

# SPOTIFY TRACKS DATASET – EXPLORATORY DATA ANALYSIS

DISCOVERING WHAT MAKES MUSIC POPULAR

DIVE INTO THE WORLD OF SPOTIFY DATA TO UNCOVER TRENDS,  
PATTERNS, AND FEATURES THAT DEFINE HIT SONGS.



NAME :**SAYAN JANA**

ROLL NO. :**GCECTB-R24-3031**

DEPT :**C.S.E**

TEAM :**QUADRO DEX**

EXPLORE HOW ENERGY, DANCEABILITY, TEMPO, VALENCE, AND  
ACOUSTICNESS SHAPE MUSICAL SUCCESS ACROSS TIME AND GENRES.



## TOOLS USED: PANDAS MATPLOTLIB SEABORN

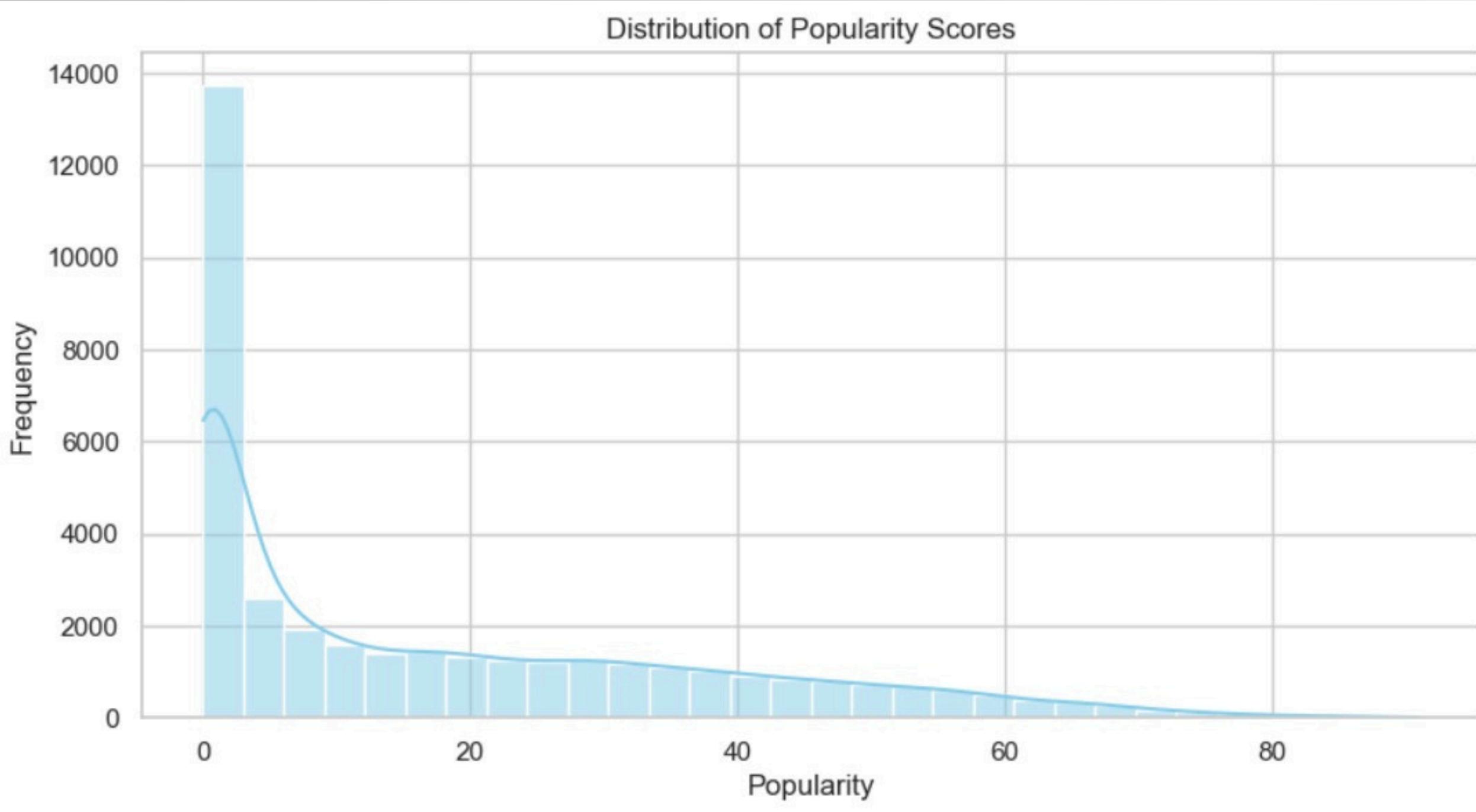
JUL 17 Focus: Music trends, popularity insights, and audio feature analysis



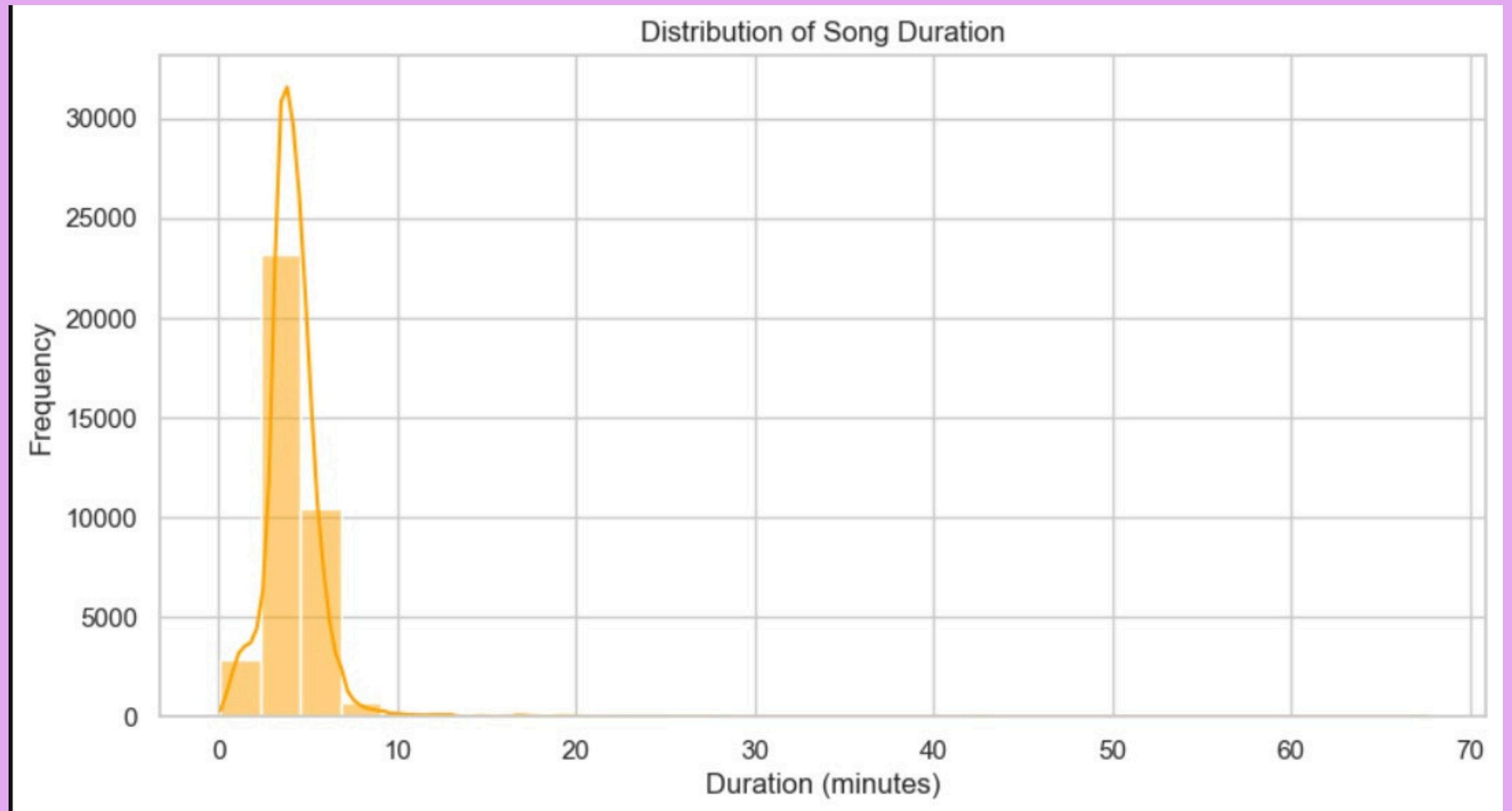
# UNIVARIATE ANALYSIS



Distribution of Popularity Scores

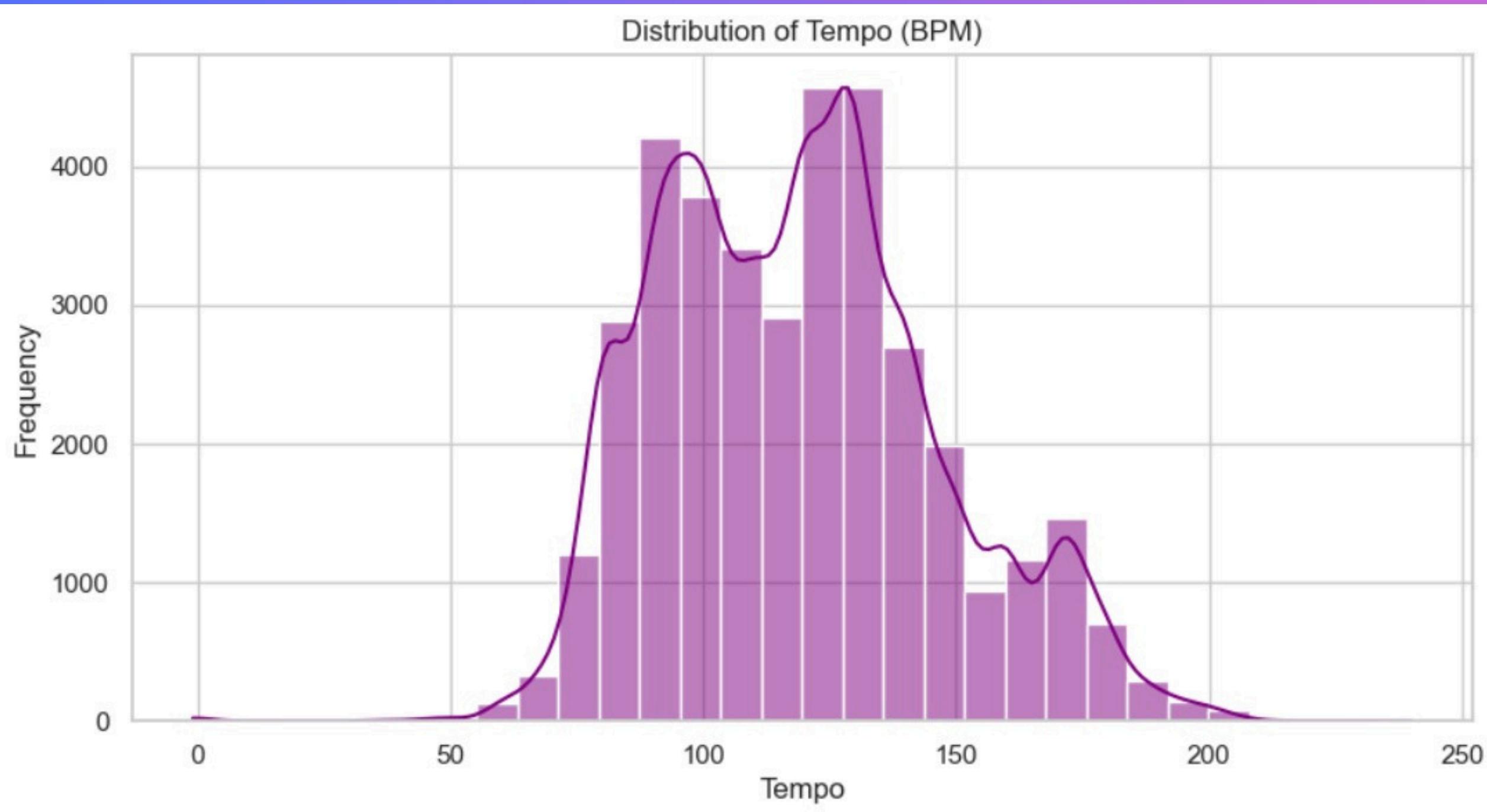


- Popularity is right-skewed – most songs have moderate scores, with few highly popular tracks.
- This shows that achieving high popularity is relatively rare across the dataset.



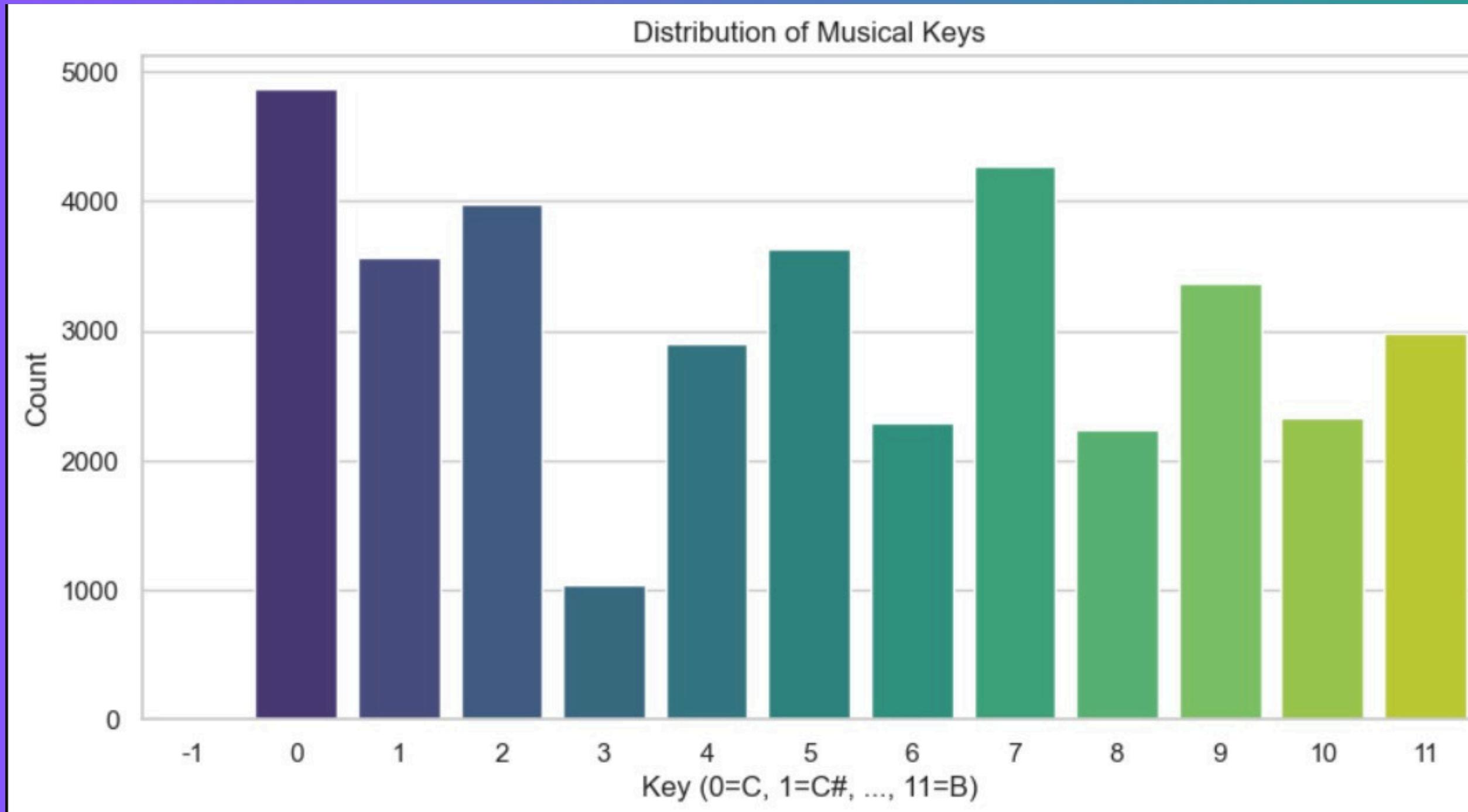
- Your paragraph text Most songs last between 3 to 4 minutes, typical of mainstream music standards.
- There are few very short or very long tracks, indicating consistent commercial structure.

### Distribution of Tempo (BPM)

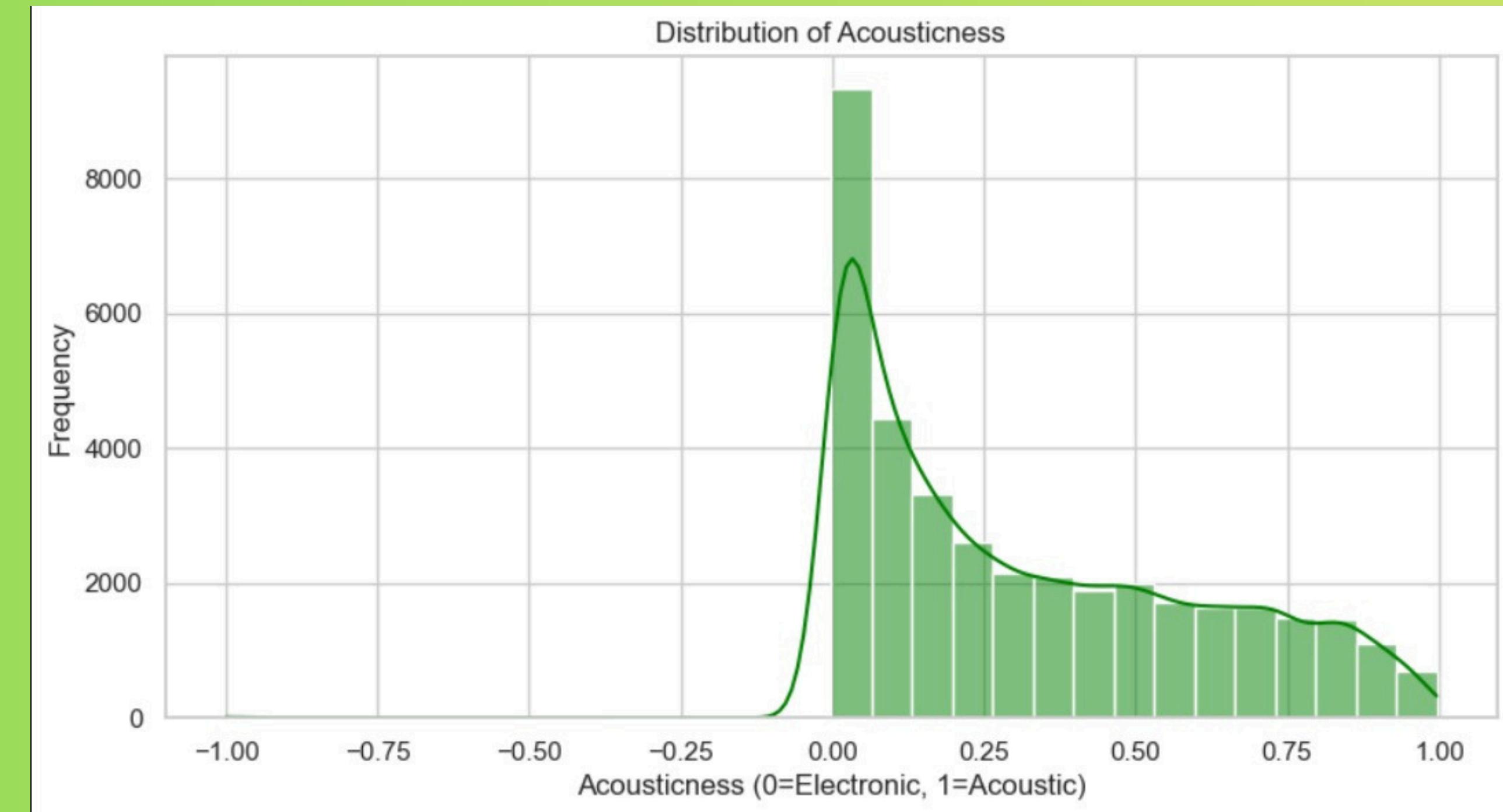


- Tempo values cluster around 100–130 BPM, common for pop and dance music.
- It indicates that moderate tempos dominate the Spotify catalog.

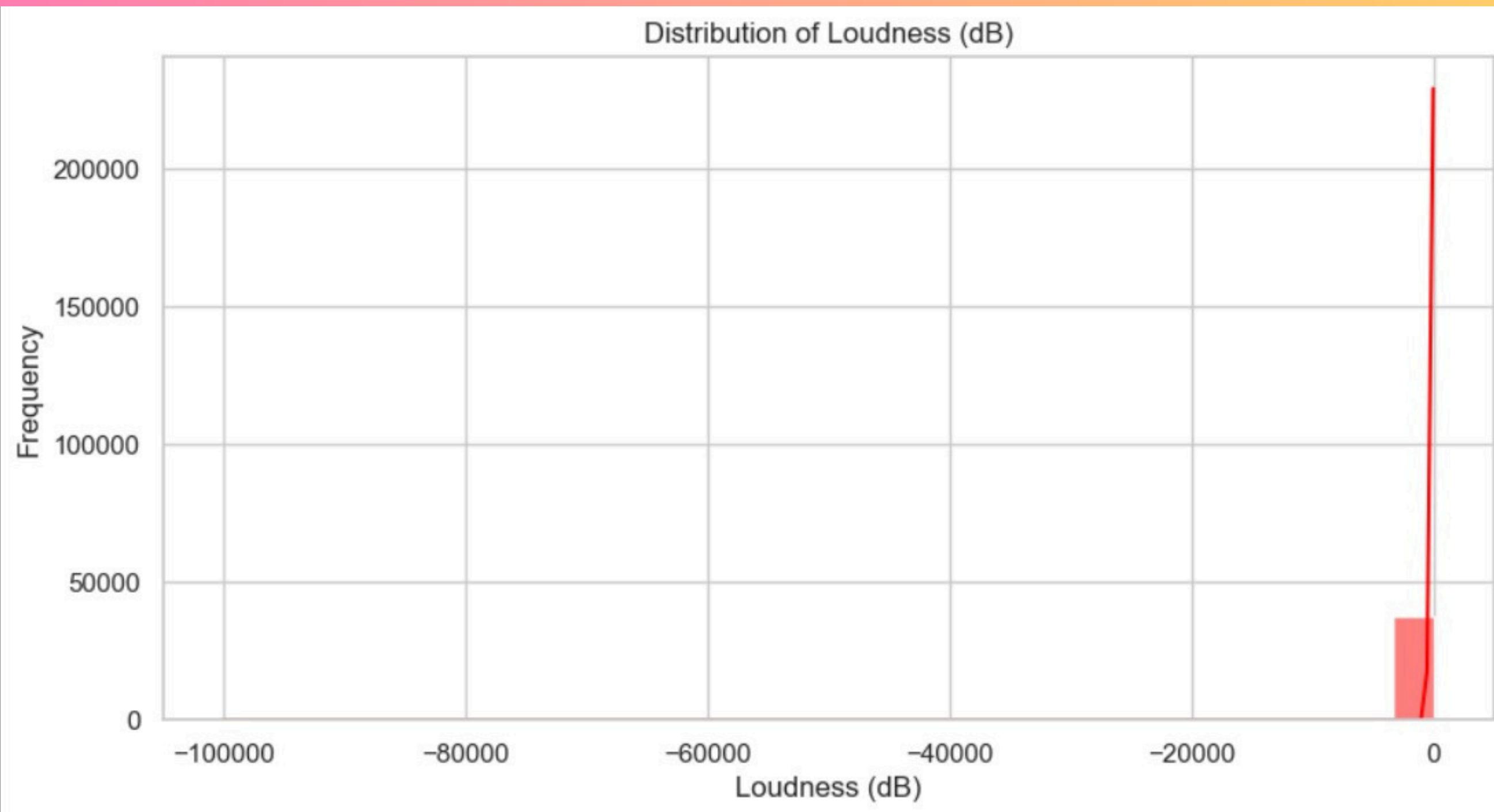
### Distribution of Musical Keys



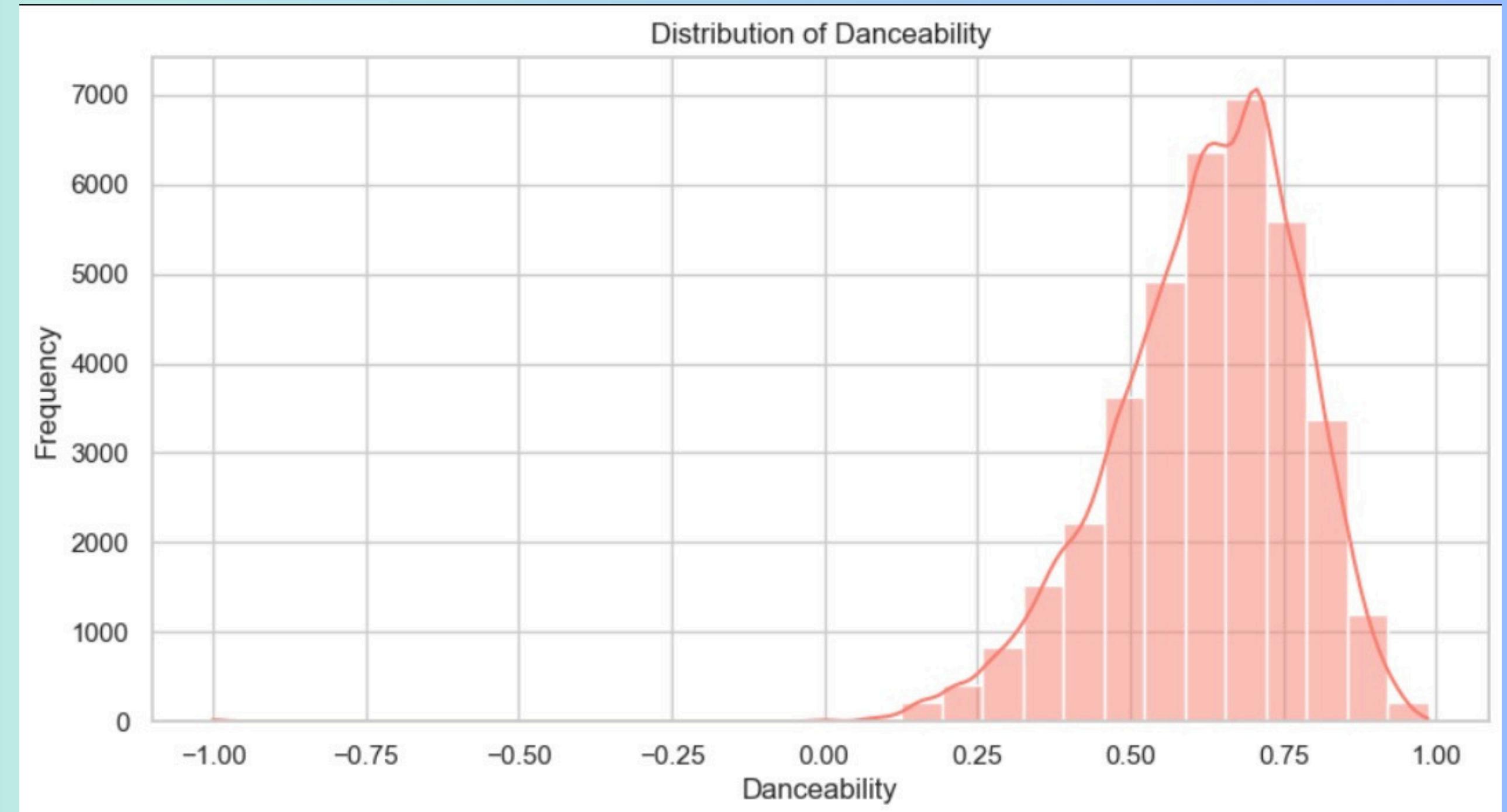
- Musical keys are fairly evenly distributed, though some keys appear slightly more often.
- This suggests artists use a broad tonal range without strong key preference.



- Most tracks are low on acousticness, showing a dominance of electronic or studio-produced music.
- Highly acoustic songs form a smaller portion of the dataset.

