387	0.119
Decision Tree	0.512	0.46
Random Forest	0.528	0.523
XGBoost	0.60	0.59
Neural Network	0.494	0.493

*Baseline Model Performance = 0.42

ERROR ANALYSIS