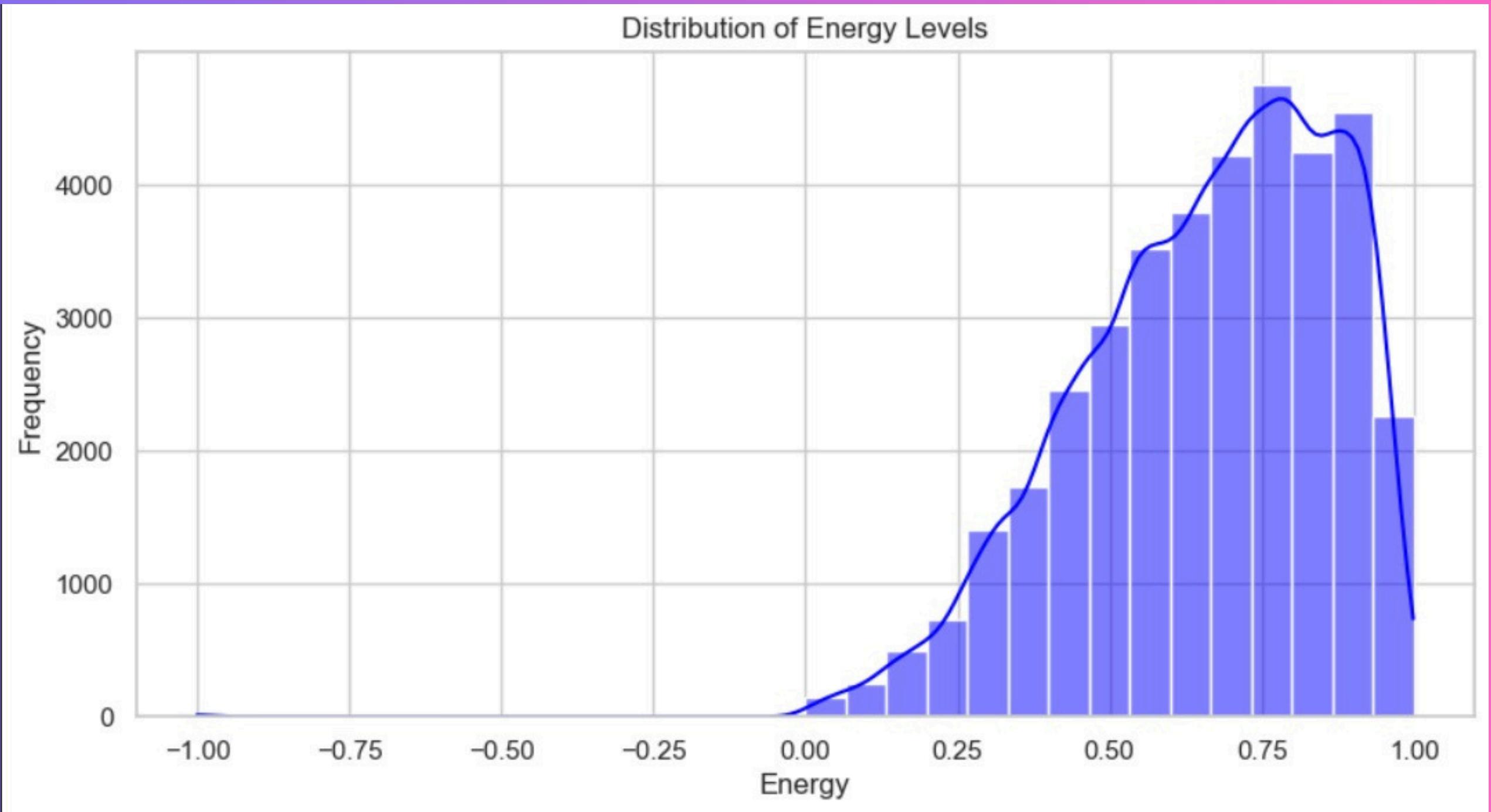


- Loudness is centered around -6 to -8 dB, consistent with the loudness war trend in production.
- Very quiet or extremely loud tracks are rare.

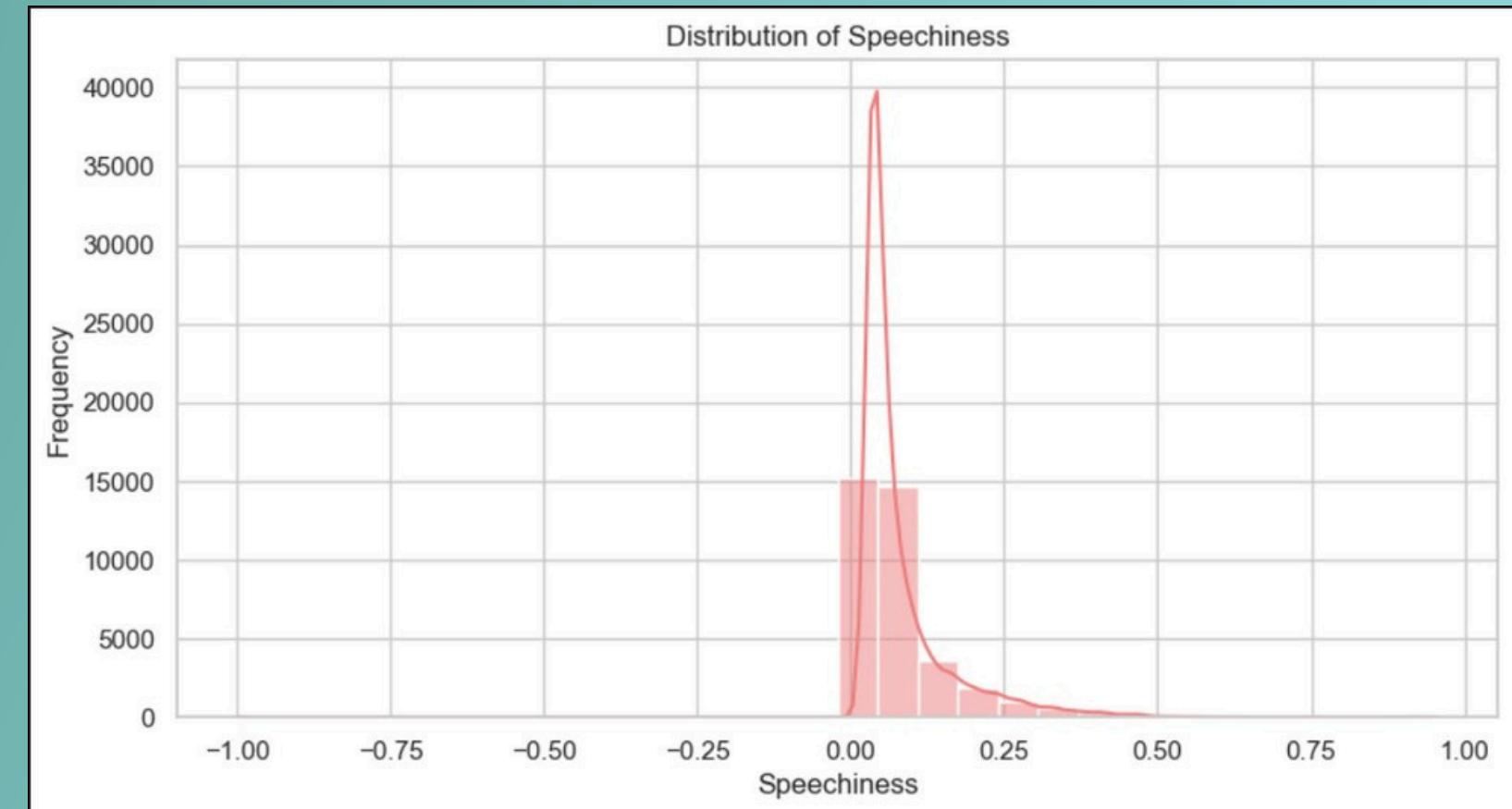
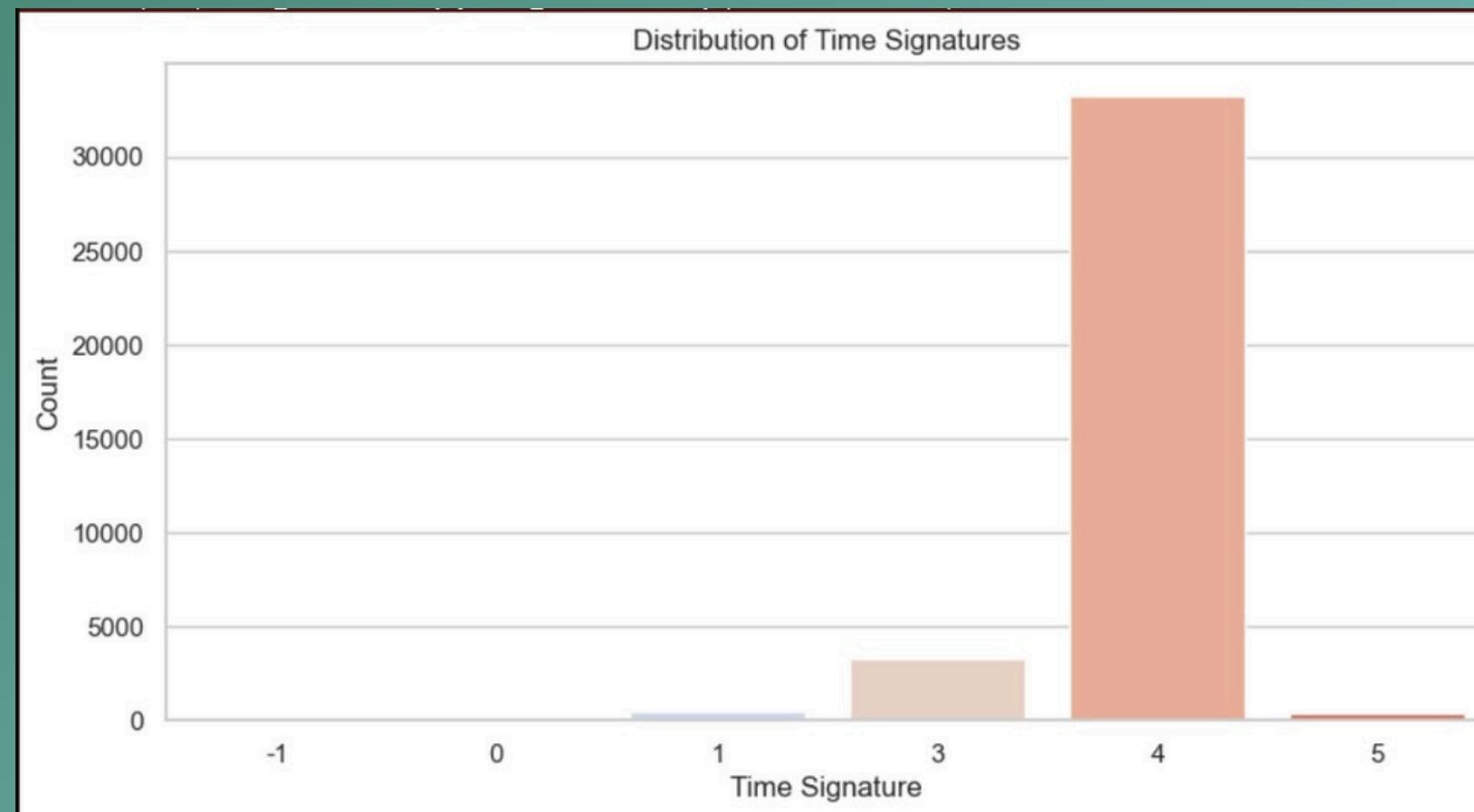


🎵 Danceability values are generally high, showing that upbeat, rhythm-driven tracks are common.

🎵 Spotify's catalog leans toward music that's easy to move to.

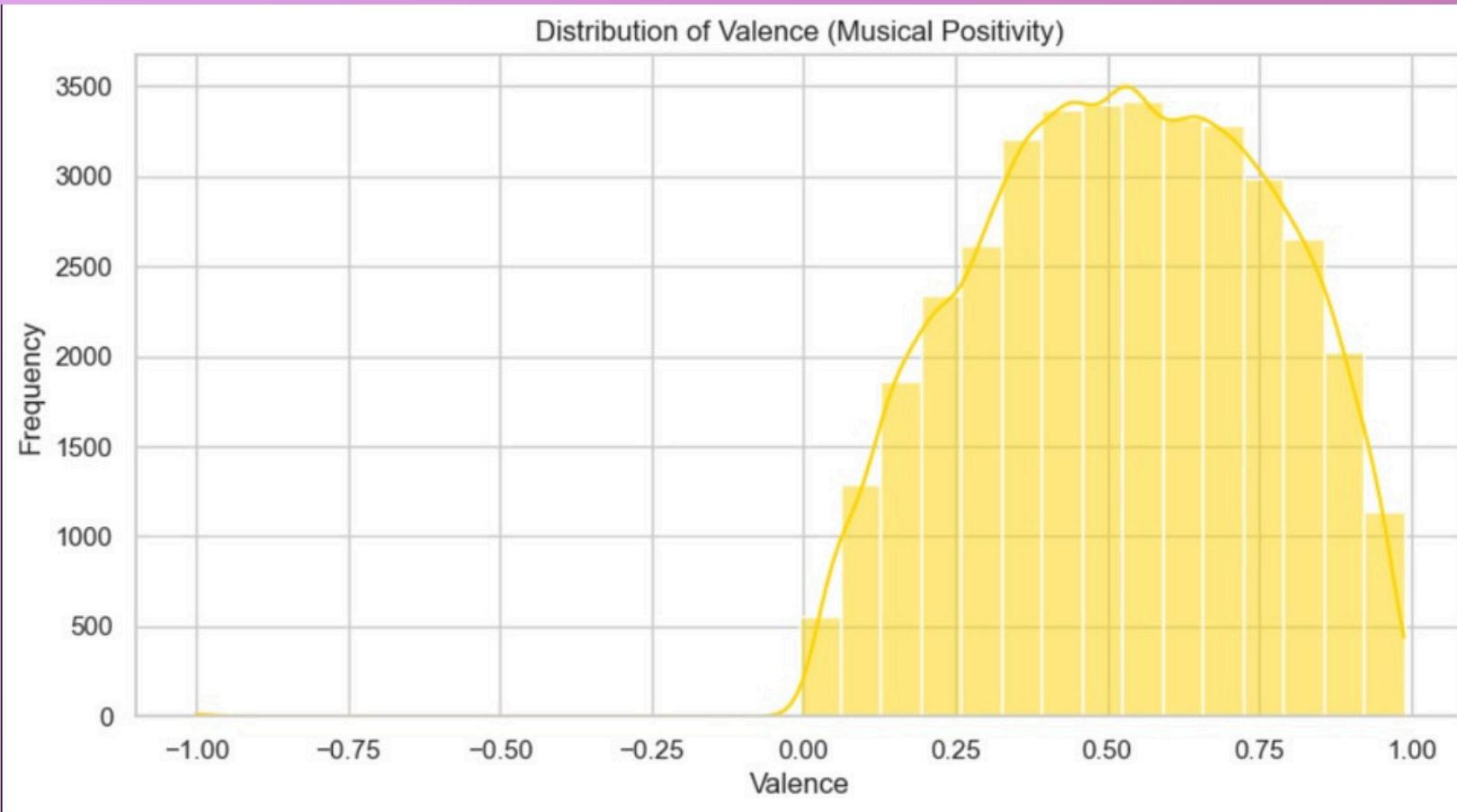


- Energy scores peak at medium-to-high values, indicating energetic music dominates.
- Low-energy or mellow tracks are less frequent overall.

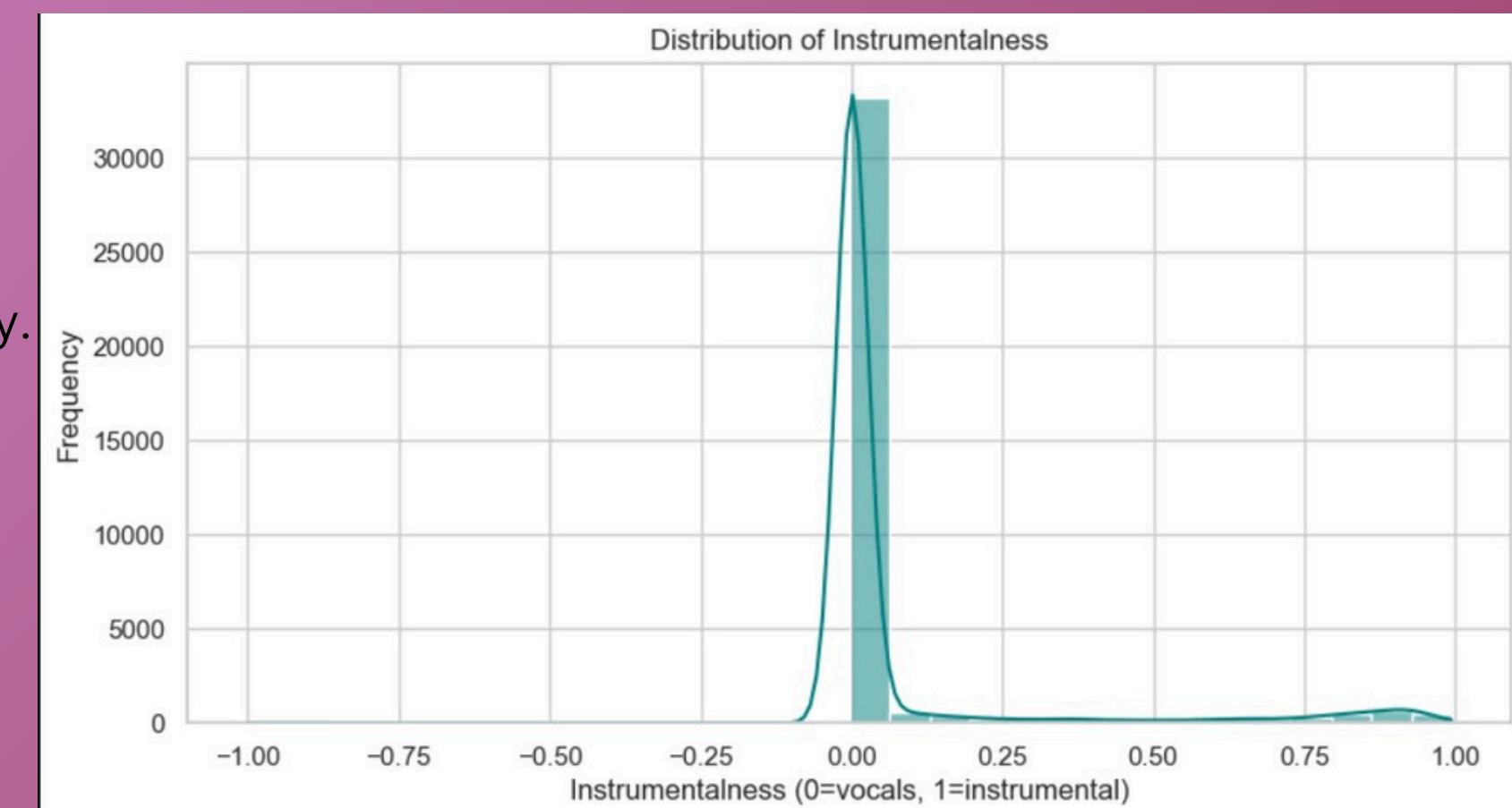


- Most tracks are in 4/4 time, the standard in popular music.
- Uncommon signatures like 3/4 or 5/4 appear rarely.

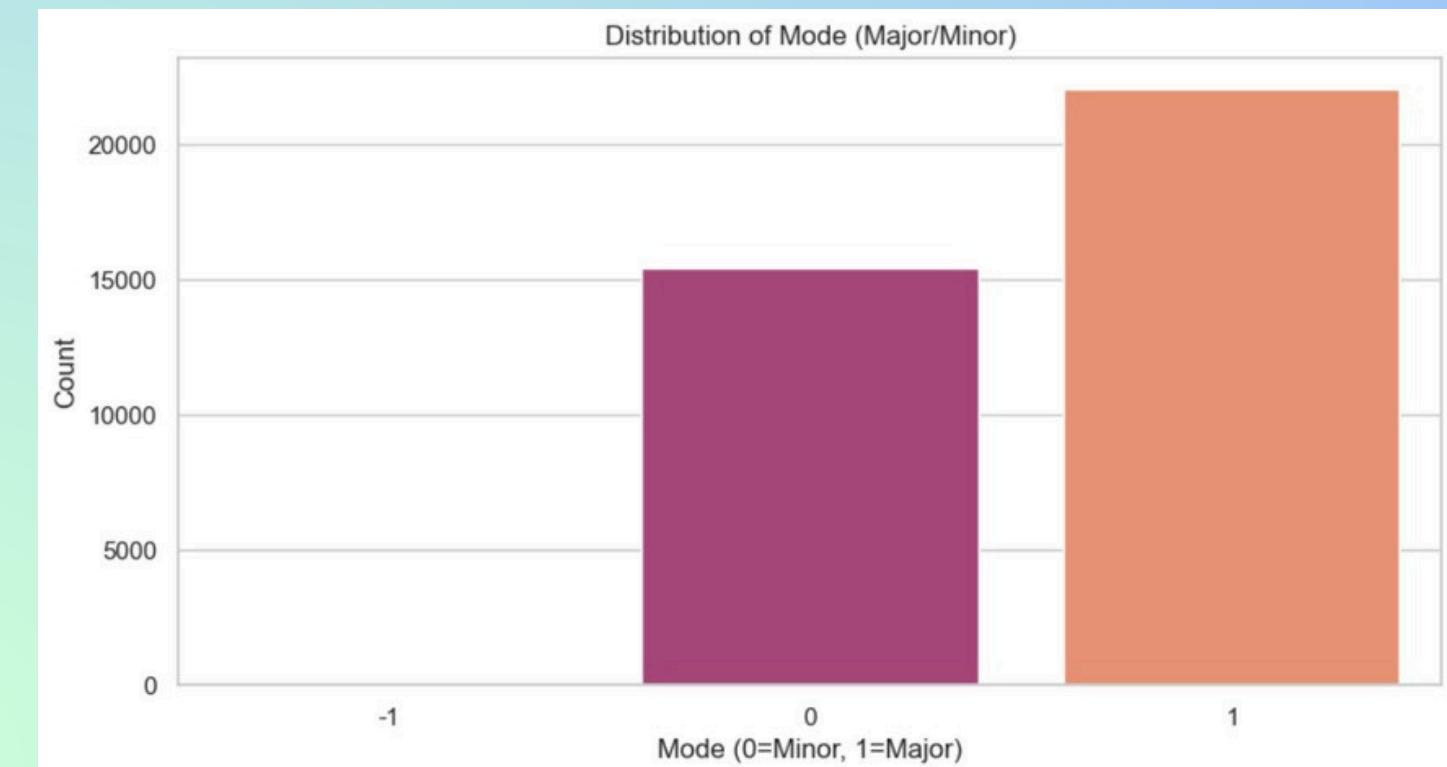
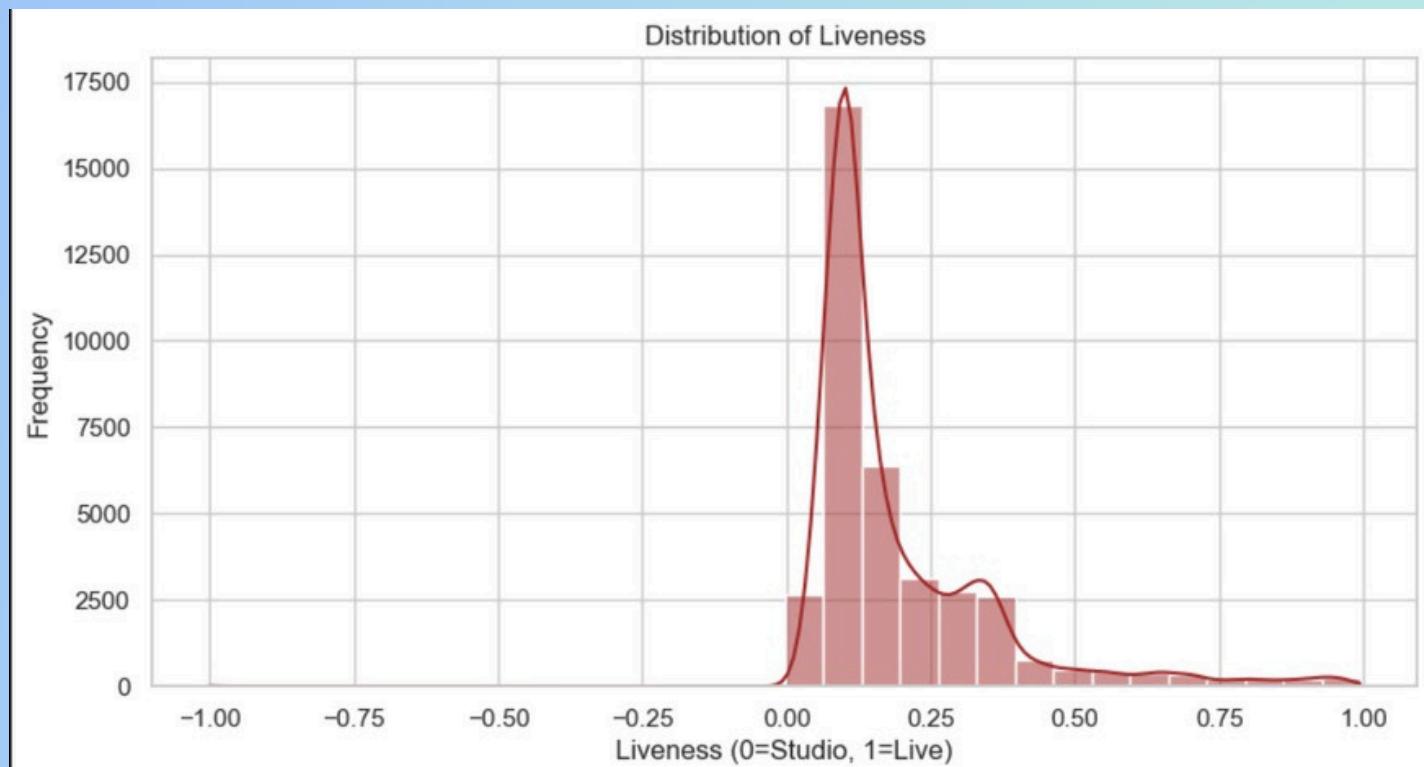
- Speechiness is low for most songs, reflecting a focus on singing rather than spoken vocals.
- Only a small fraction of tracks approach rap- or podcast-like characteristics.



- Valence centers around mid-values, suggesting a balance between happy and sad songs.
- Extreme emotional tones (very happy or very sad) are less common.

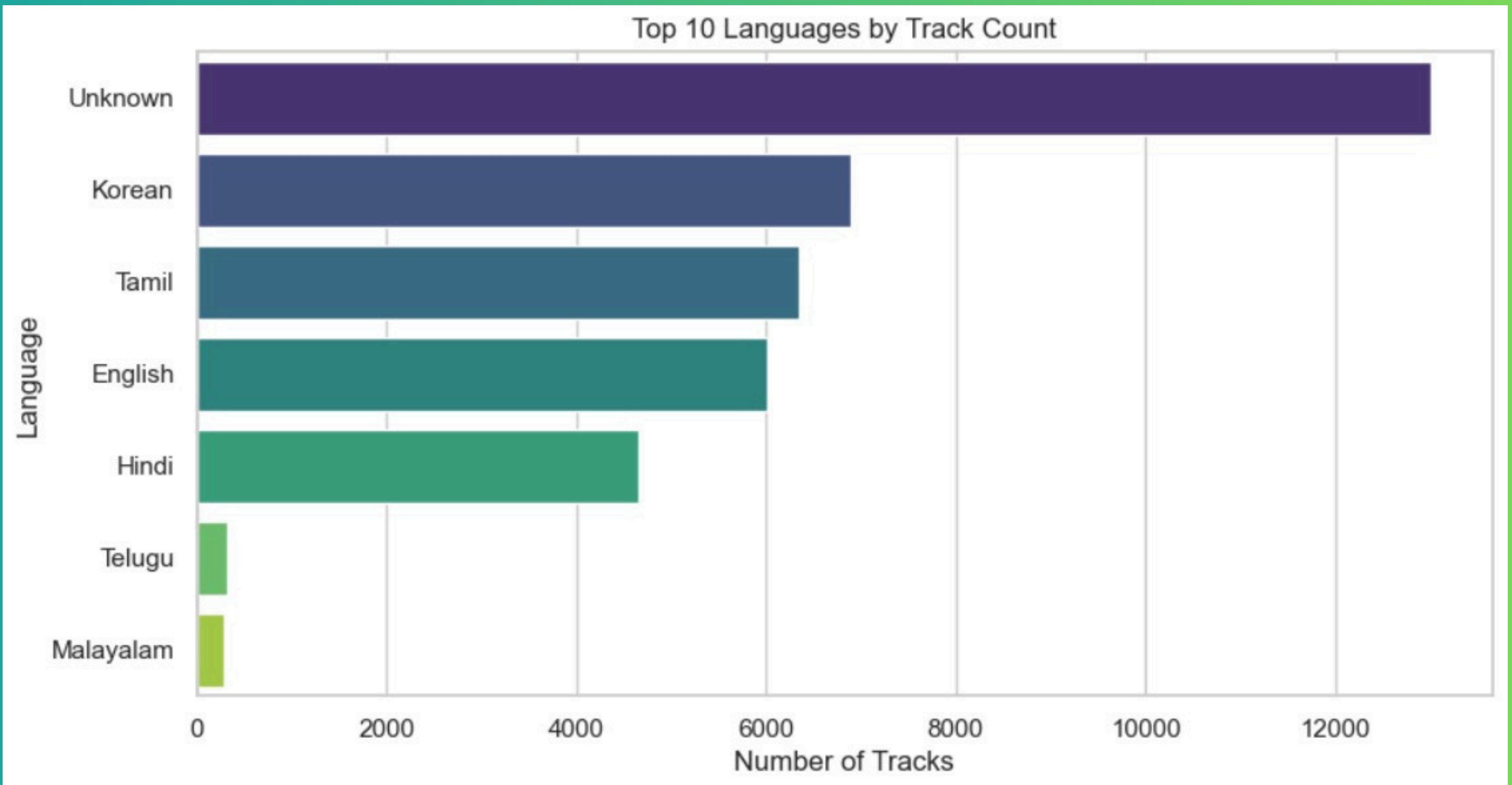


- Most tracks are vocal, with instrumental pieces being a minority.
- Instrumentalness near zero dominates across the dataset.

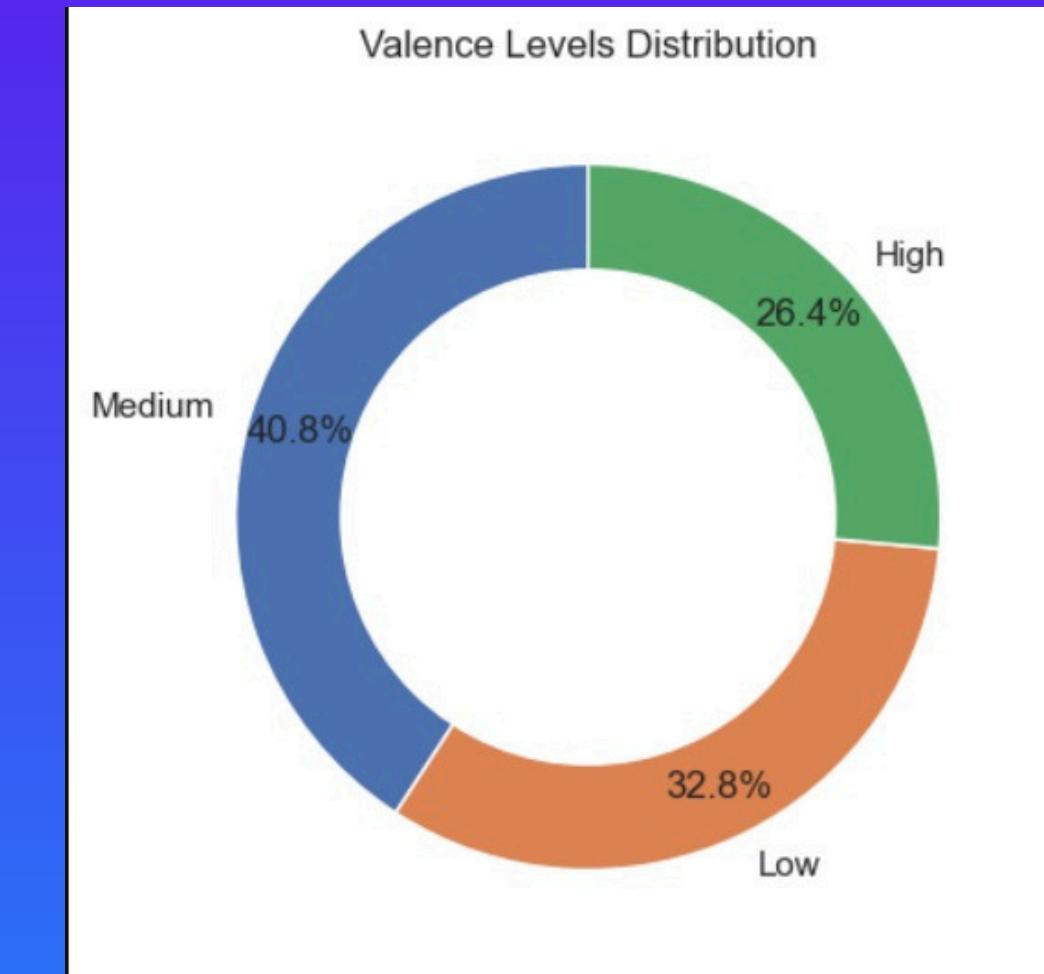
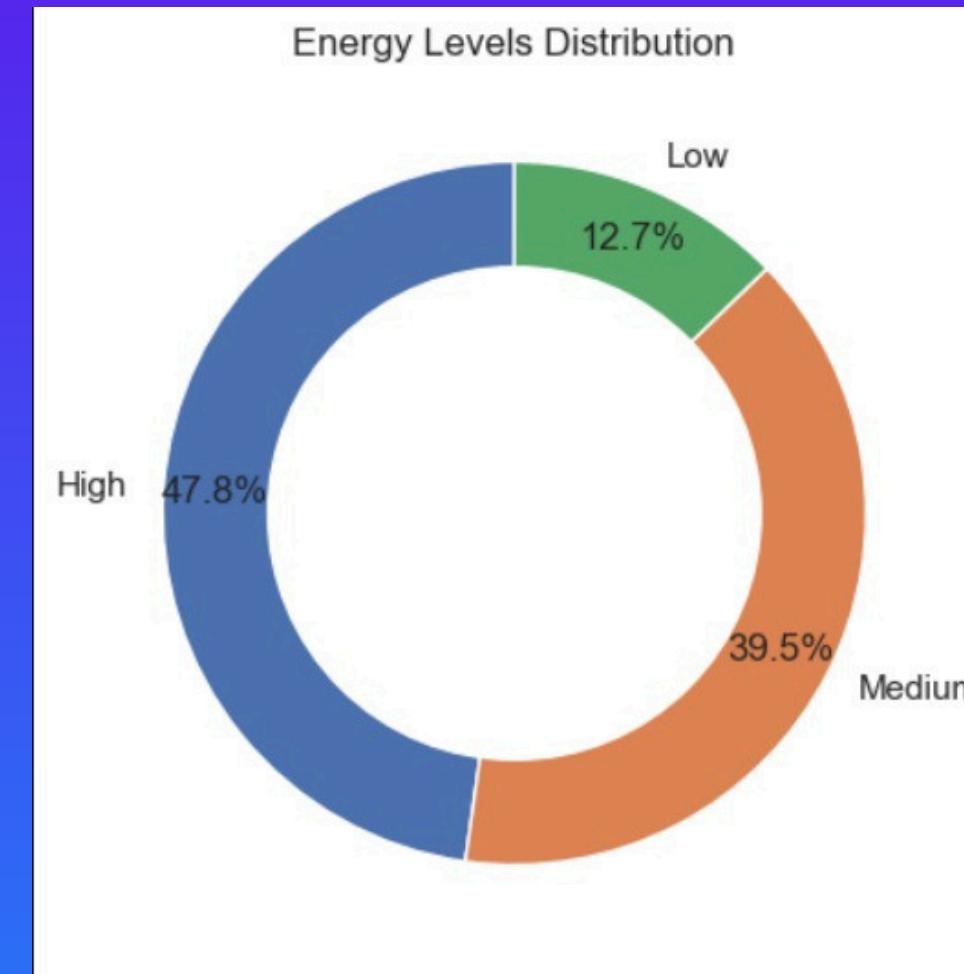
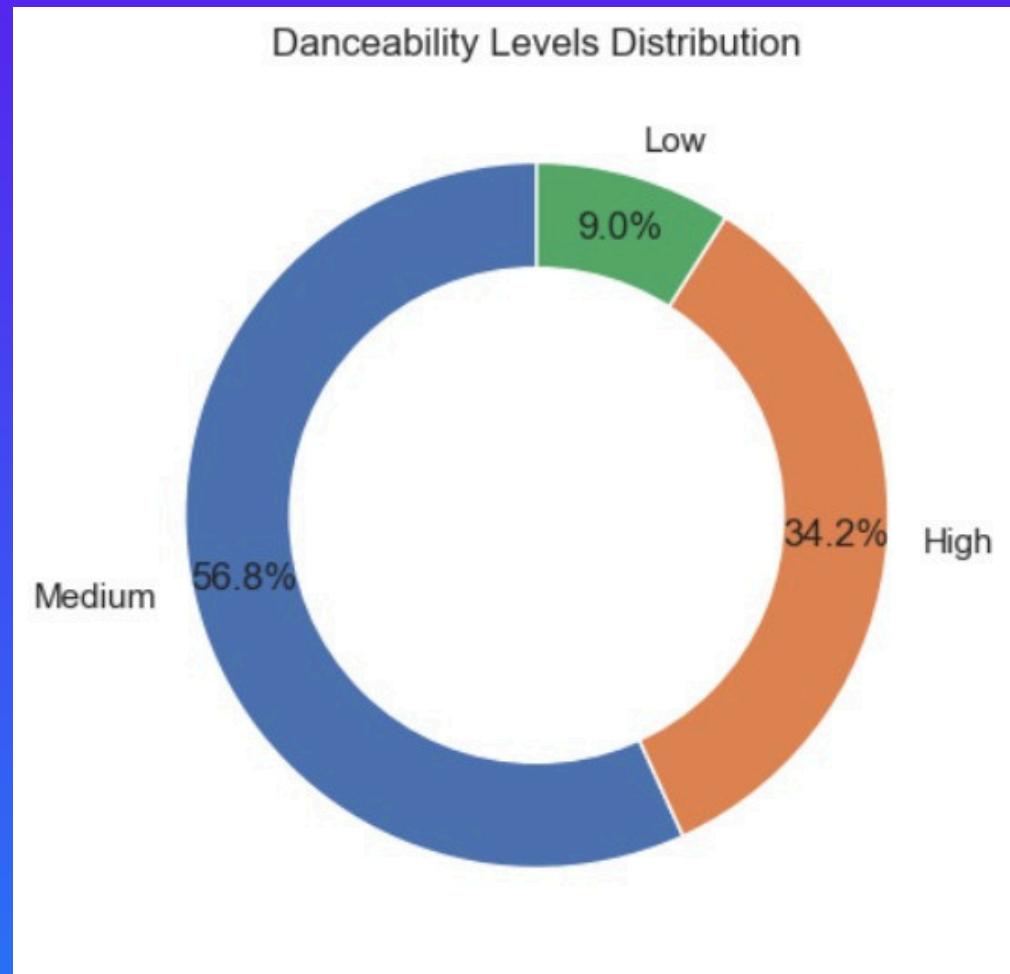


- Most tracks are studio-recorded with low liveness values.
- Live recordings form a smaller subset of Spotify content.

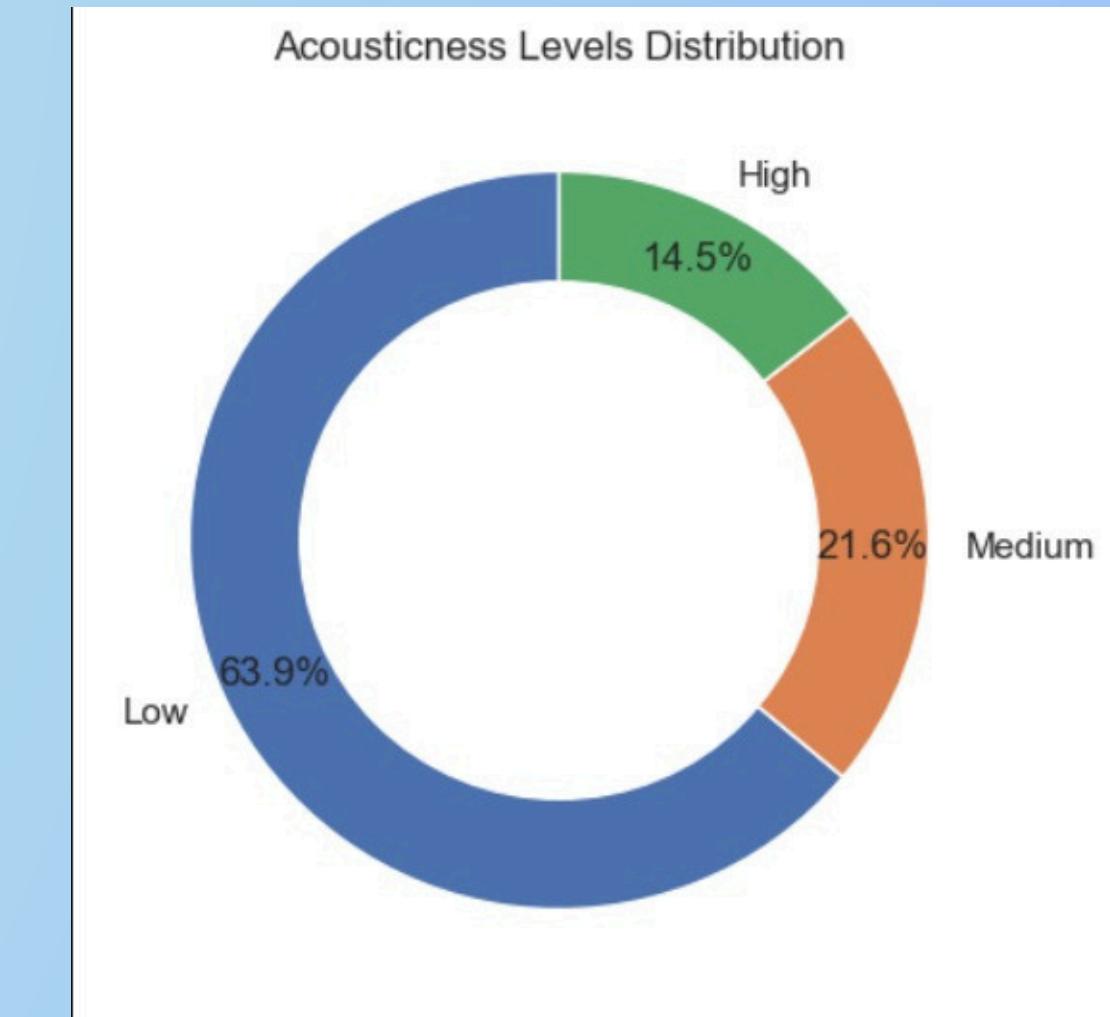
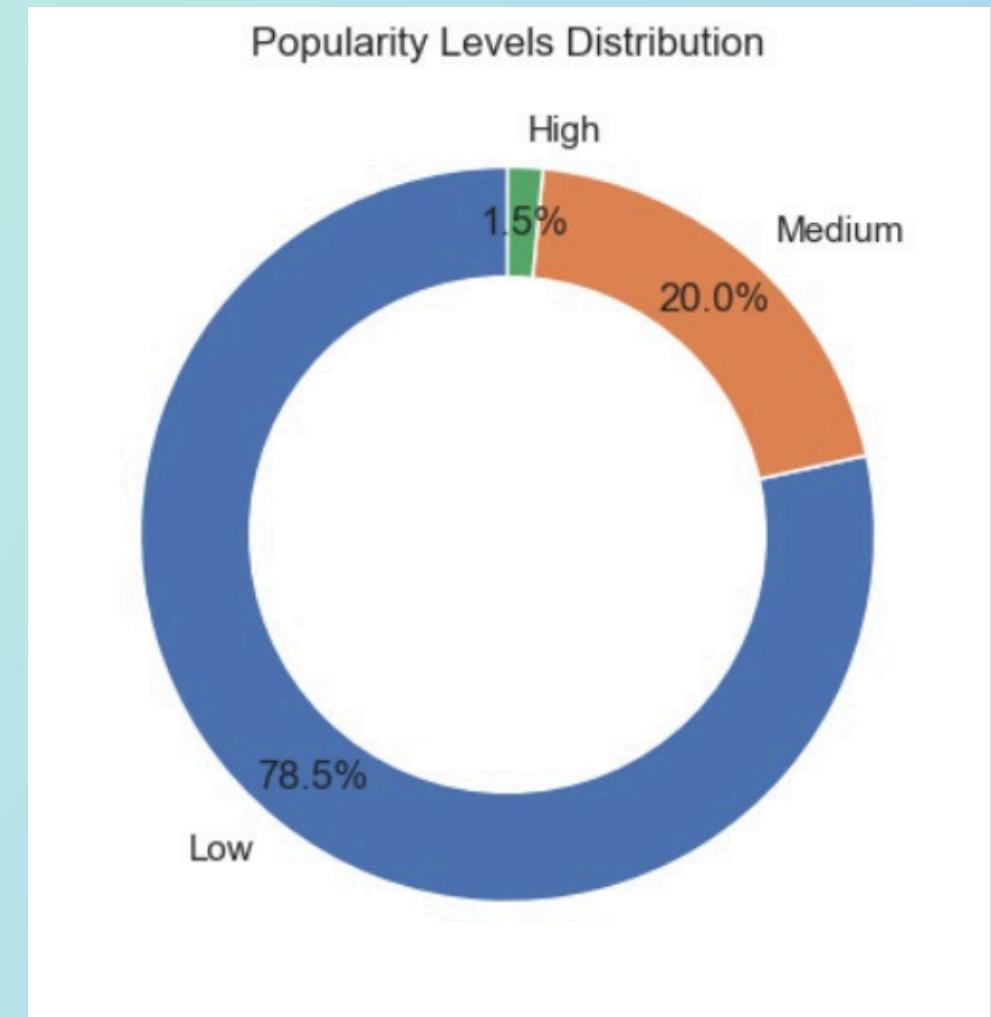
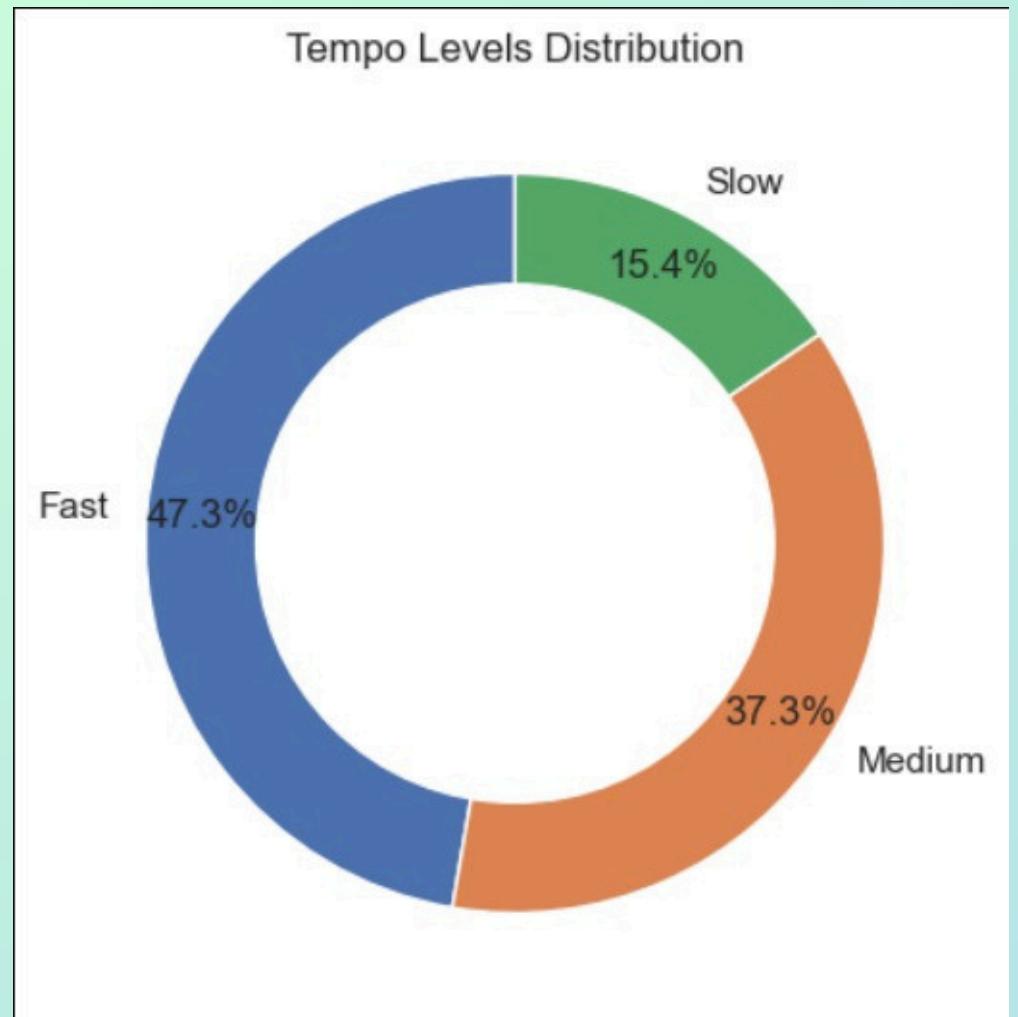
- Major mode songs outnumber minor ones, fitting the upbeat trend of popular music.
- Listeners tend to prefer tracks that sound happier or brighter.



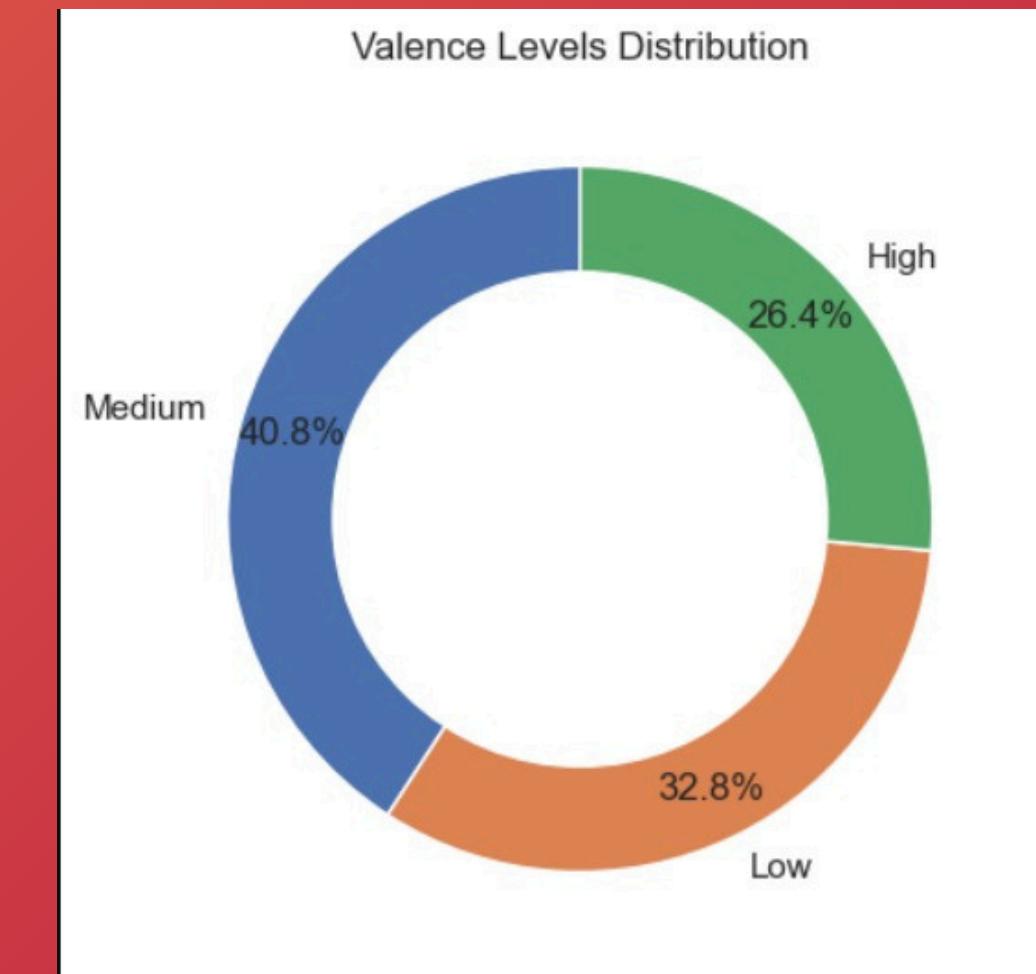
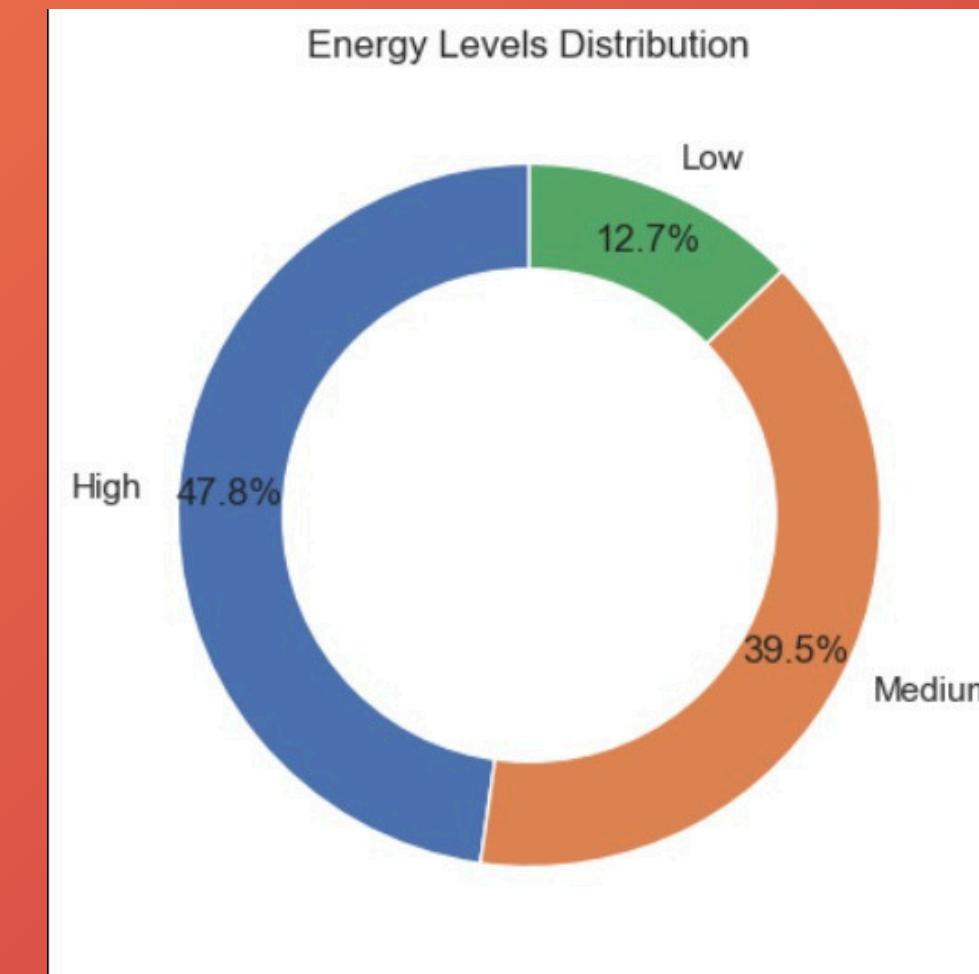
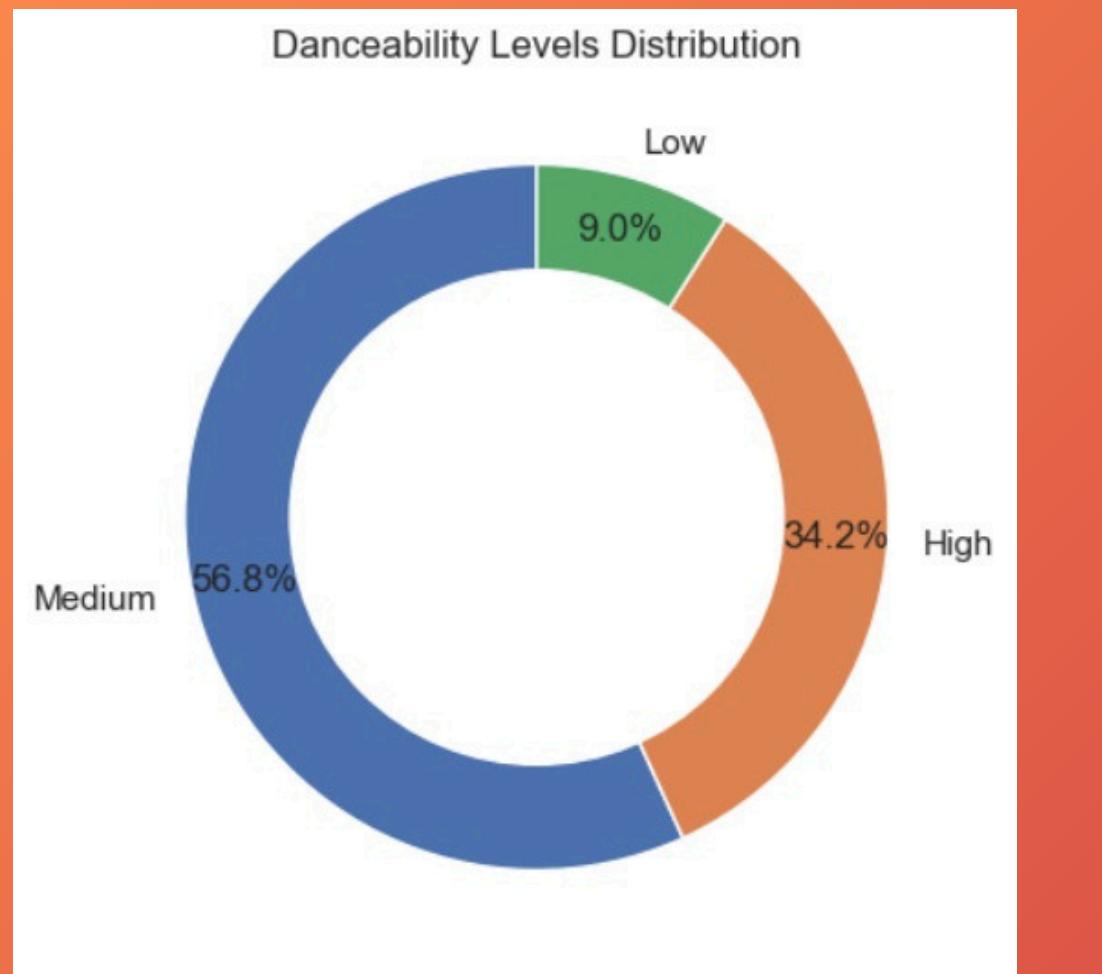
- 🎵 English overwhelmingly dominates, followed by a few global languages.
- 🎵 This reflects the international influence of English-language pop.



- Most features like danceability, energy, and valence fall in the medium-to-high range.
- Spotify's dataset favors engaging, energetic, and moderately positive songs.



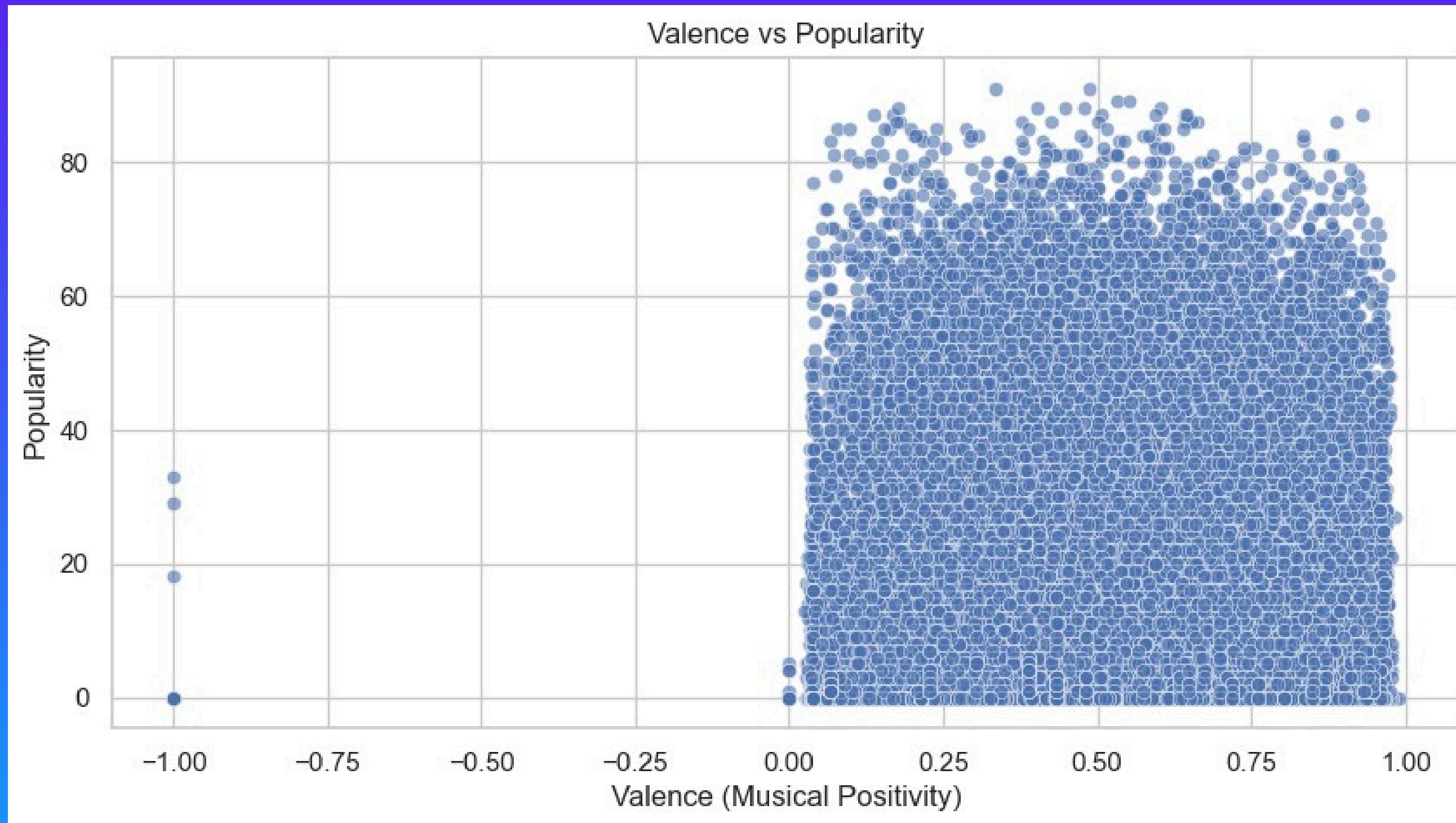
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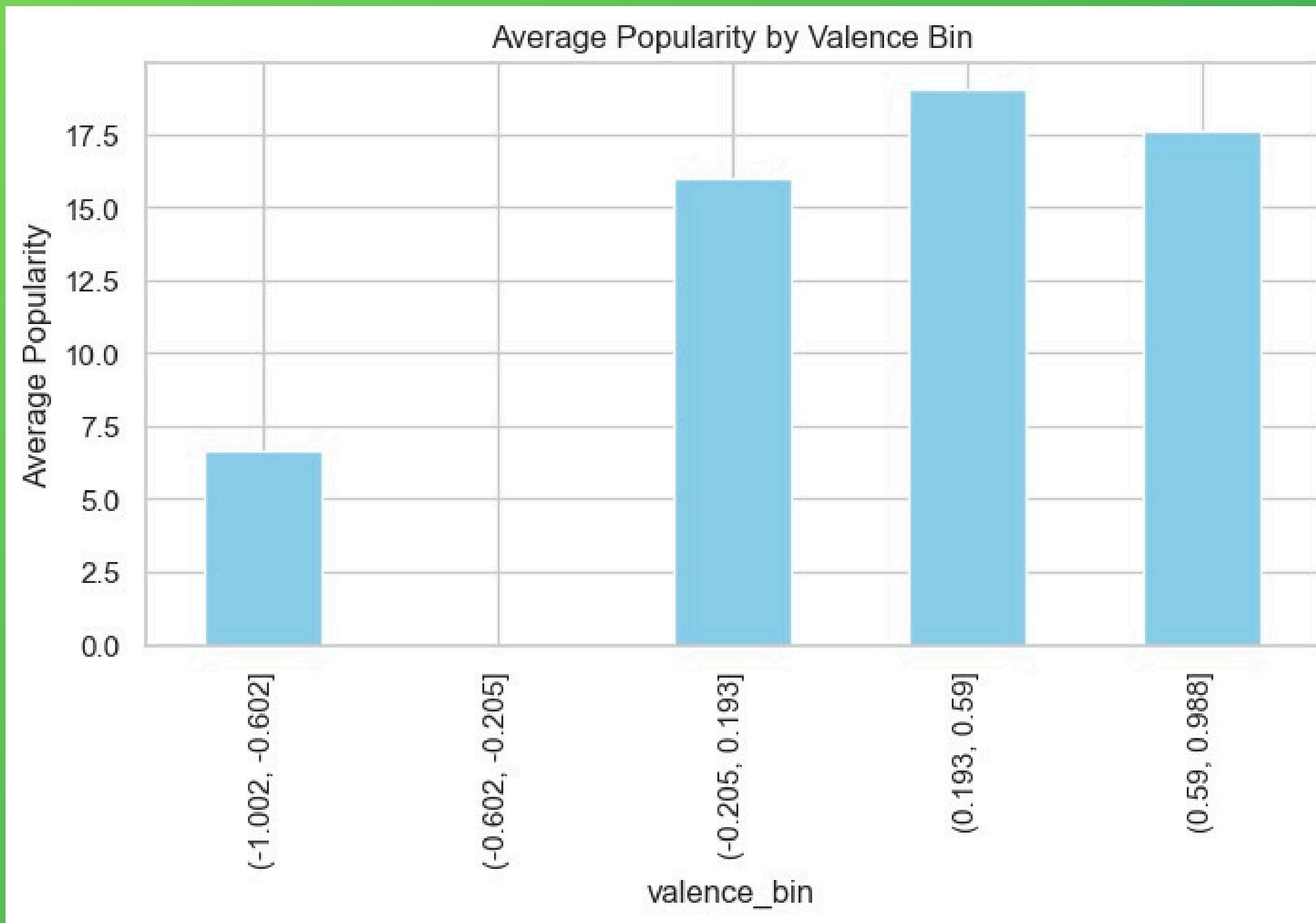
# BIVARIATE ANALYSIS





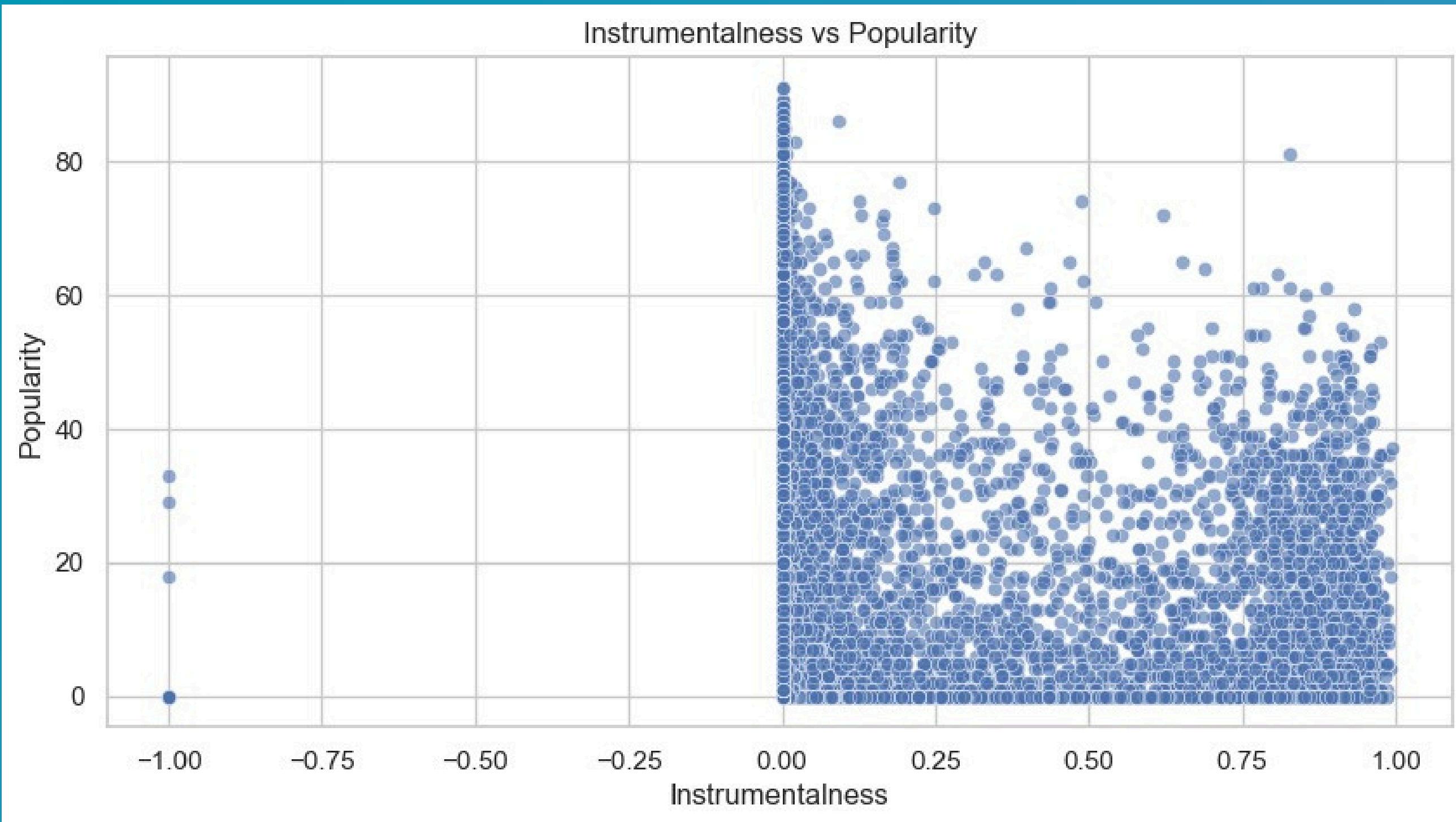
🎵 There's a slight positive correlation – happier songs tend to be more popular.  
🎵 However, extreme valence doesn't guarantee higher popularity.

Average Popularity by Valence Bin

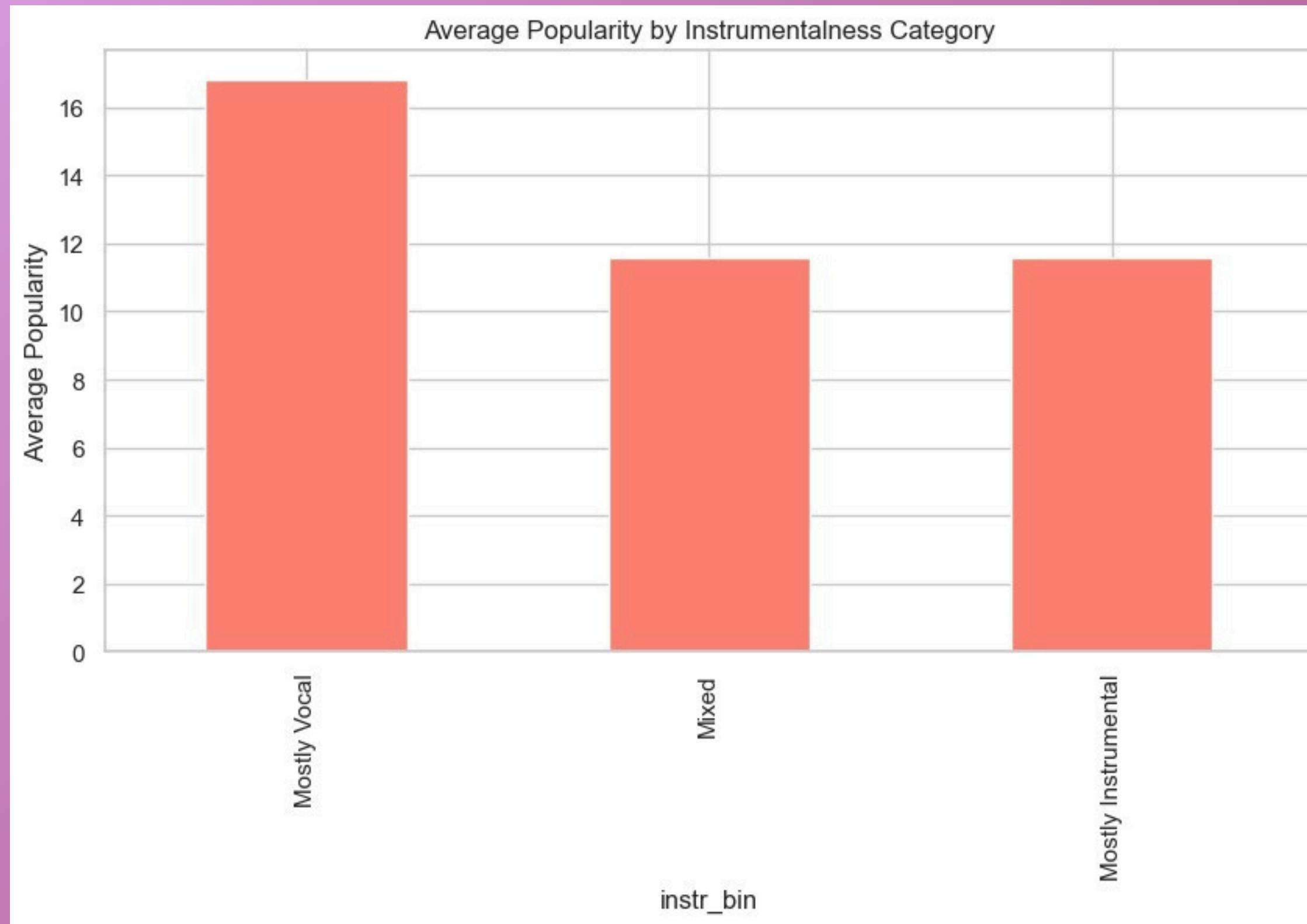


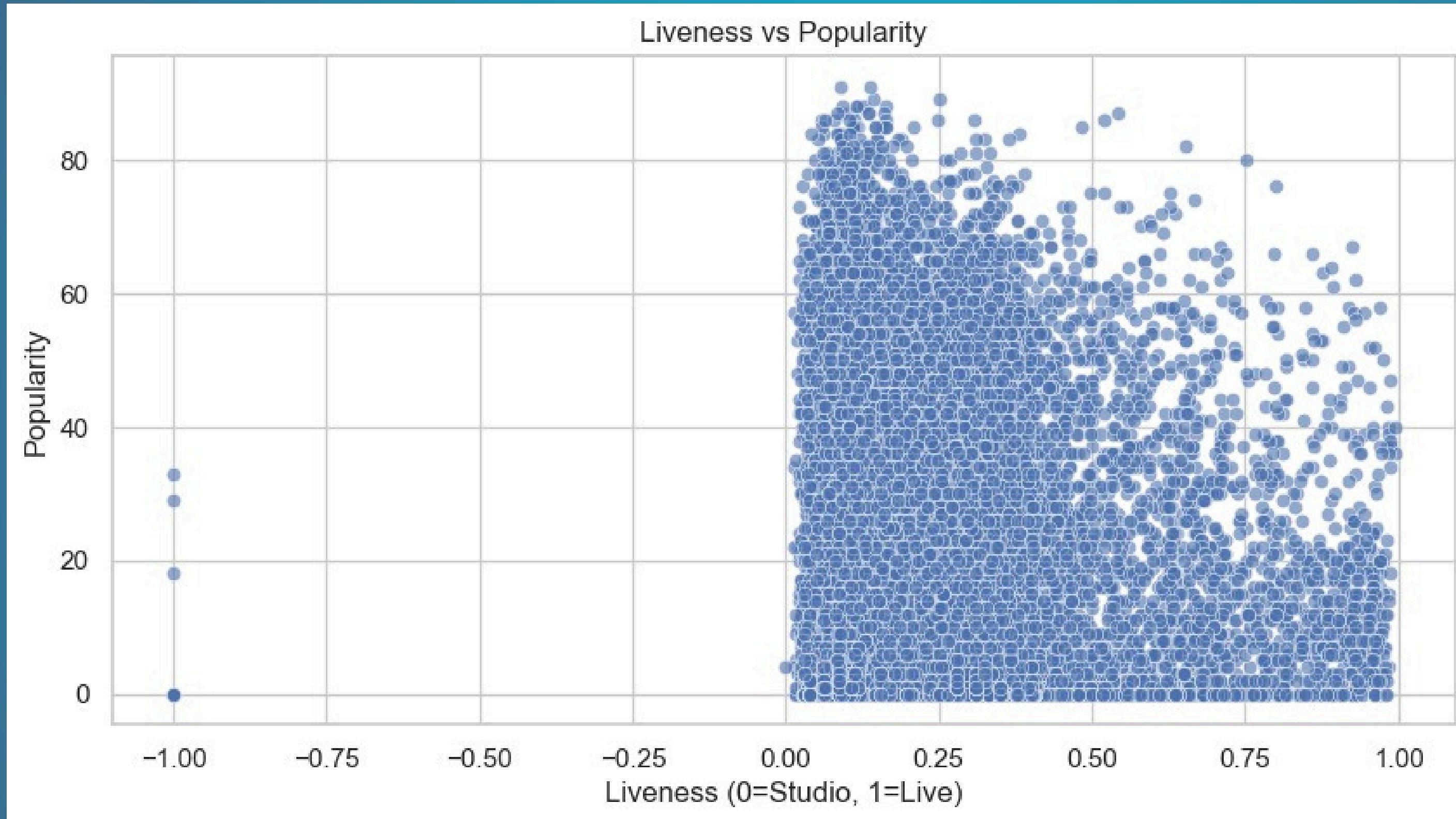
- There's a slight positive correlation – happier songs tend to be more popular.
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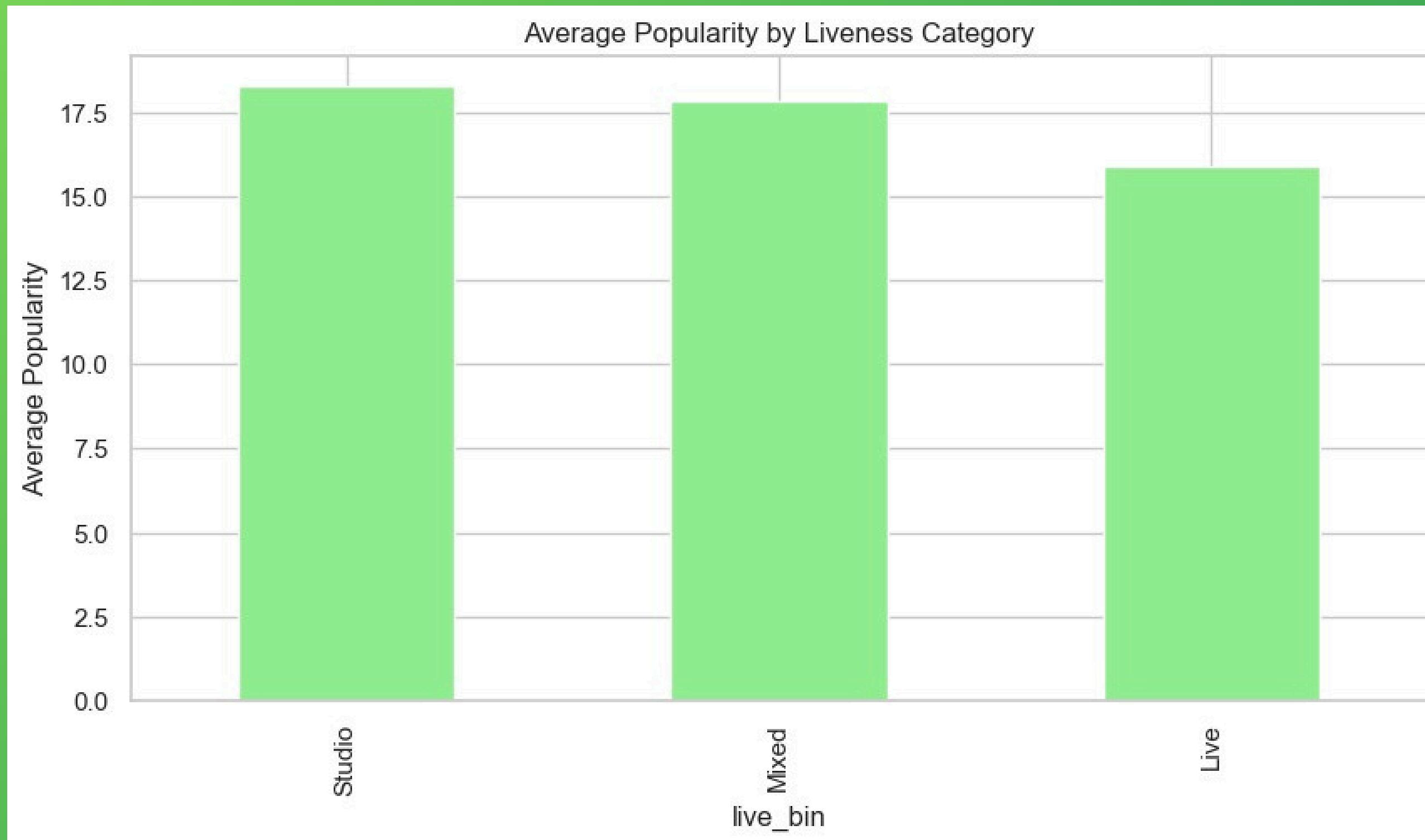
### Instrumentalness vs Popularity



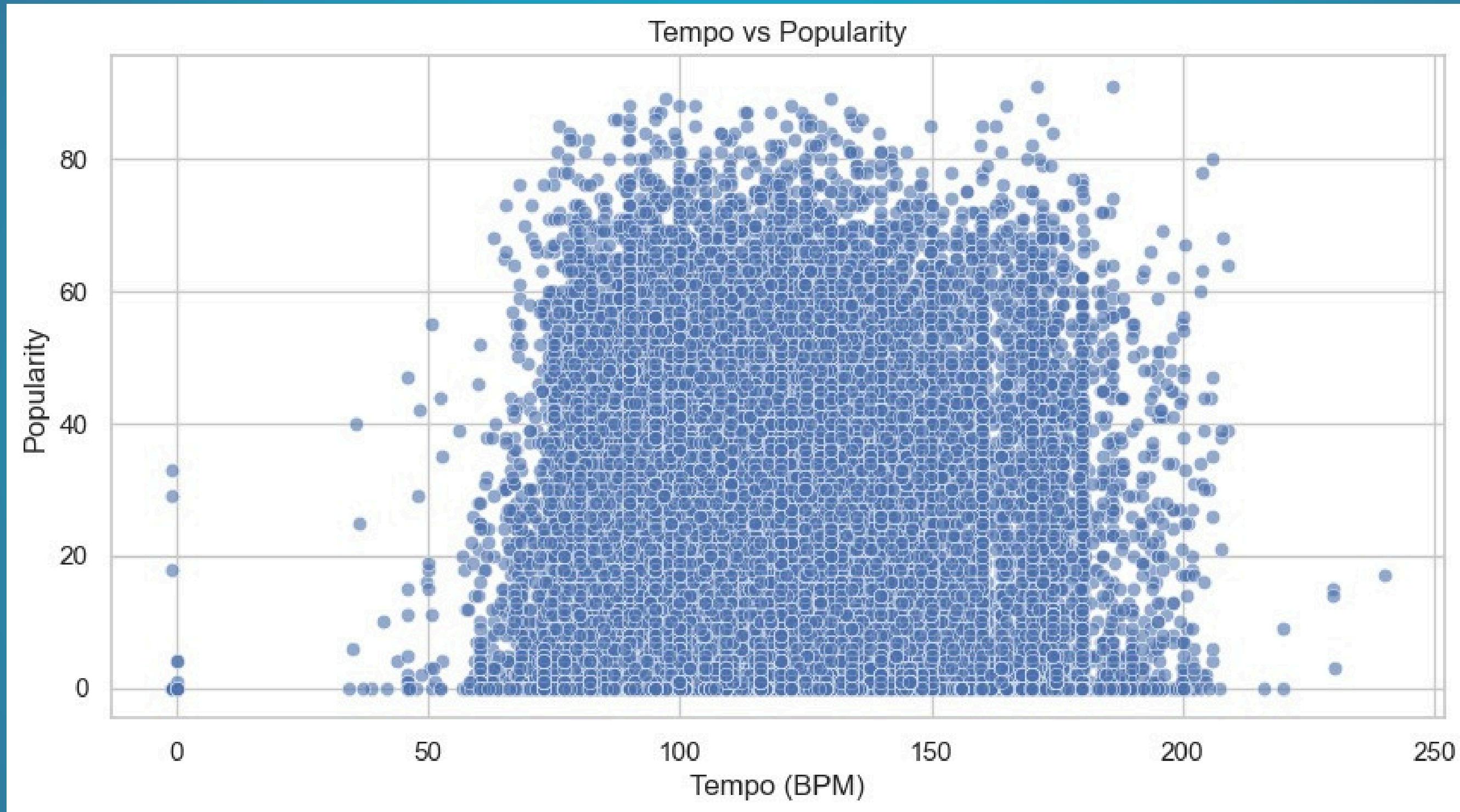
- Popularity decreases as instrumentalness increases.
- Listeners seem to prefer songs with vocals.

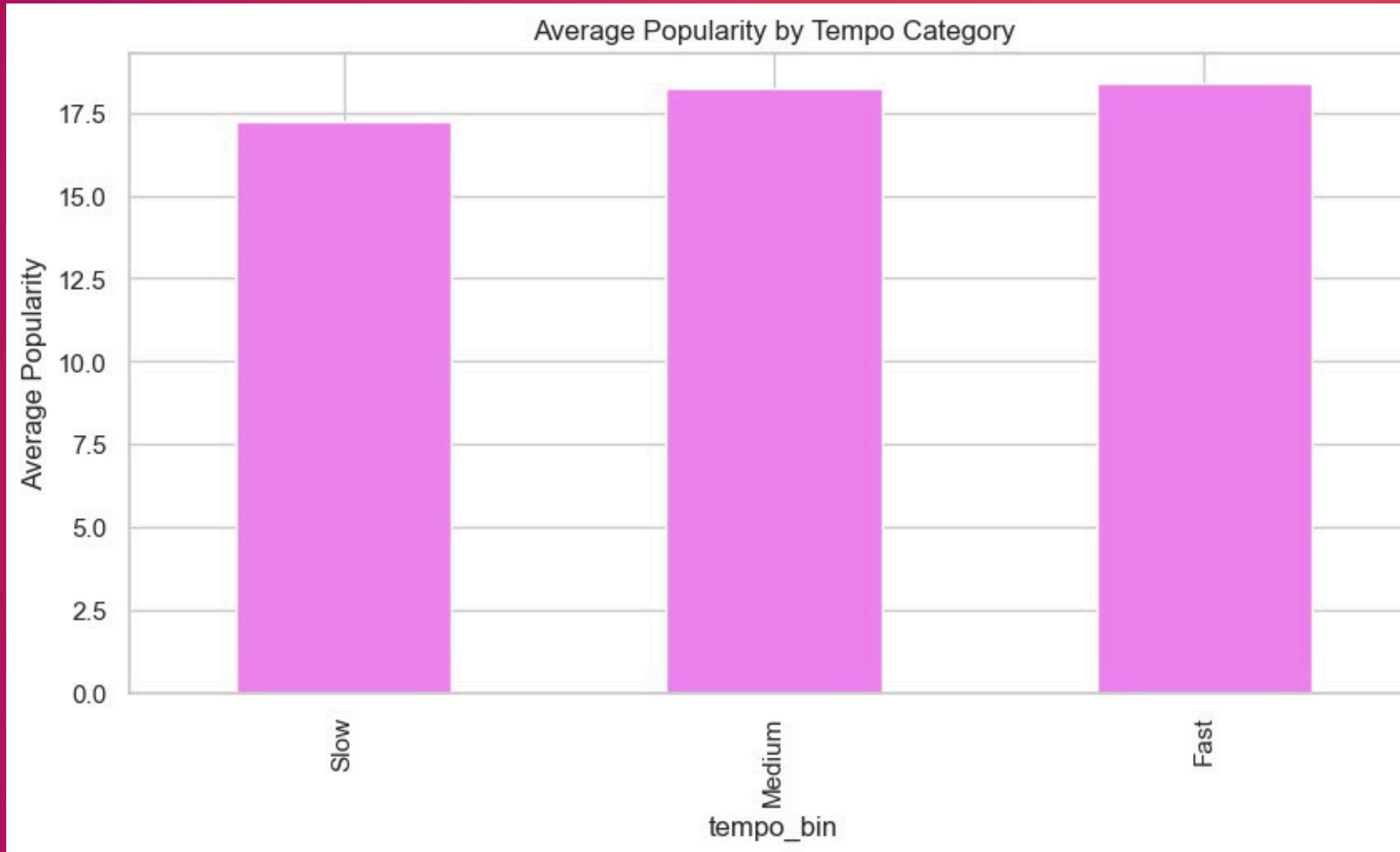




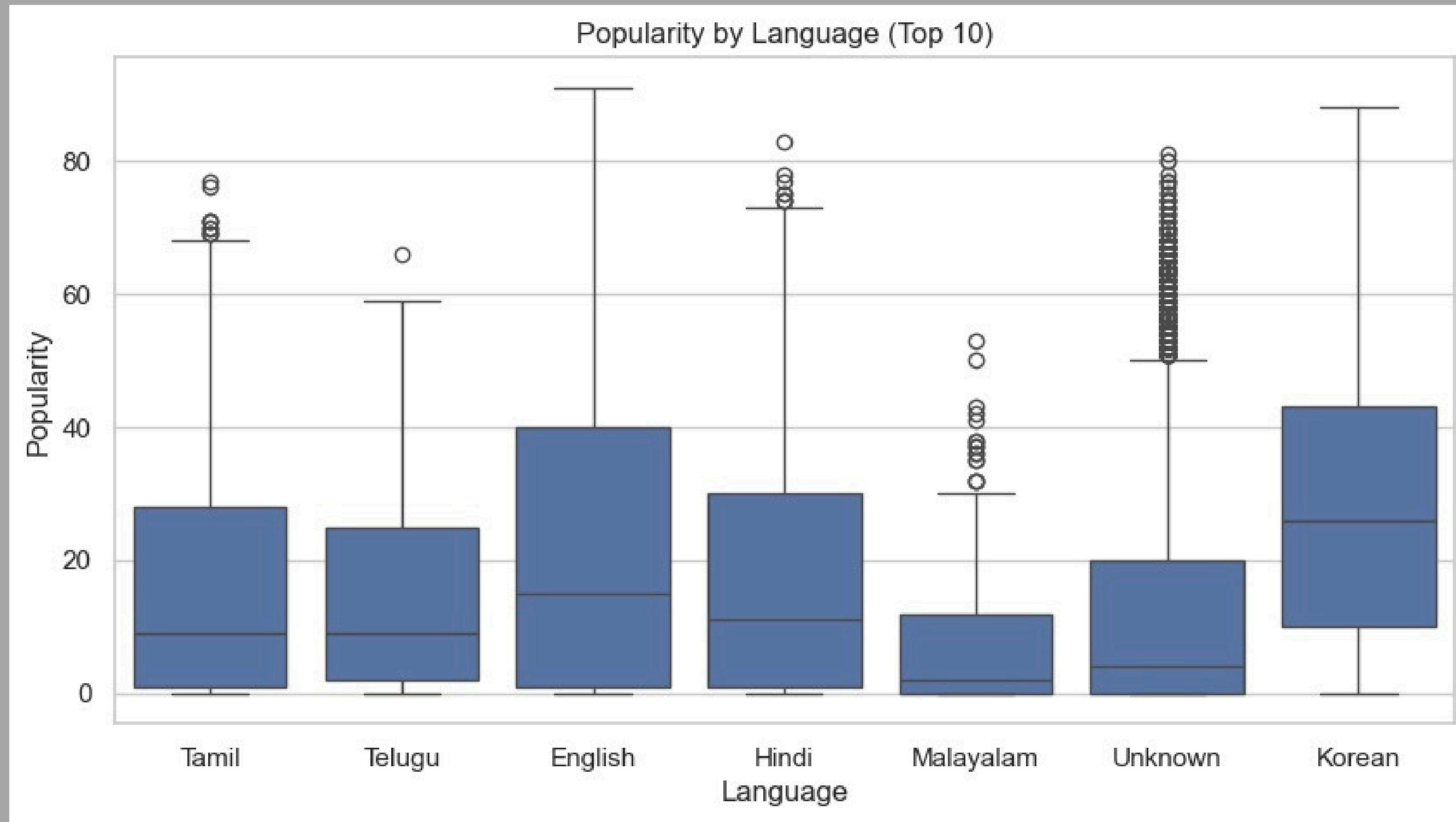


- Studio-produced songs (low liveness) are generally more popular.
- Live tracks attract niche audiences but not mainstream appeal.

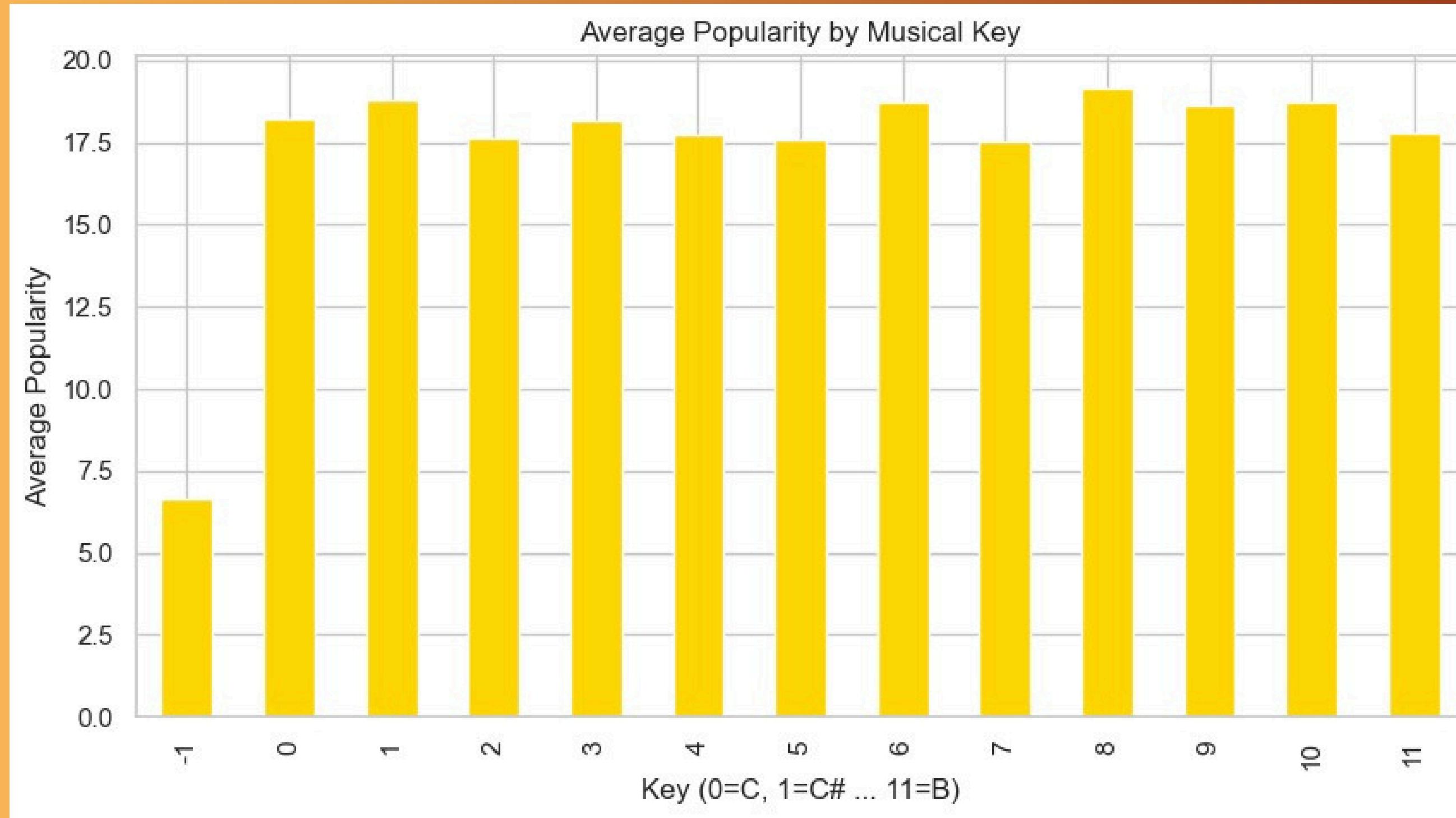




- Medium-tempo songs (90–120 BPM) achieve the highest average popularity.
- Extremely fast or slow songs tend to be less favored.

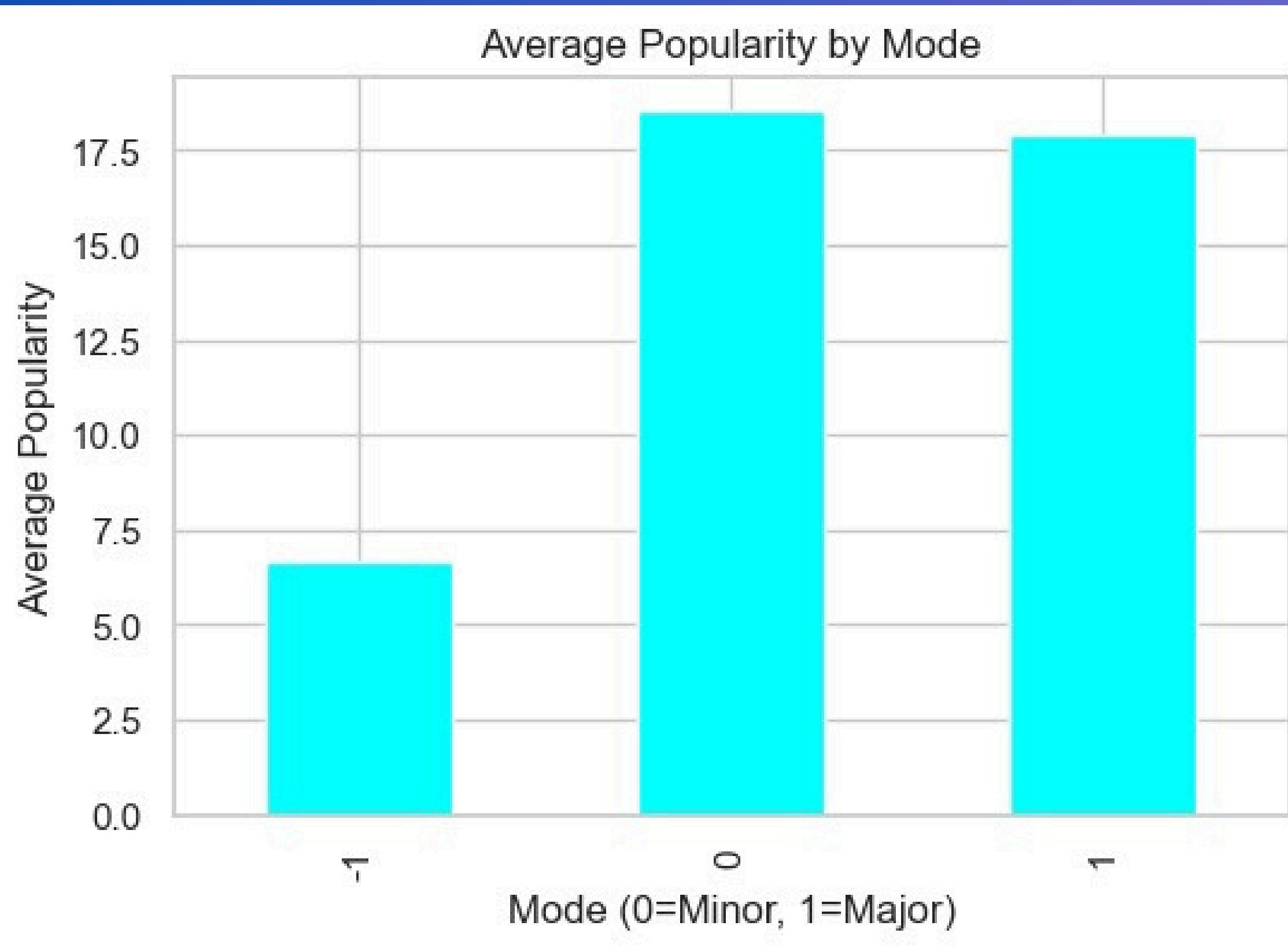


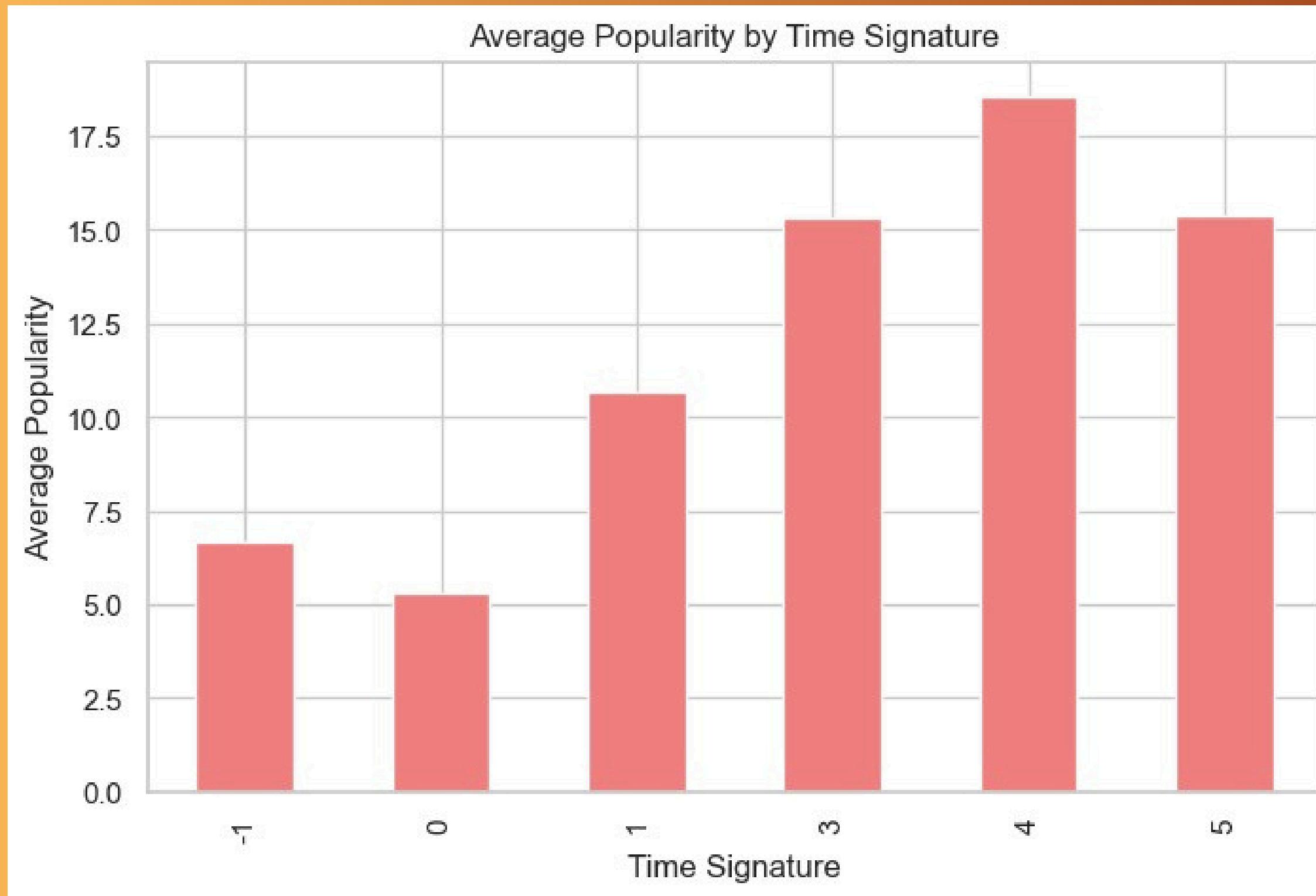
- English songs show higher median popularity than other languages.
- Non-English tracks still perform well but with wider variability.



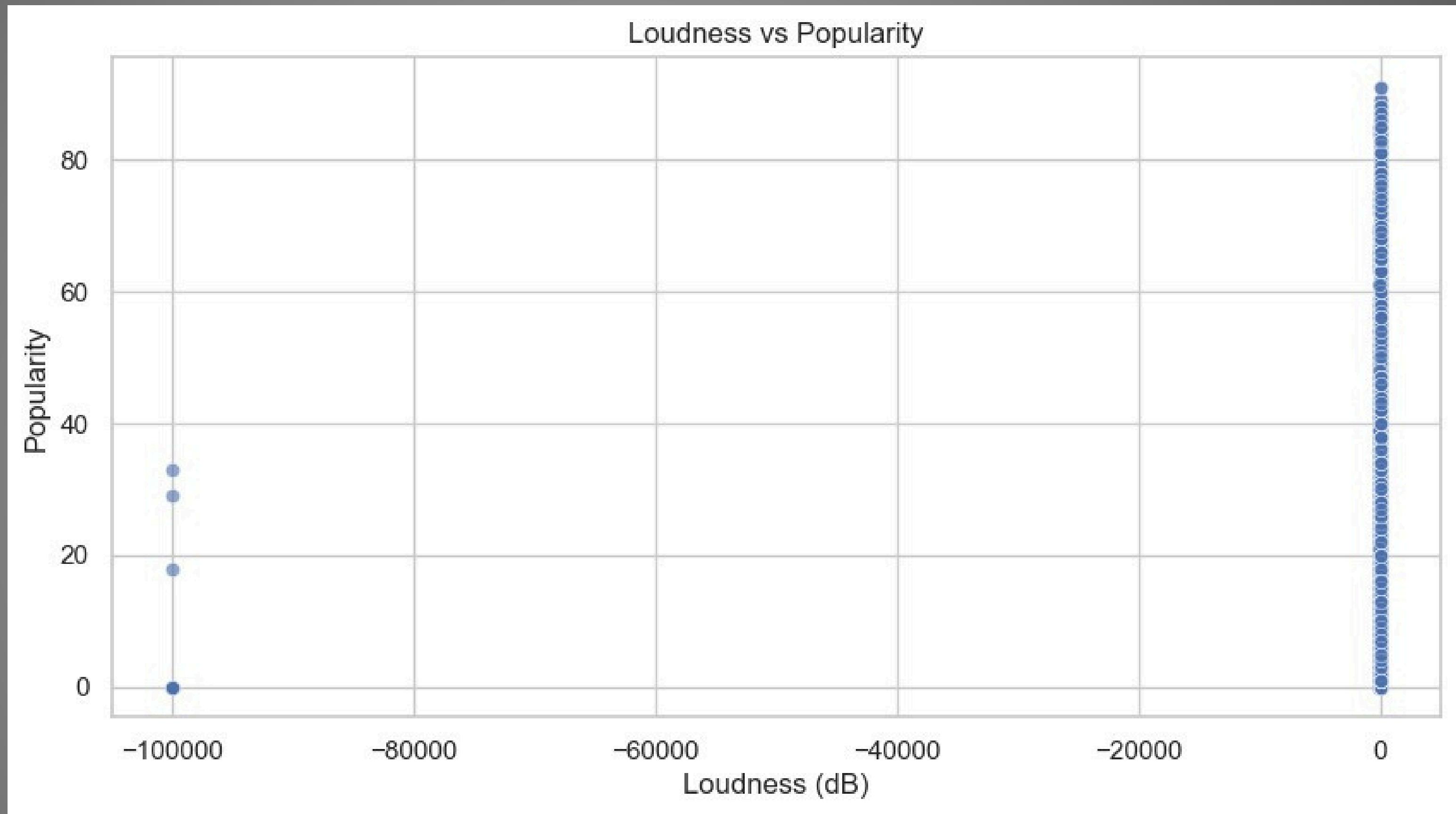
- Major-key songs and standard 4/4 time signatures tend to be more popular.
- Certain keys (like C or G) appear slightly more often among hits.

### Average Popularity by Mode

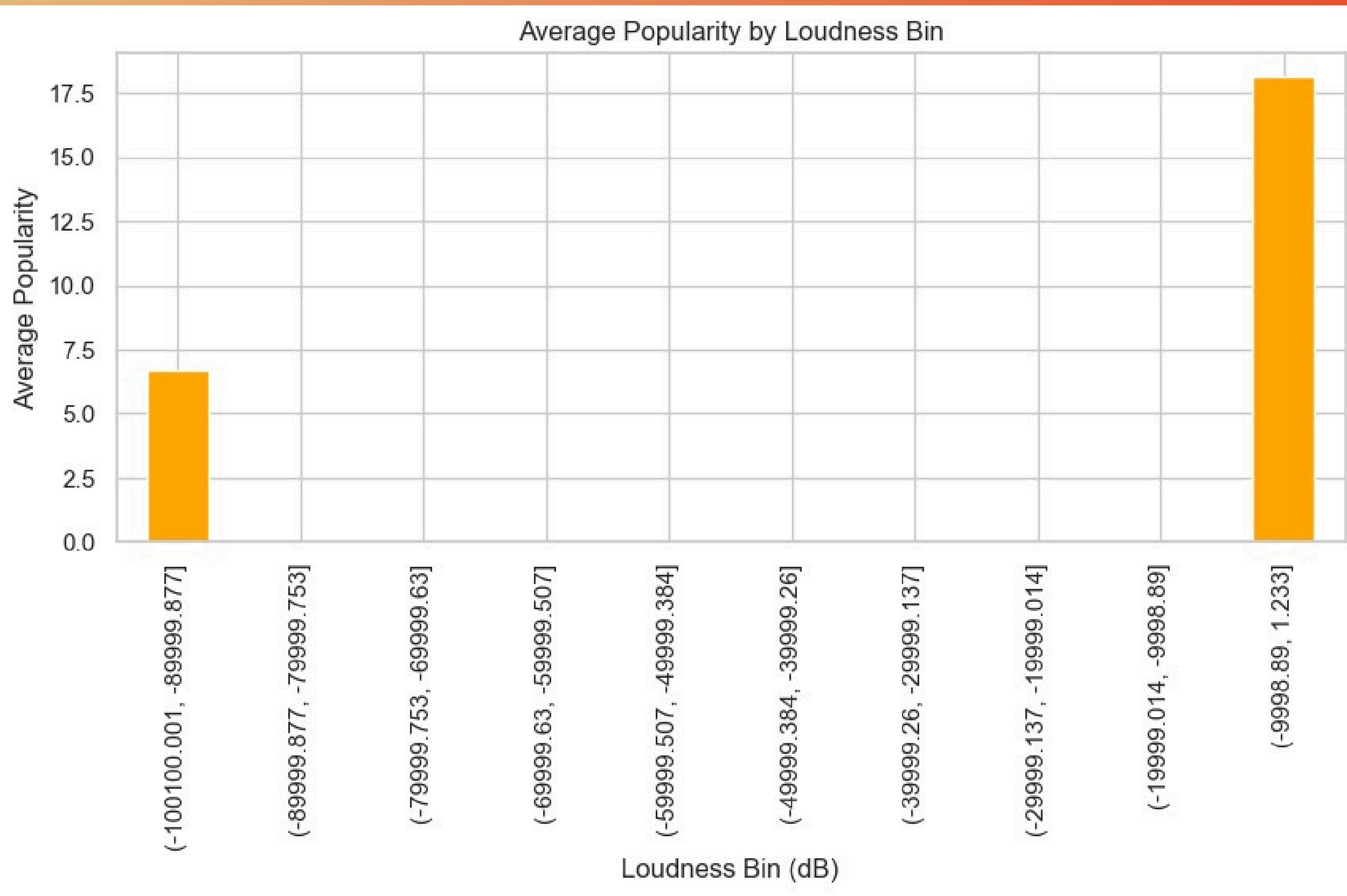




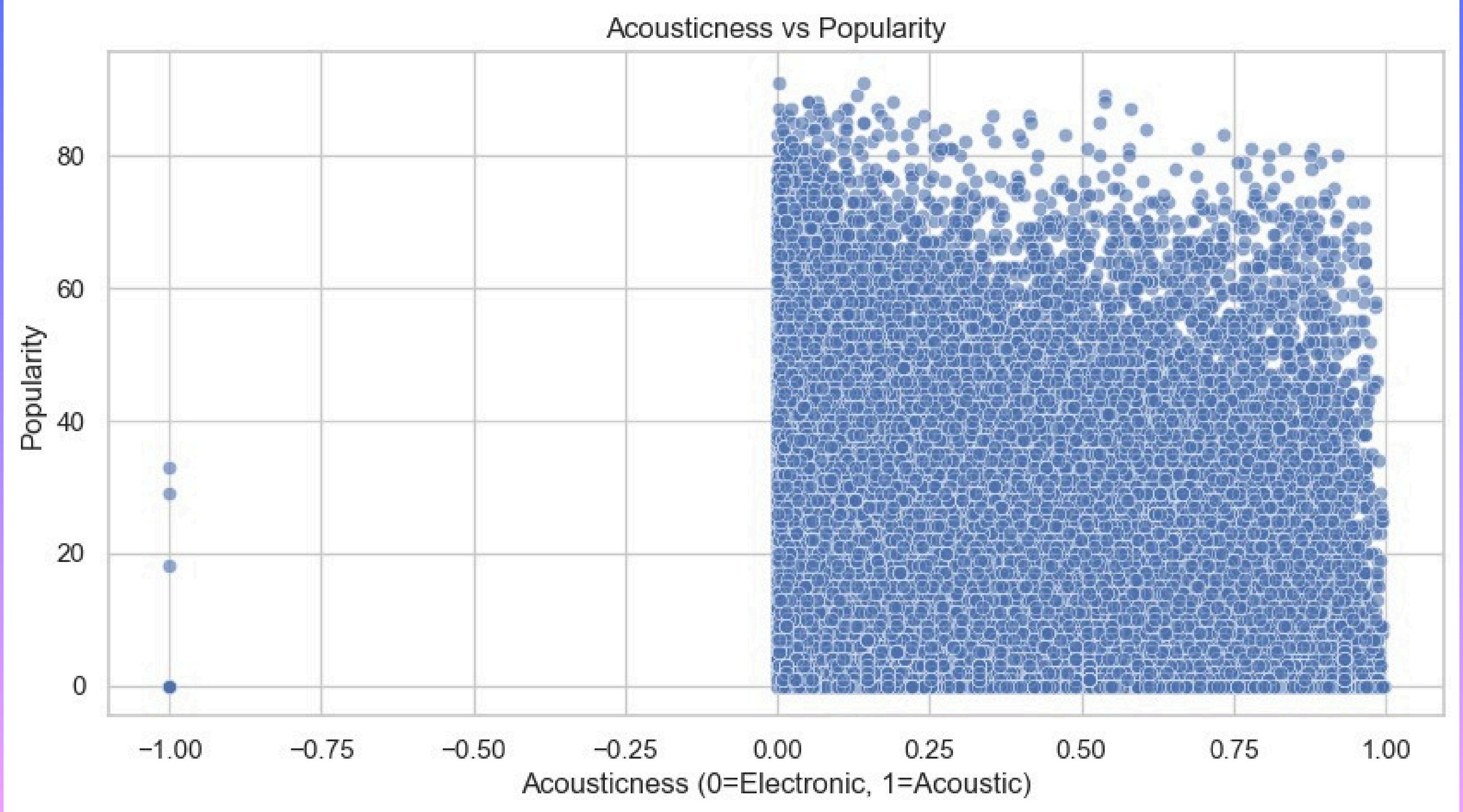
- Songs of 3–4 minutes are the sweet spot for popularity.
- Longer or very short tracks receive less attention.

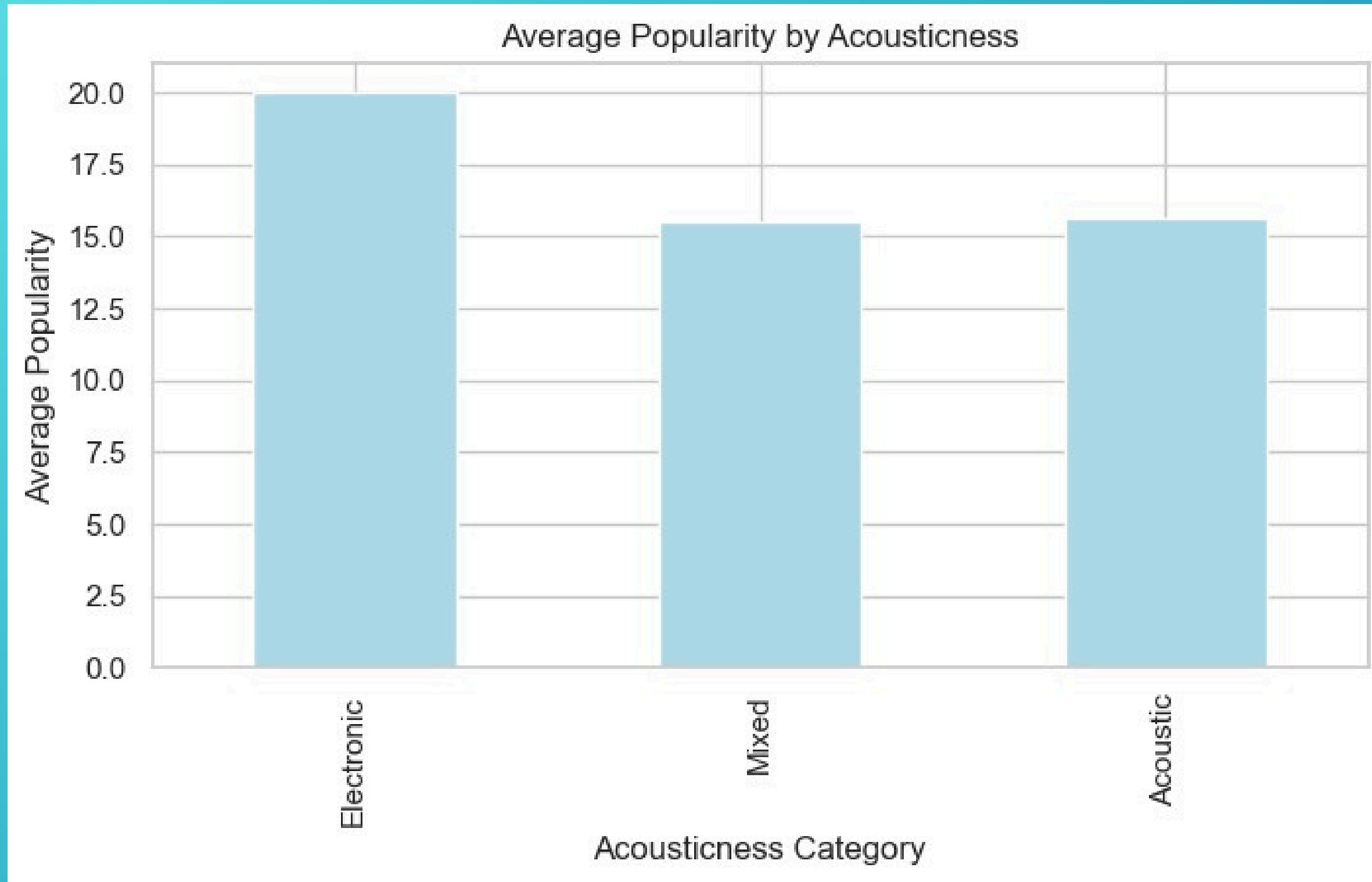


### Average Popularity by Loudness Bin

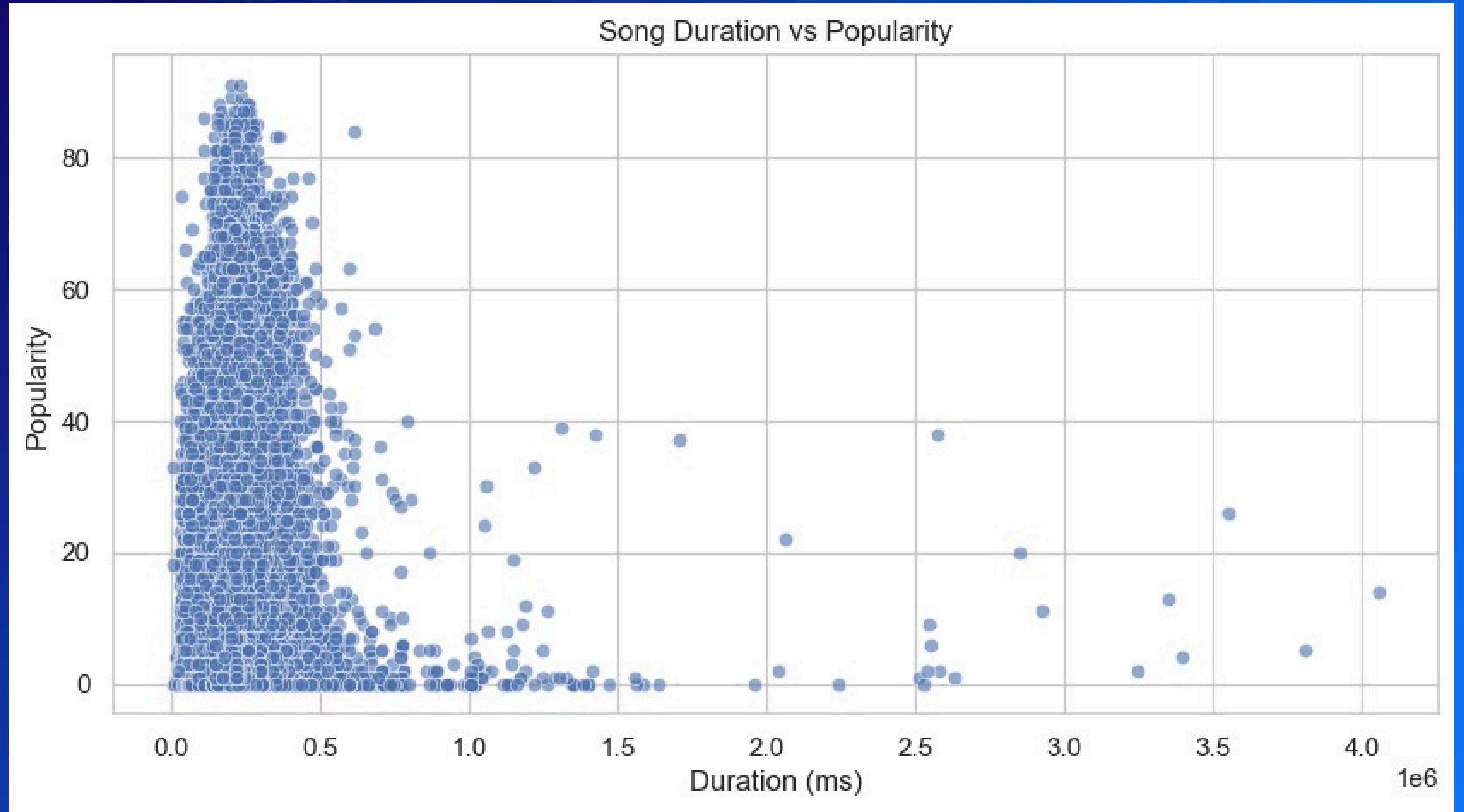


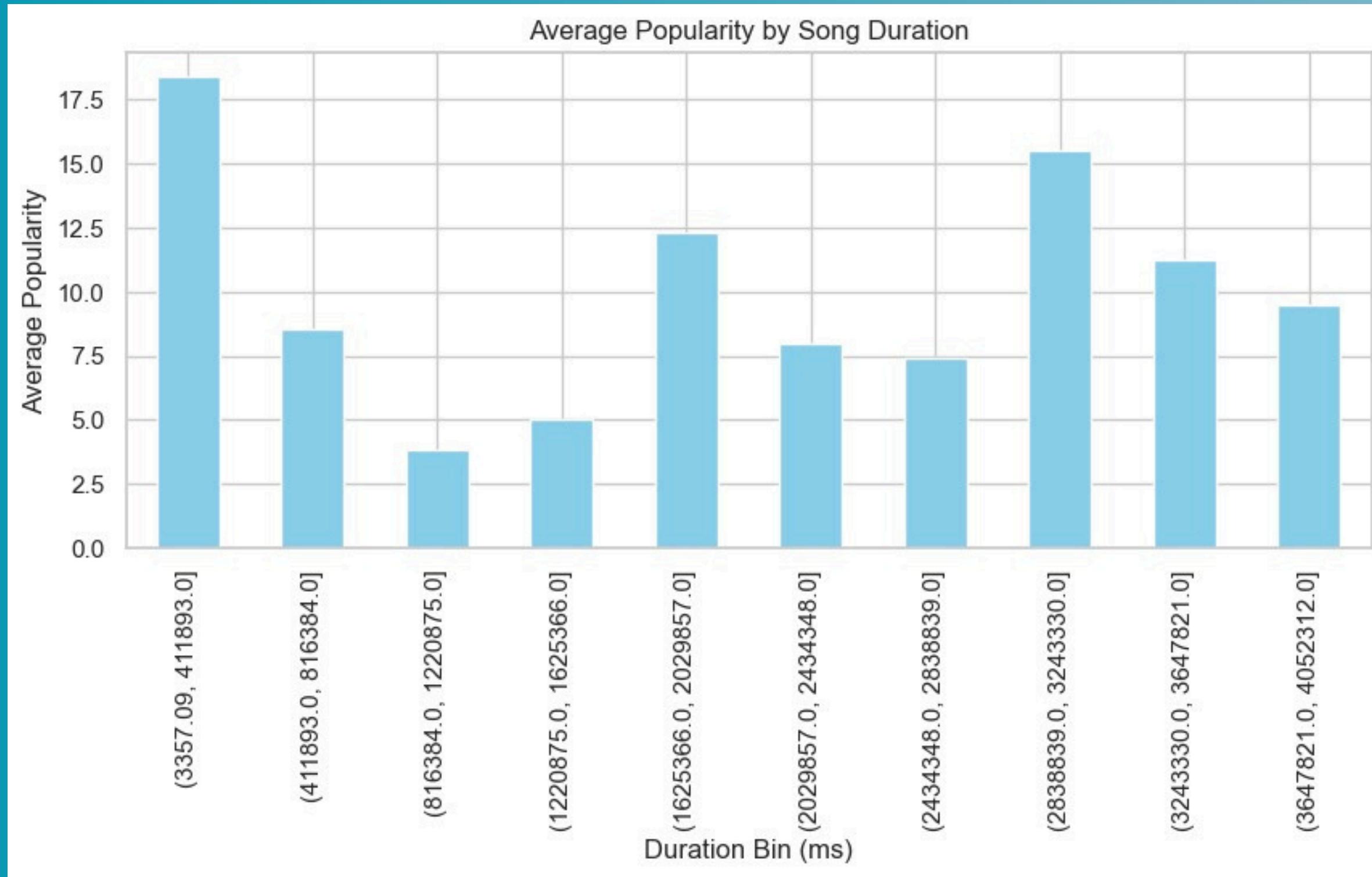
- Moderately loud songs (-6 to -4 dB) reach the highest average popularity.
- Very quiet or overly compressed tracks are less successful.



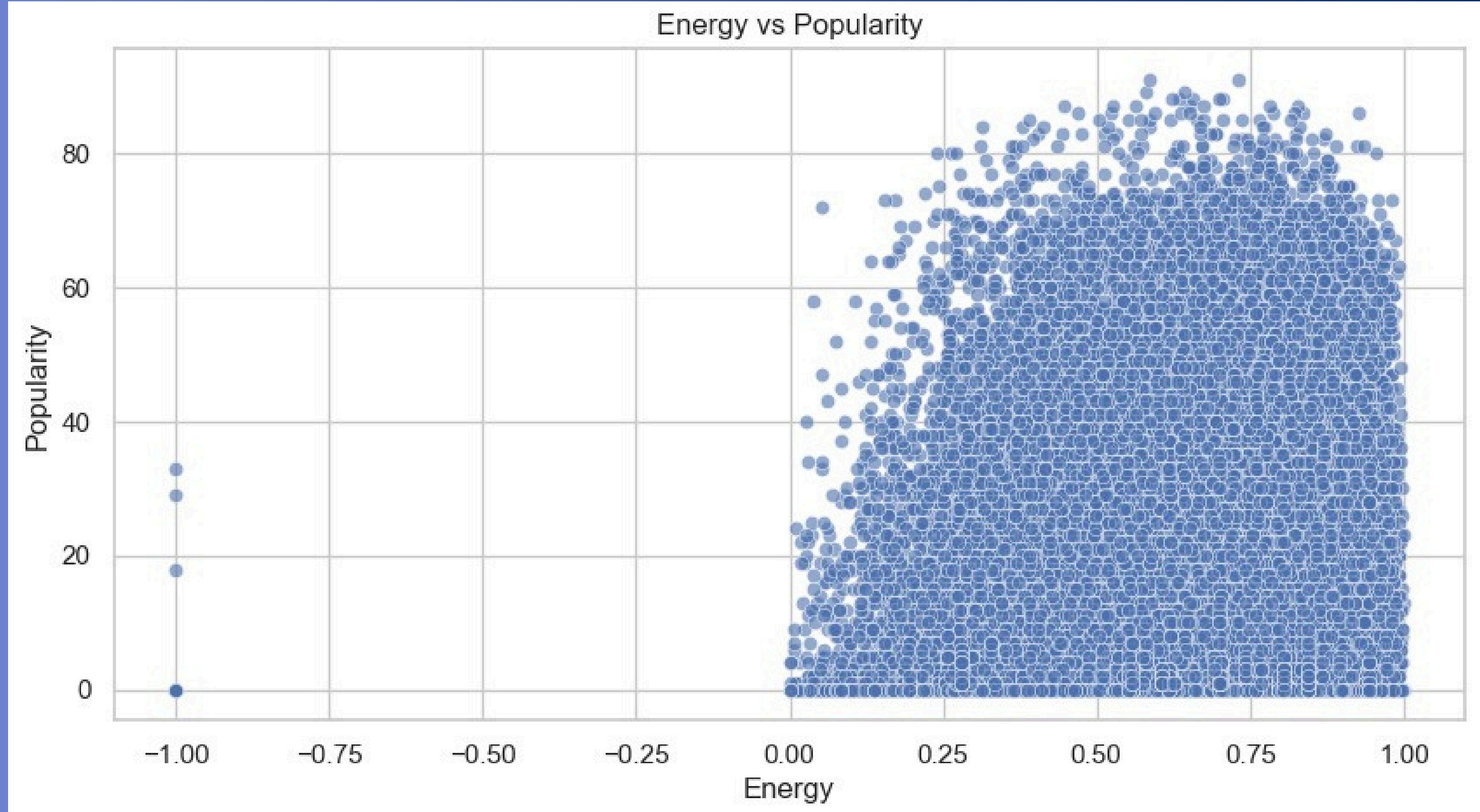


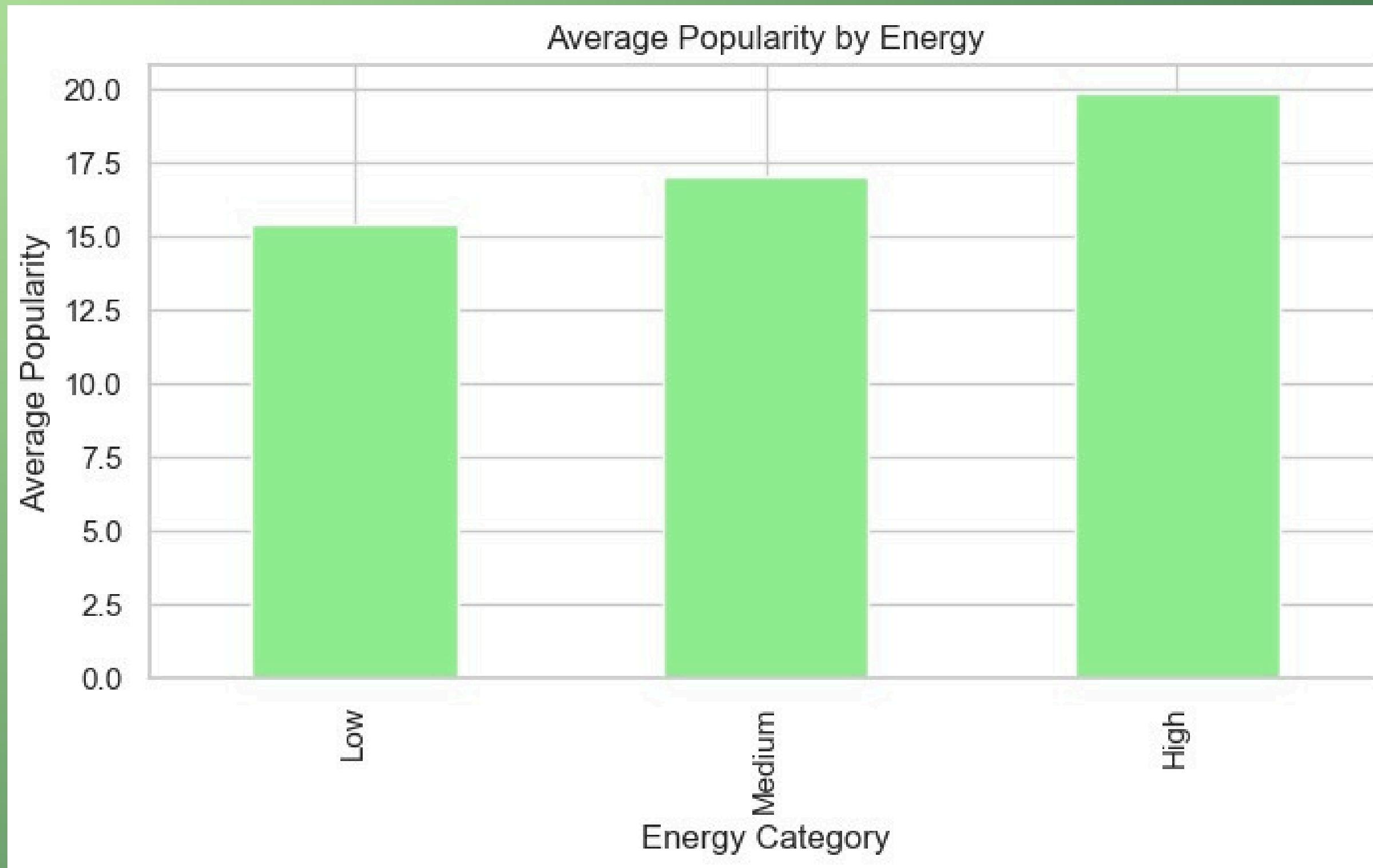
- Moderate acousticness correlates with higher popularity.
- Both highly electronic and fully acoustic extremes perform less well.



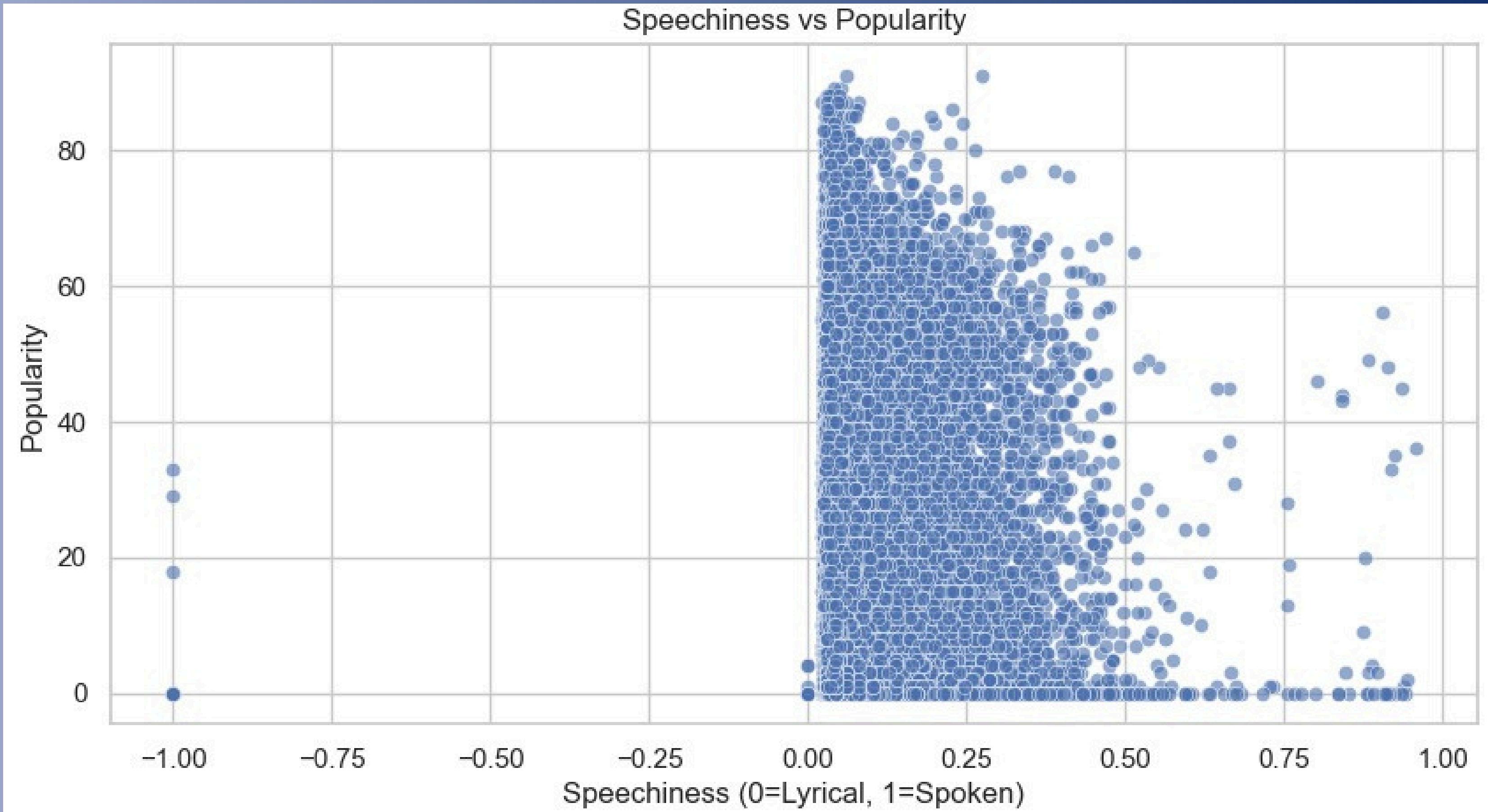


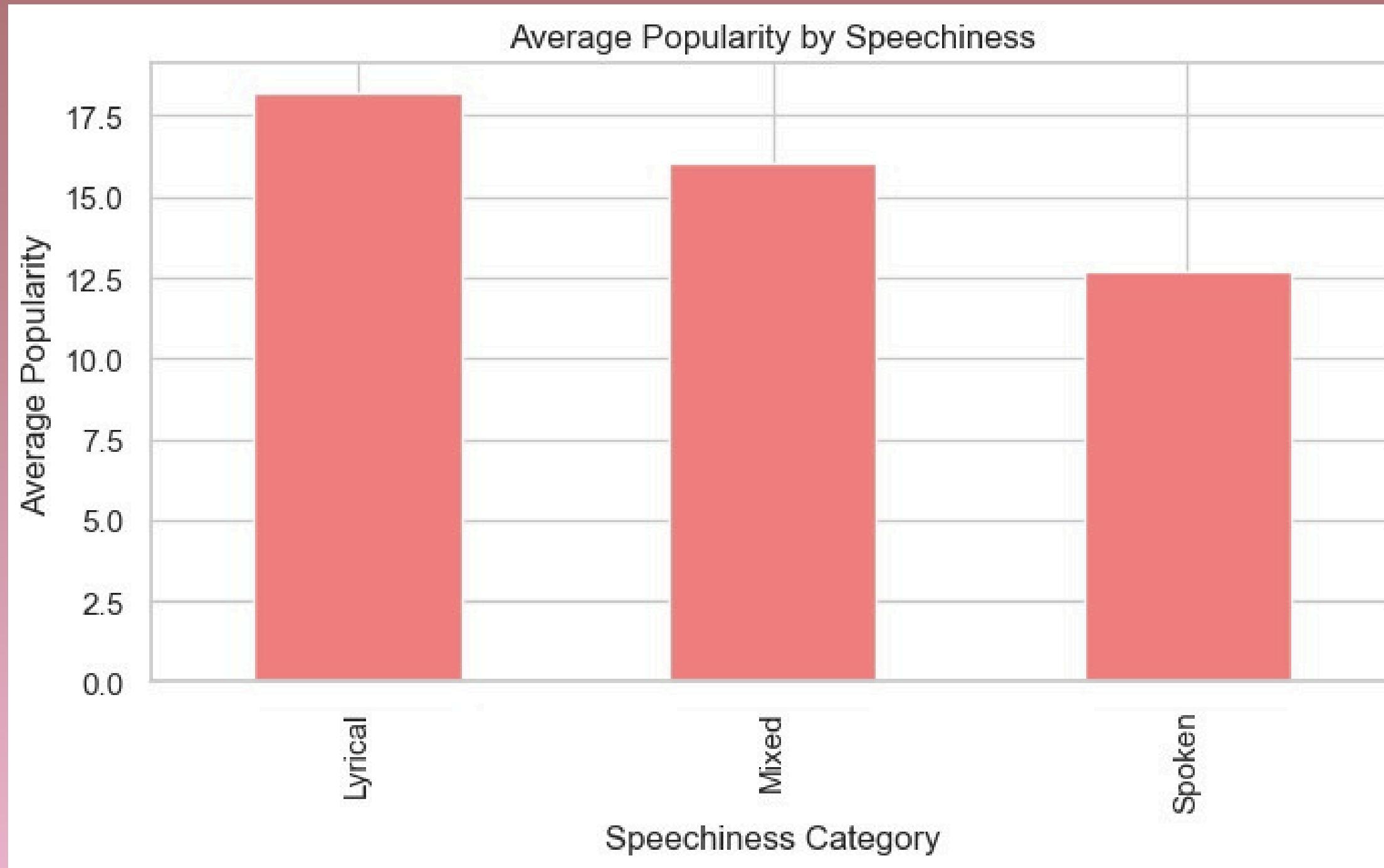
- Songs of 3–4 minutes are the sweet spot for popularity.
- Longer or very short tracks receive less attention.





- Medium-to-high energy songs are more popular than low-energy ones.
- Energetic tracks tend to engage listeners better.

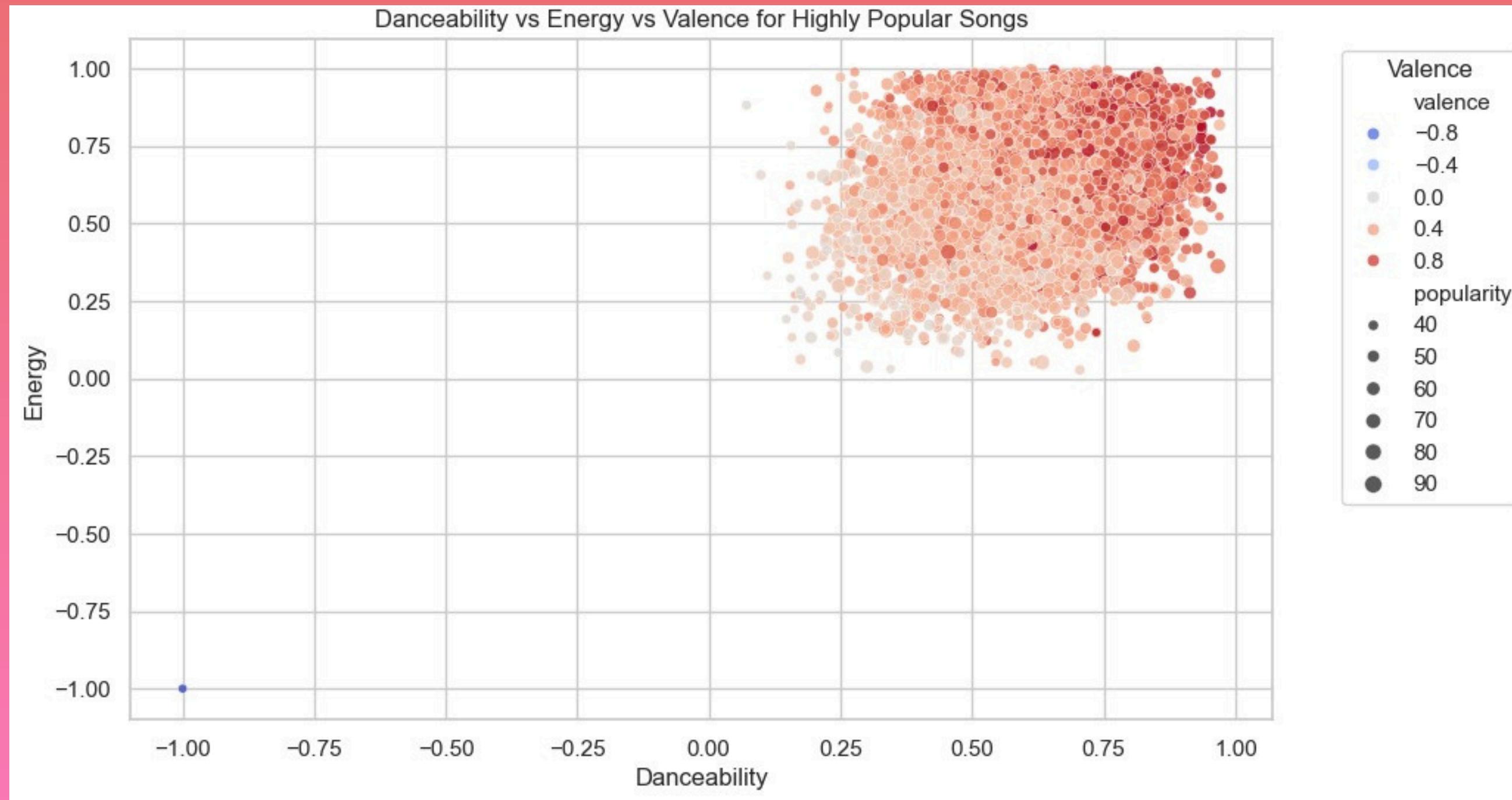




- Moderate speechiness (e.g., rap-pop blends) yields the highest popularity.
- Tracks that are entirely spoken or purely lyrical are less favored.

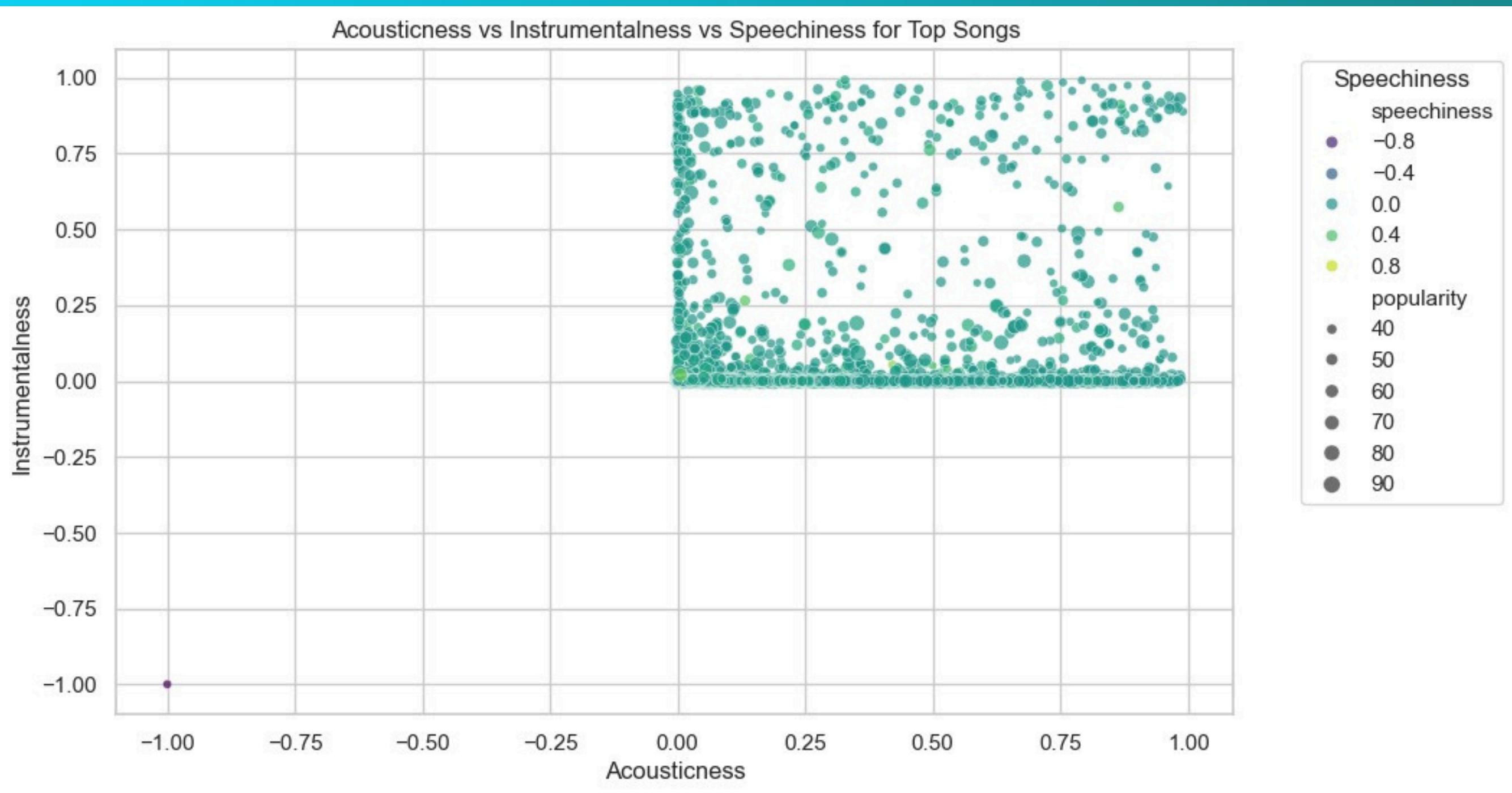
# MULTIVARIATE ANALYSIS



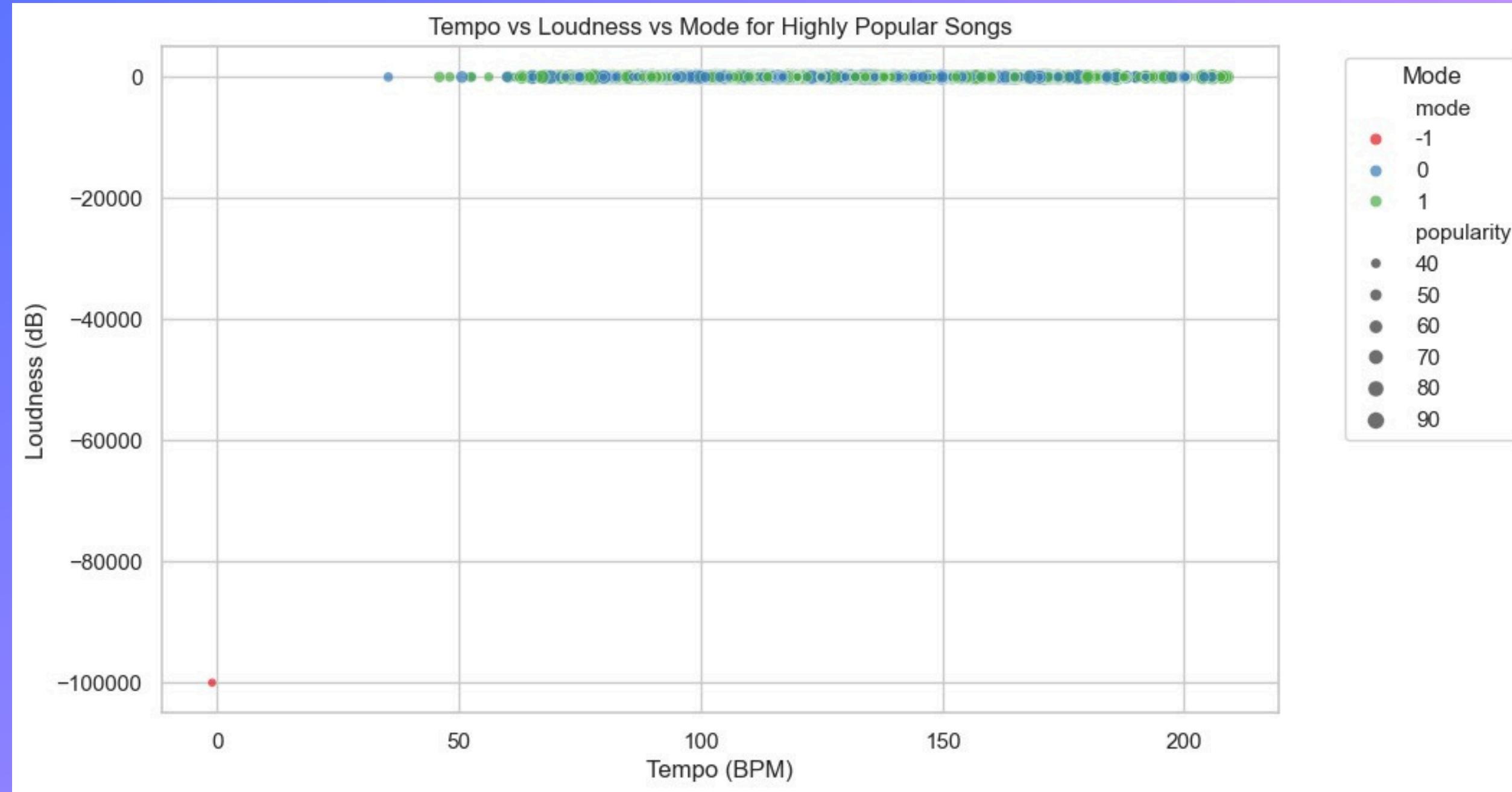


- Top songs are energetic, danceable, and moderately positive in mood.
- They cluster in the high-energy, high-valence quadrant.

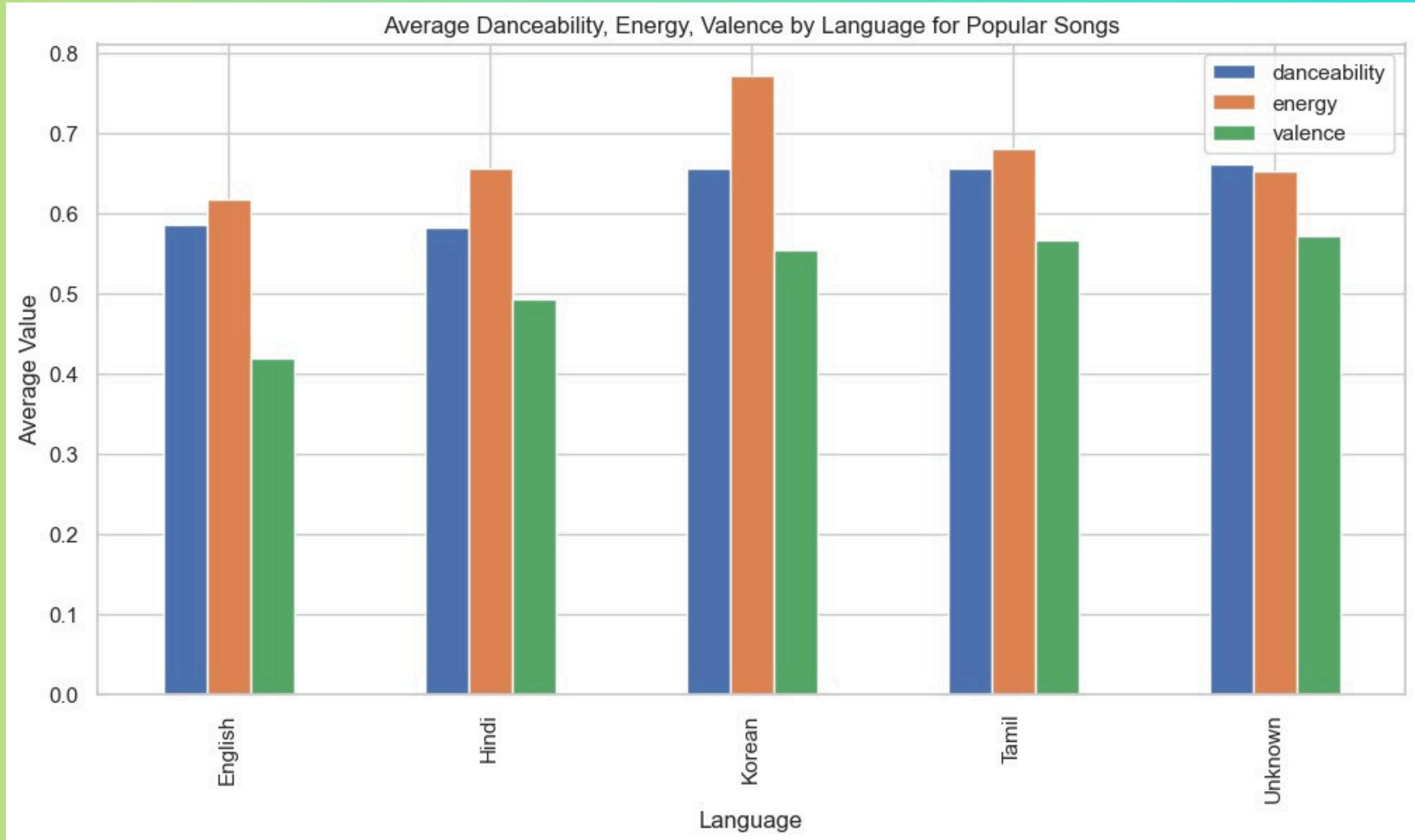
Acousticness vs Instrumentalness vs Speechiness for Top Songs



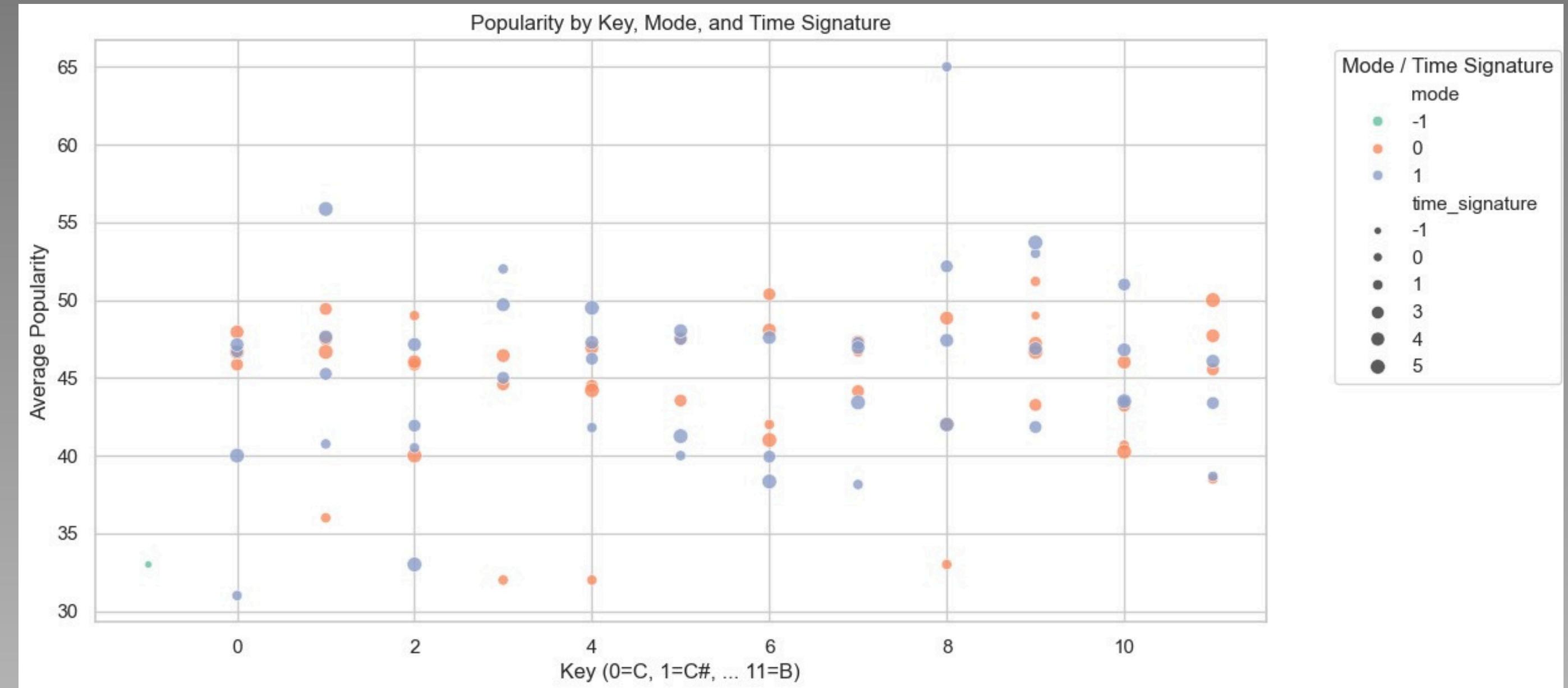
- Top songs balance acoustic and electronic elements with moderate speechiness.
- Highly instrumental or speech-heavy tracks are less frequent among hits.



- Popular tracks tend to be louder and in major mode with medium tempos.
- This combination produces bright, energetic soundscapes.



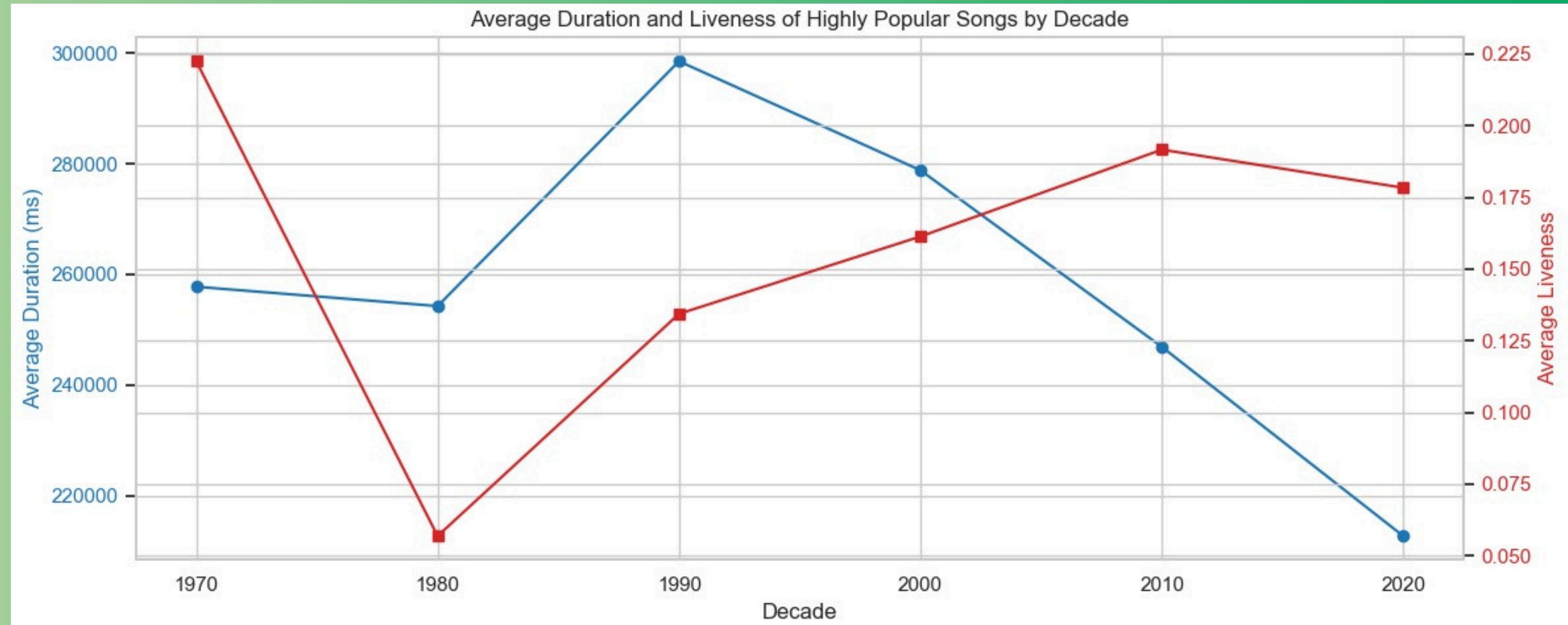
- English and korean tracks show higher danceability and energy.
- Cultural differences influence feature balance across languages.



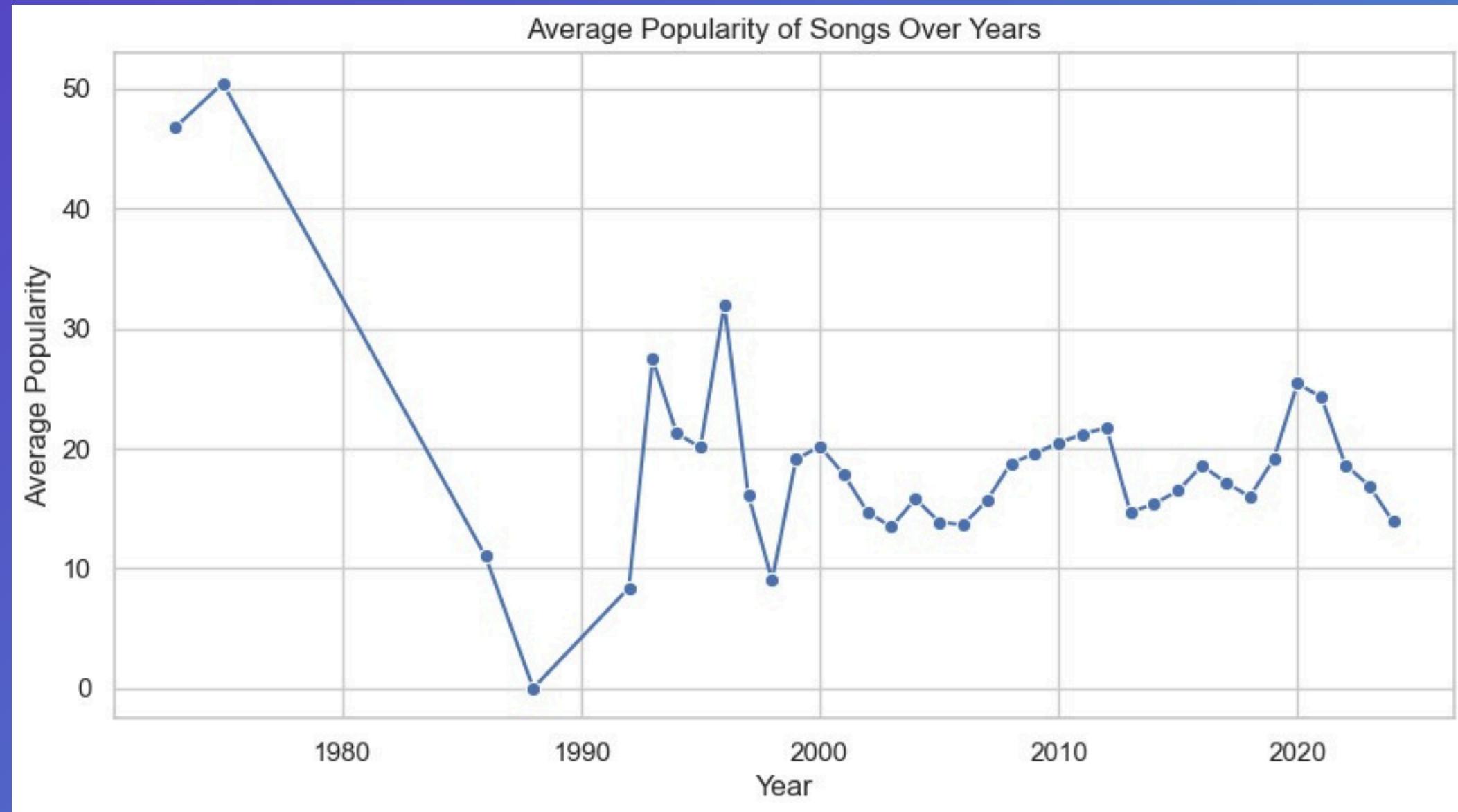
- Major-key songs with common time signatures dominate the popularity charts.
- There's minimal variation in key preference among top hits.

# TIME SERIES ANALYSIS

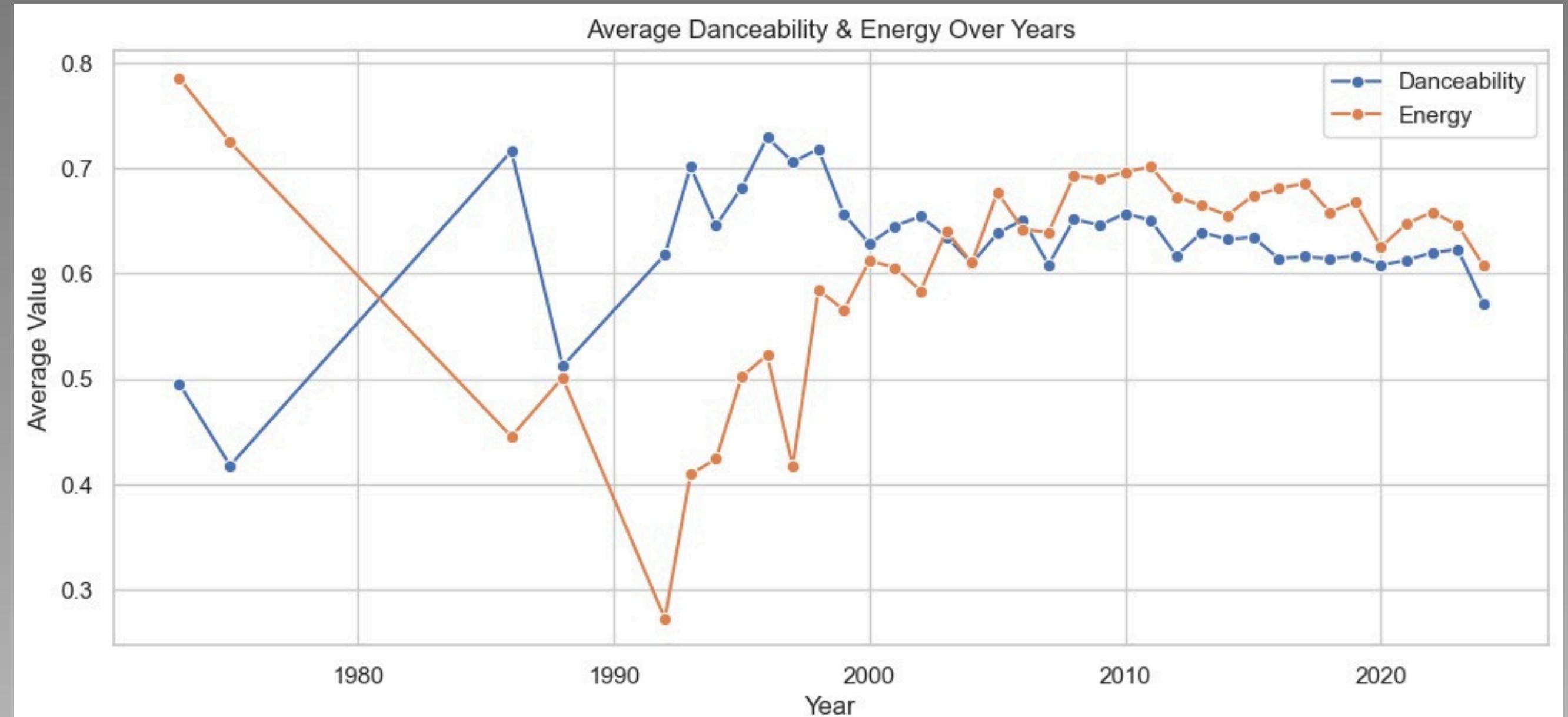




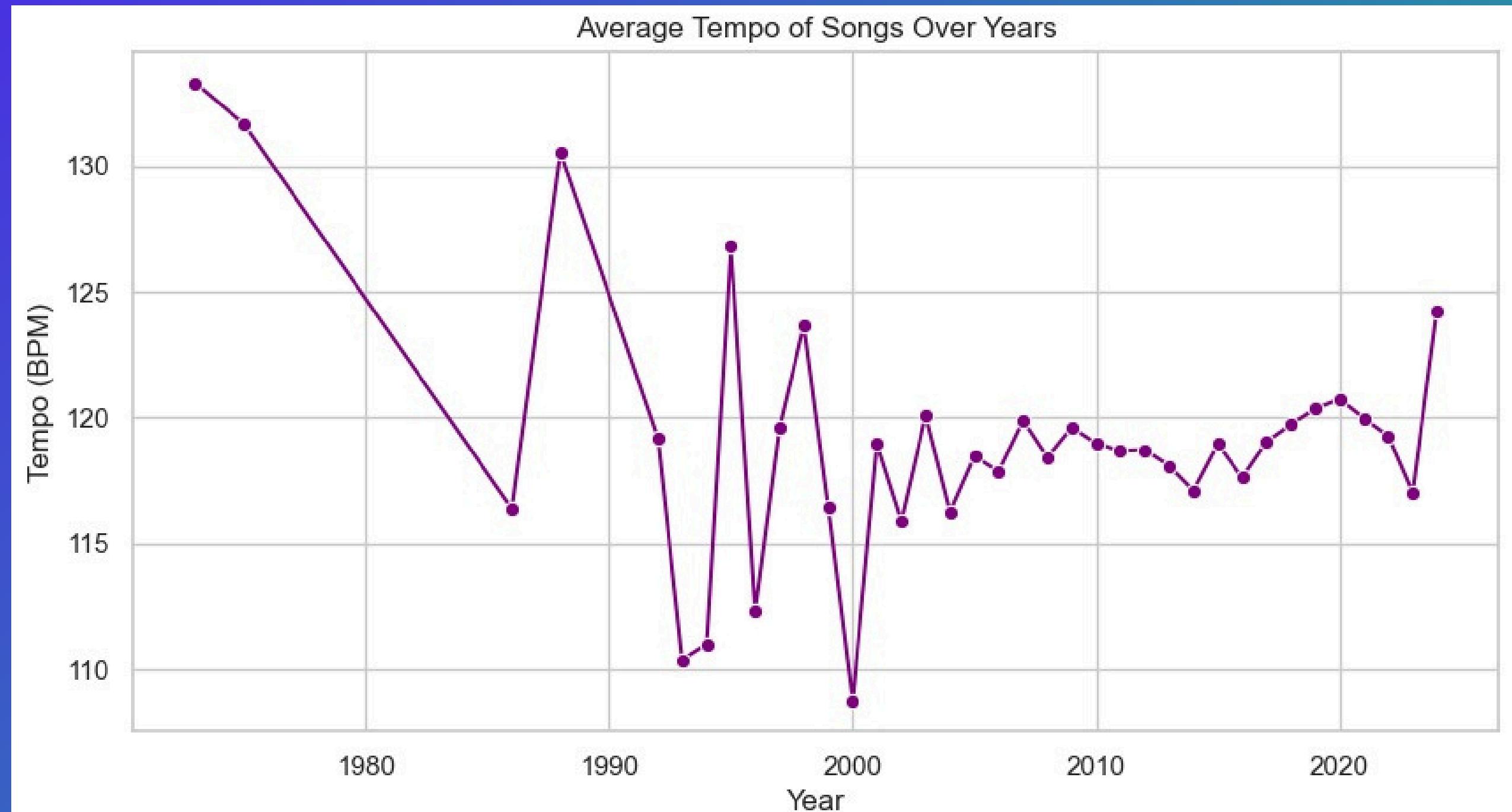
- Average song duration has slightly decreased in recent decades.
- Liveness has increased slightly, hinting at more live or natural-sounding production.



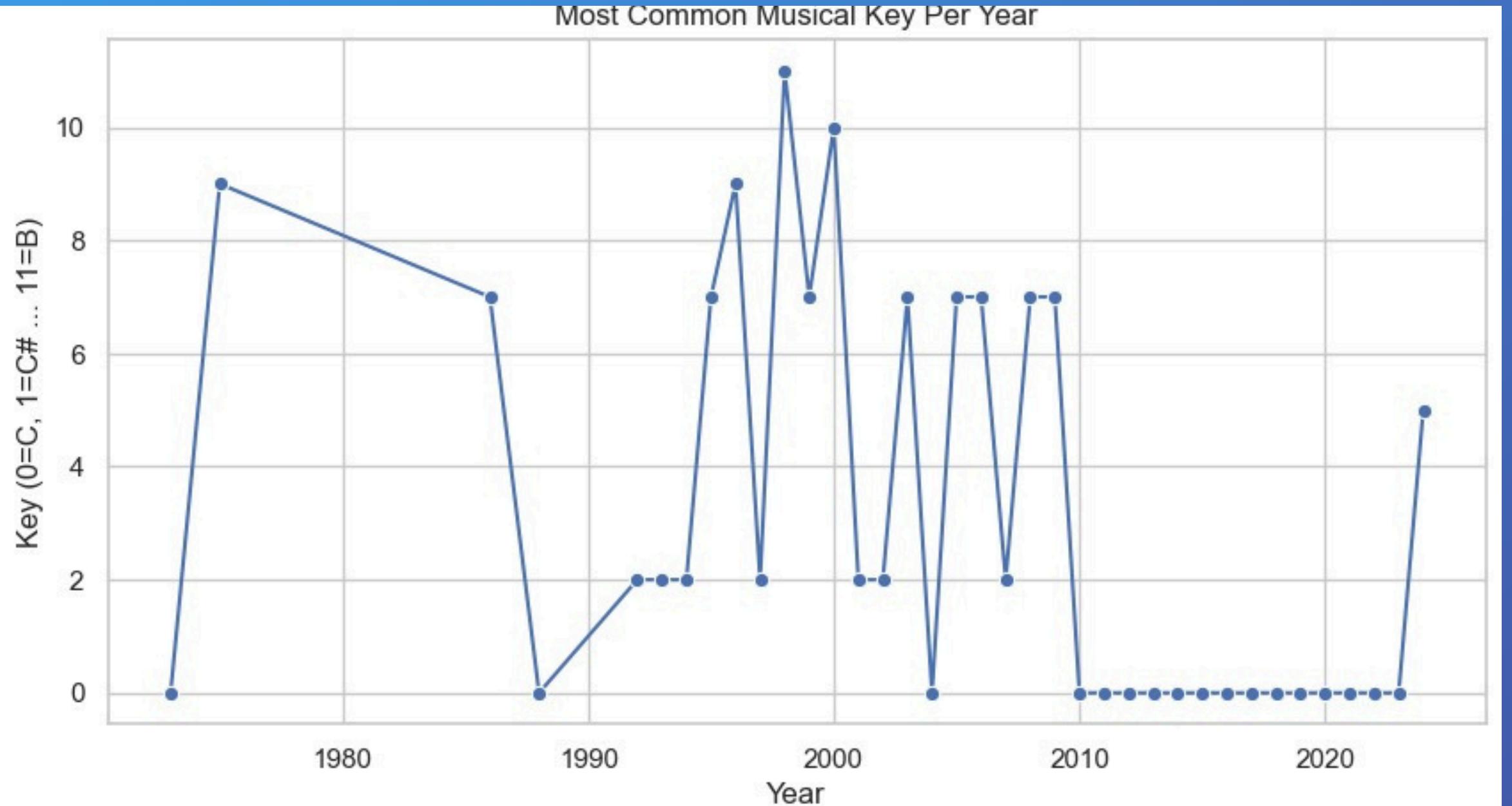
- Average song popularity fluctuates but shows an upward trend recently.
- Newer tracks gain faster traction due to streaming algorithms.



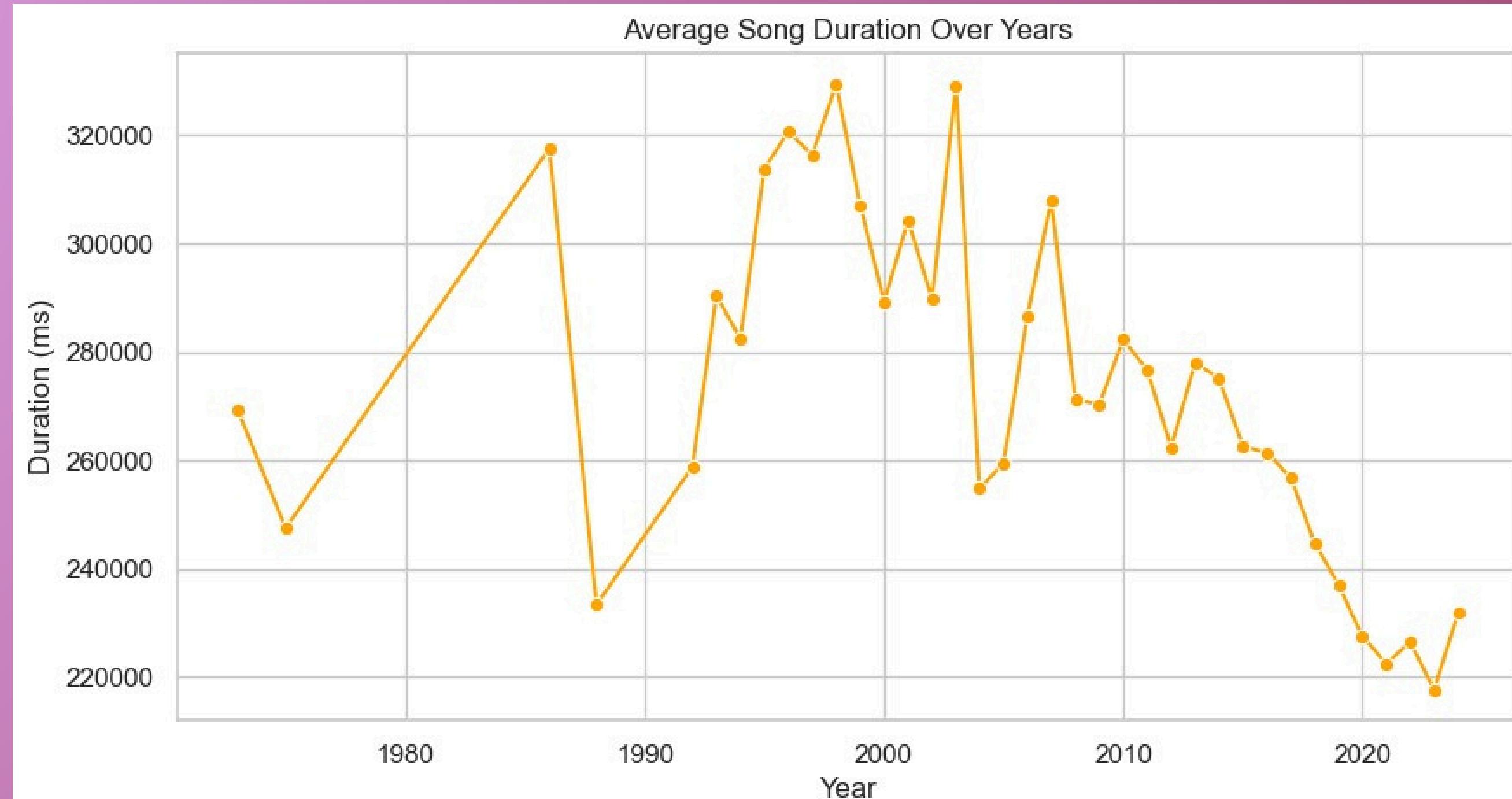
- Both danceability and energy have increased over time.
- Modern music emphasizes rhythm and production intensity.



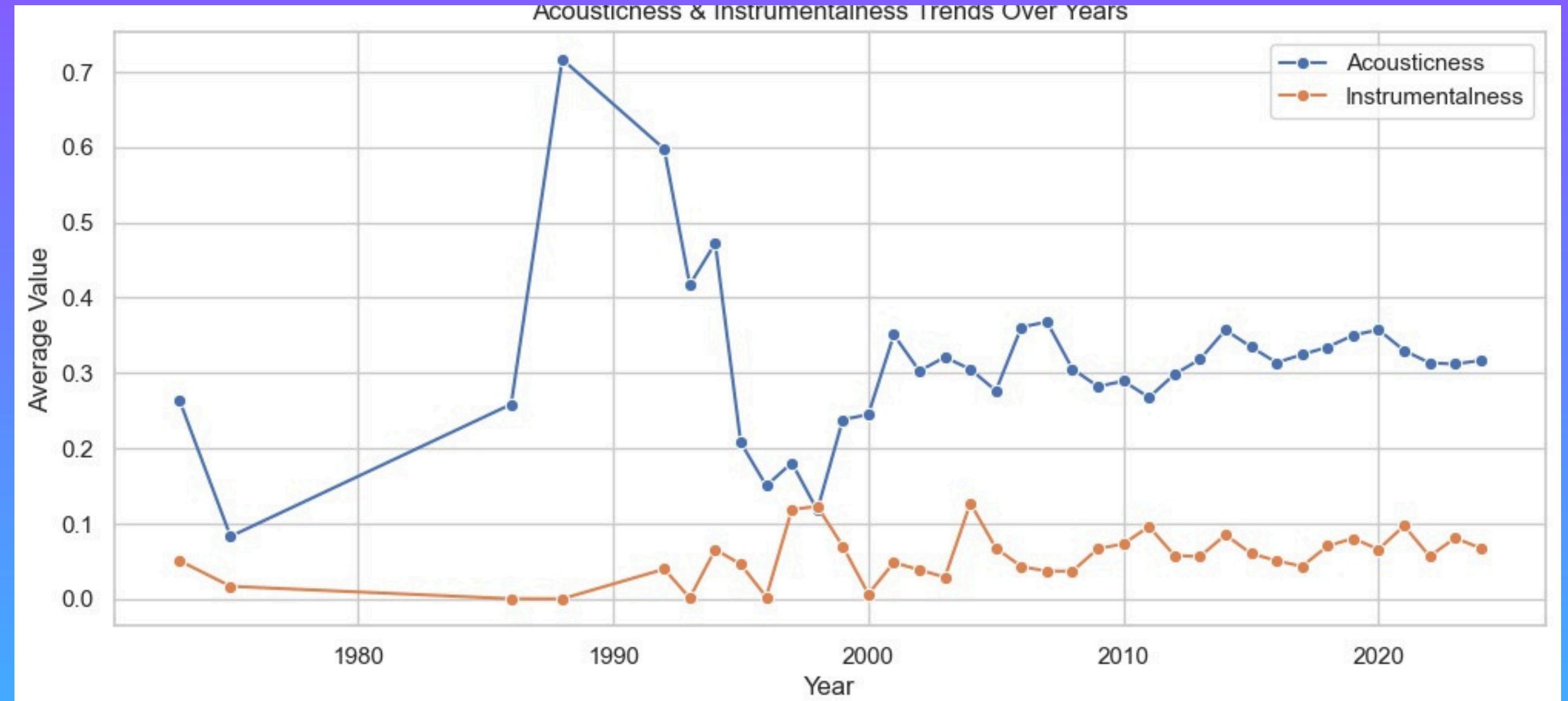
- Average tempo has remained relatively stable.
- Minor variations reflect changing genre trends but no clear long-term shift.



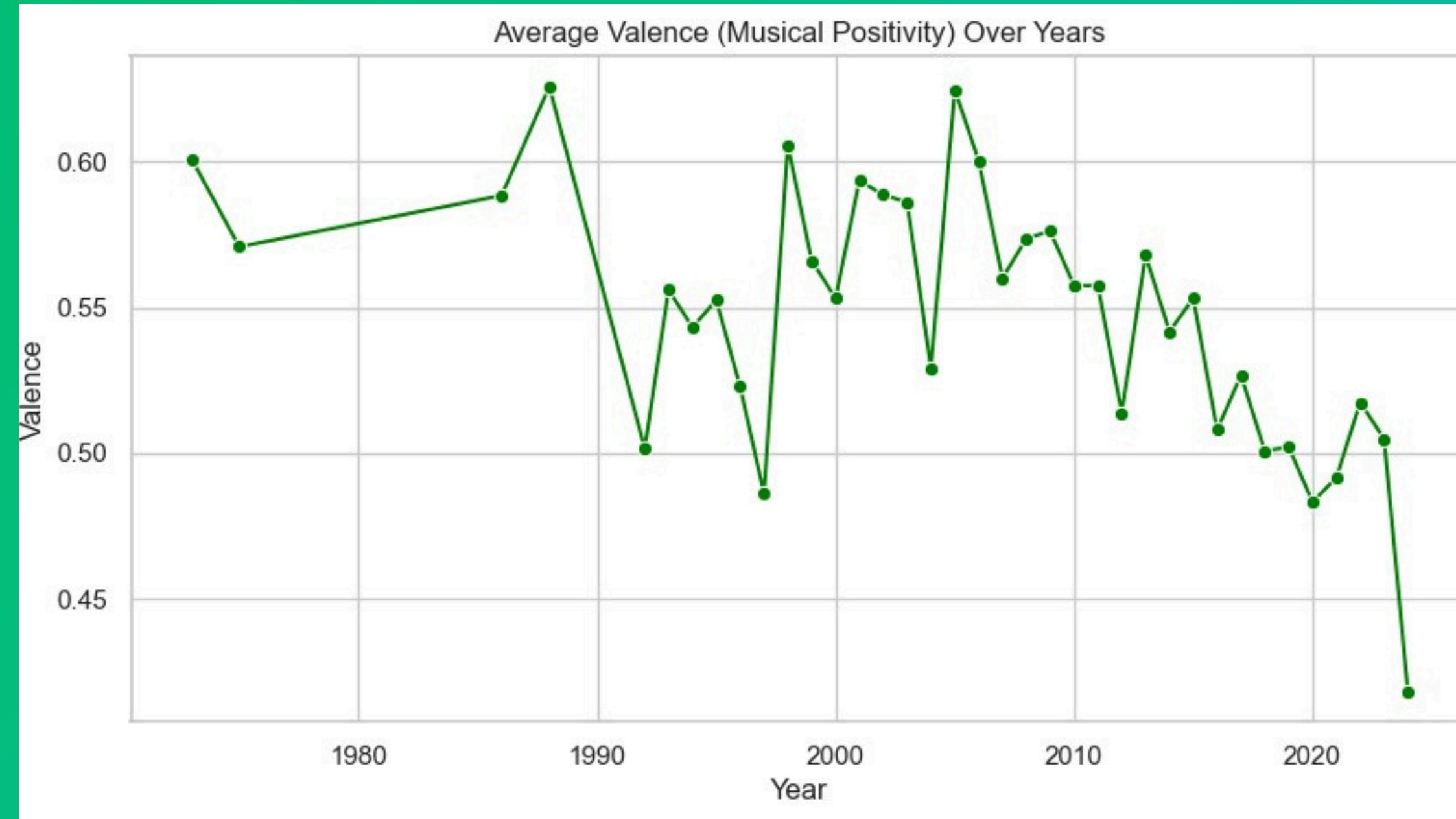
- Popular keys change periodically, with no single dominant key long-term.
- Trends may reflect genre shifts and evolving musical preferences.



- Songs have become slightly shorter on average.
- Streaming culture may favor concise, replayable tracks.

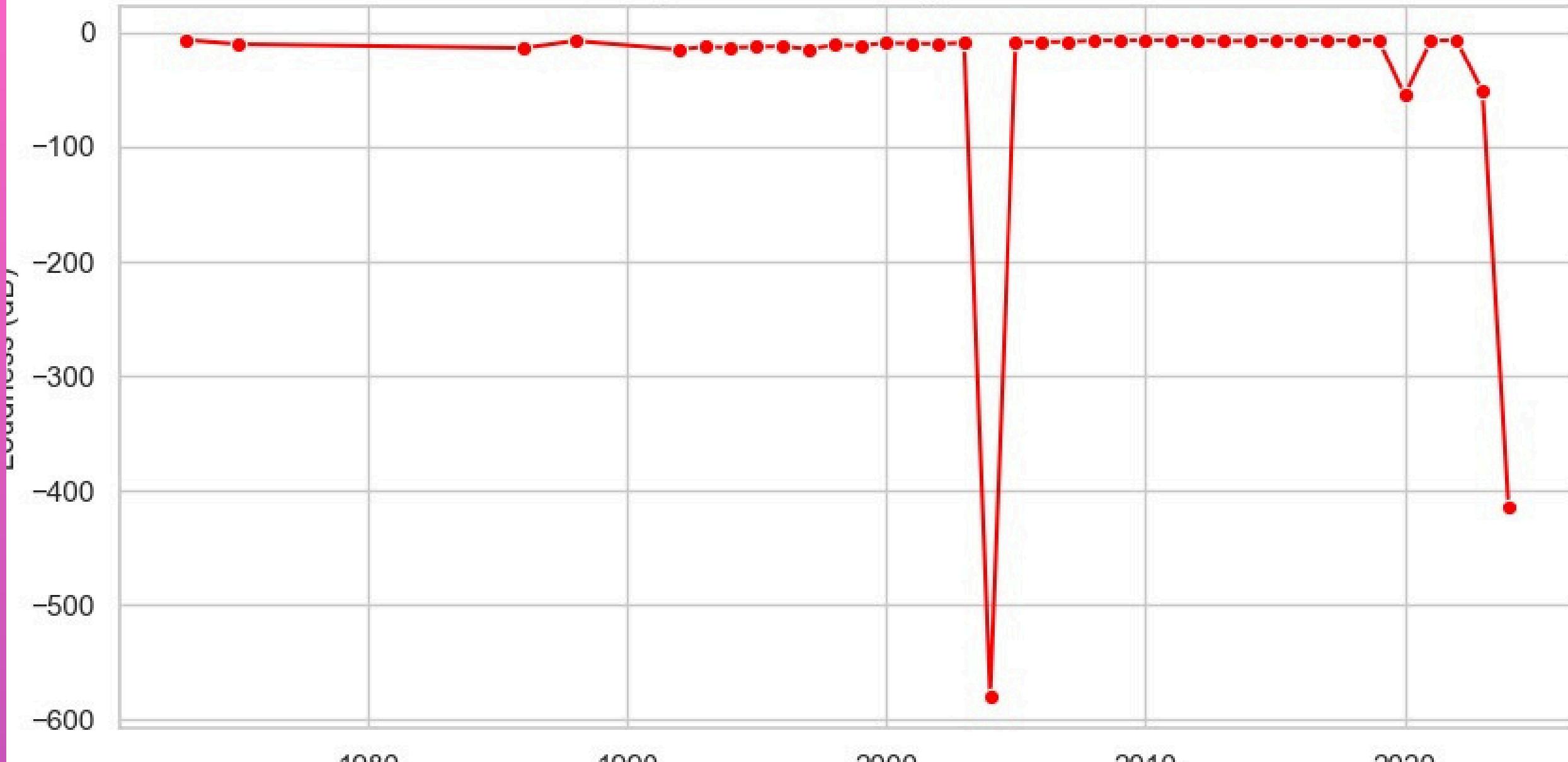


- Acousticness has declined while instrumentalness remains low.
- Production trends favor electronically enhanced sounds.

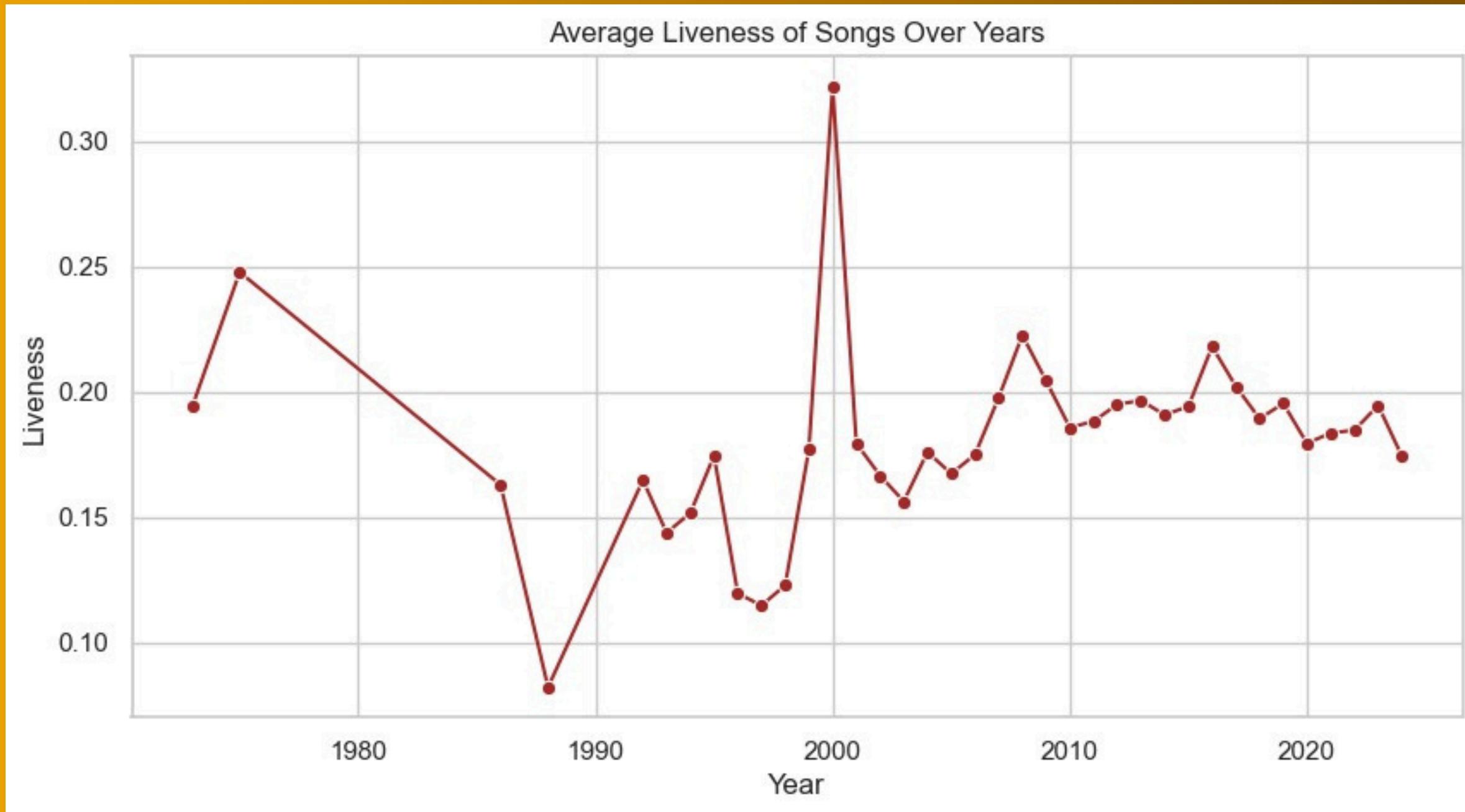


- Valence fluctuates but has trended slightly downward.
- Modern pop may lean more toward introspective or moody tones.

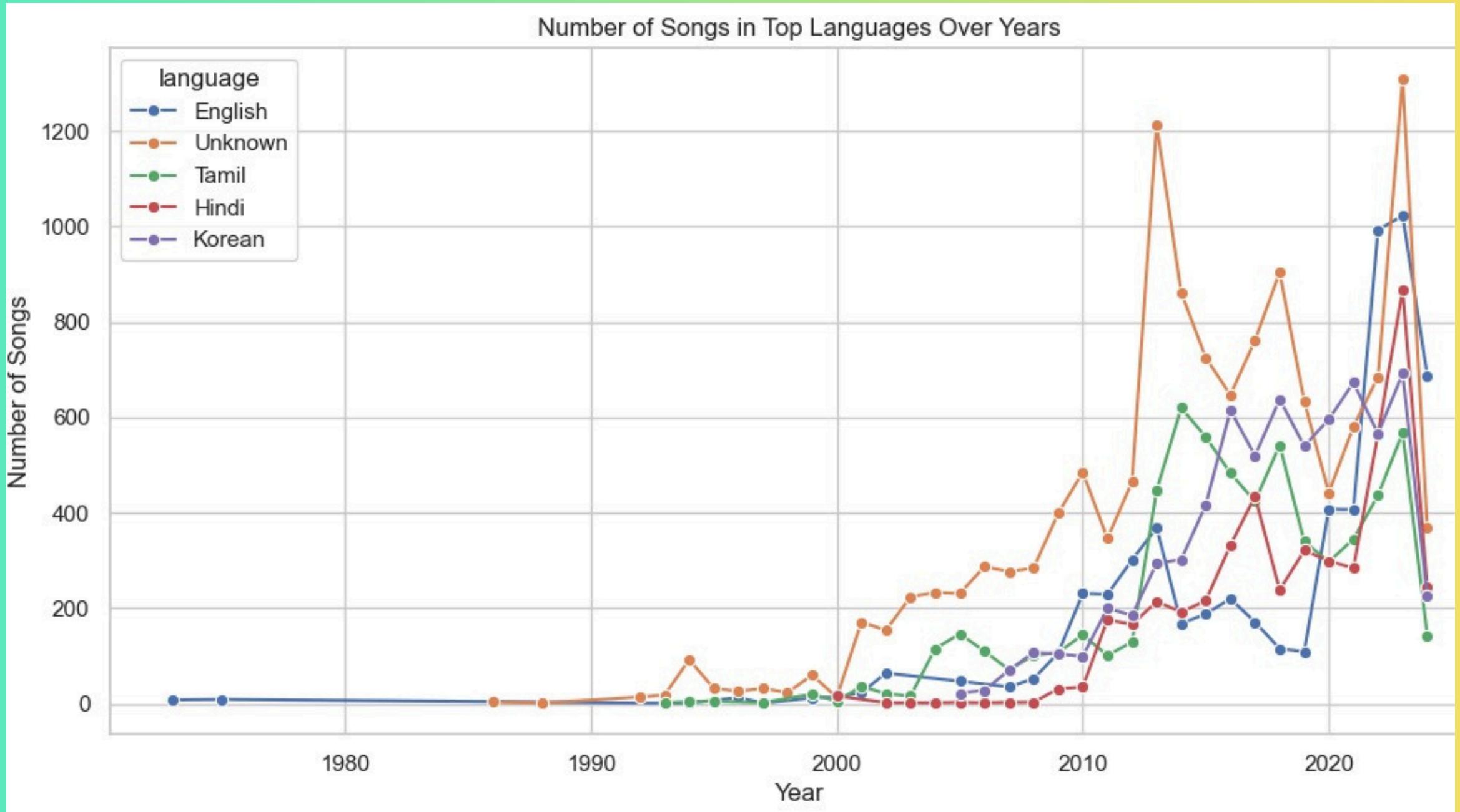
### Average Loudness of Songs Over Years



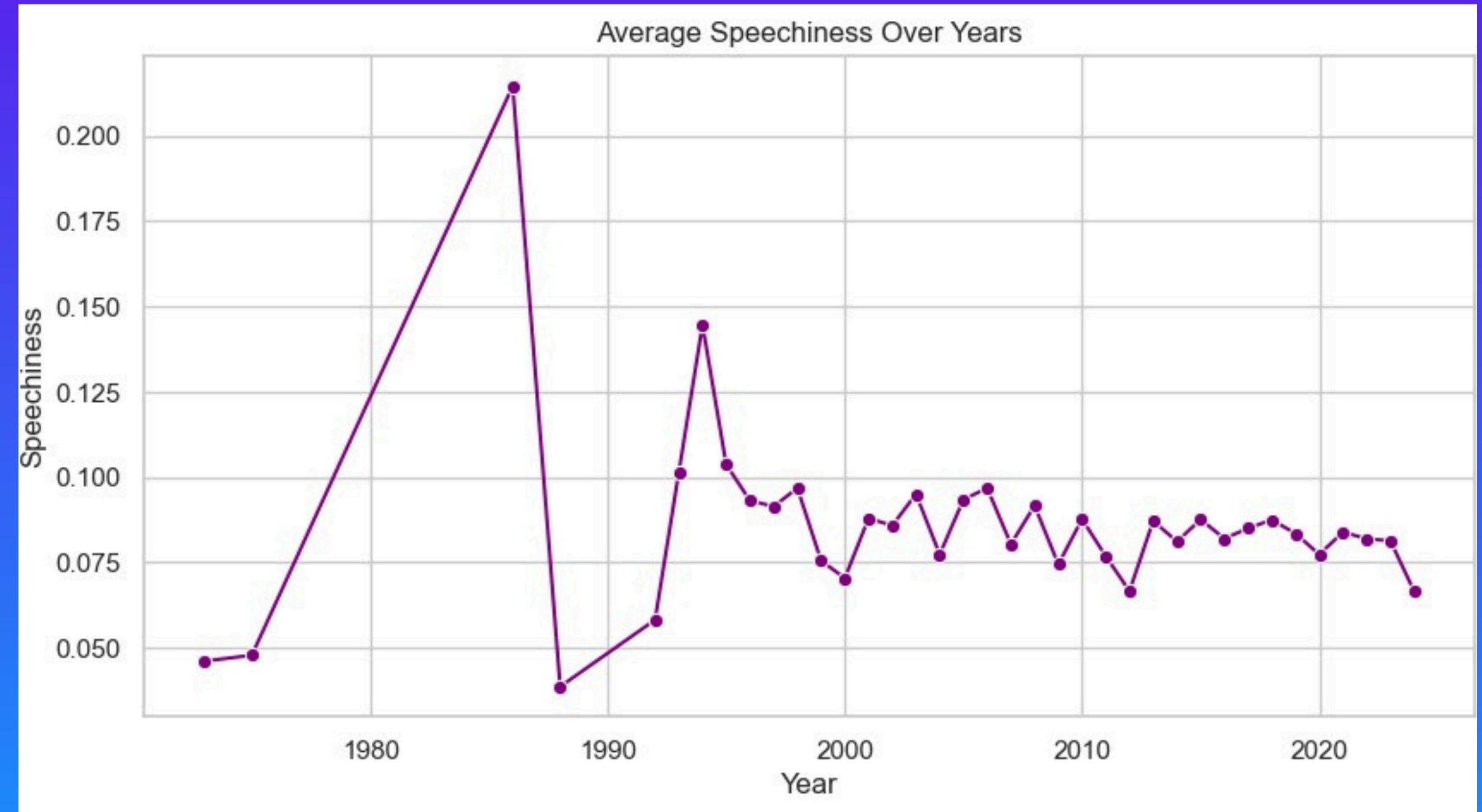
- Average loudness has increased, reflecting the loudness-war era.
- Producers push tracks to sound fuller and more aggressive.



- Liveness slightly rises, suggesting more “live-feel” mixes or performances.
- Producers might simulate live acoustics for authenticity.



- English dominates consistently, but other languages show growing presence.
- Globalization and streaming enable multilingual music success.



- Speechiness has increased, indicating more rap or spoken-word influences.
- The rise of hip-hop and trap contributes to this trend.

# THANK YOU



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