Hot or Not

Predicting a song’s appearance on the Billboard Hot 100

HOT 100 = Radio Airplay + Sales Data + Streaming Data

Published weekly, first publication: August 4, 1958

Most weekly appearances?

“Radioactive”, by Imagine Dragons (A Major, 136 BPM)

Business Case

The C.R.E.A.M.

Marketing release

Streaming recommendation engines

Advertising jingles and movie soundtracks

Validate and improve Music Information Retrieval technology

Data

Scraped billboard.com HOT 100 archive with BeautifulSoup 4

12,000 randomly chosen songs from 20th & 21st century Western music

Features Phase 1: Echo Nest's music intelligence

Final Features: Spotify API Audio Features

Python, Pandas, scikit-learn, Matplotlib

Music Features

“Acousticness”: probability from 0.0 to 1.0 the track is acoustic

“Danceability”: consistency of tempo and rhythm

Valence: mood (e.g. happy, cheerful, sad, angry)

Energy: dynamic range, onset rate, timbre, loudness, general entropy

“Instrumentalness”: probability track contains no vocals

Liveness: presence of audience (claps and yells)

Loudness: relative average decibel level across track

“Speechiness”: above 0.66 entirely of spoken words

Key: pitch class 0-11

Mode: major (1), minor (0)

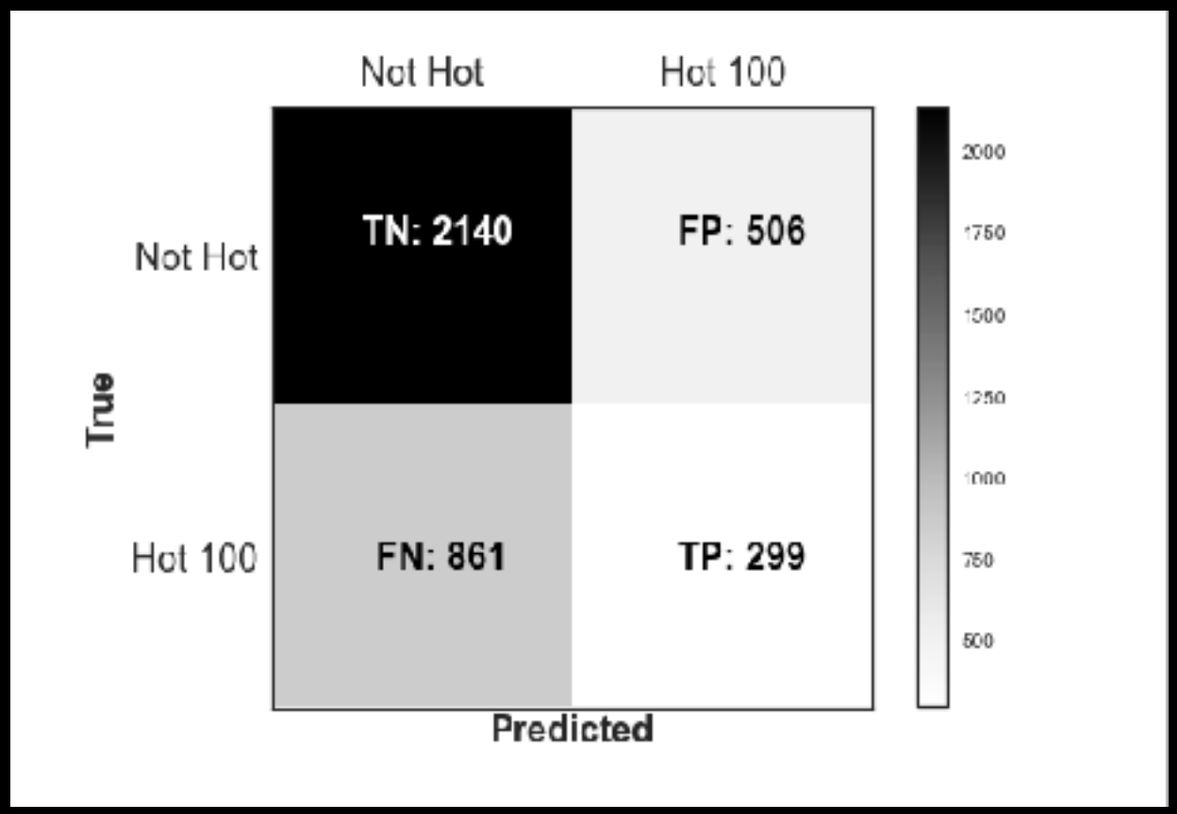
Tempo: beats per minute

Duration in milliseconds

Initial Models

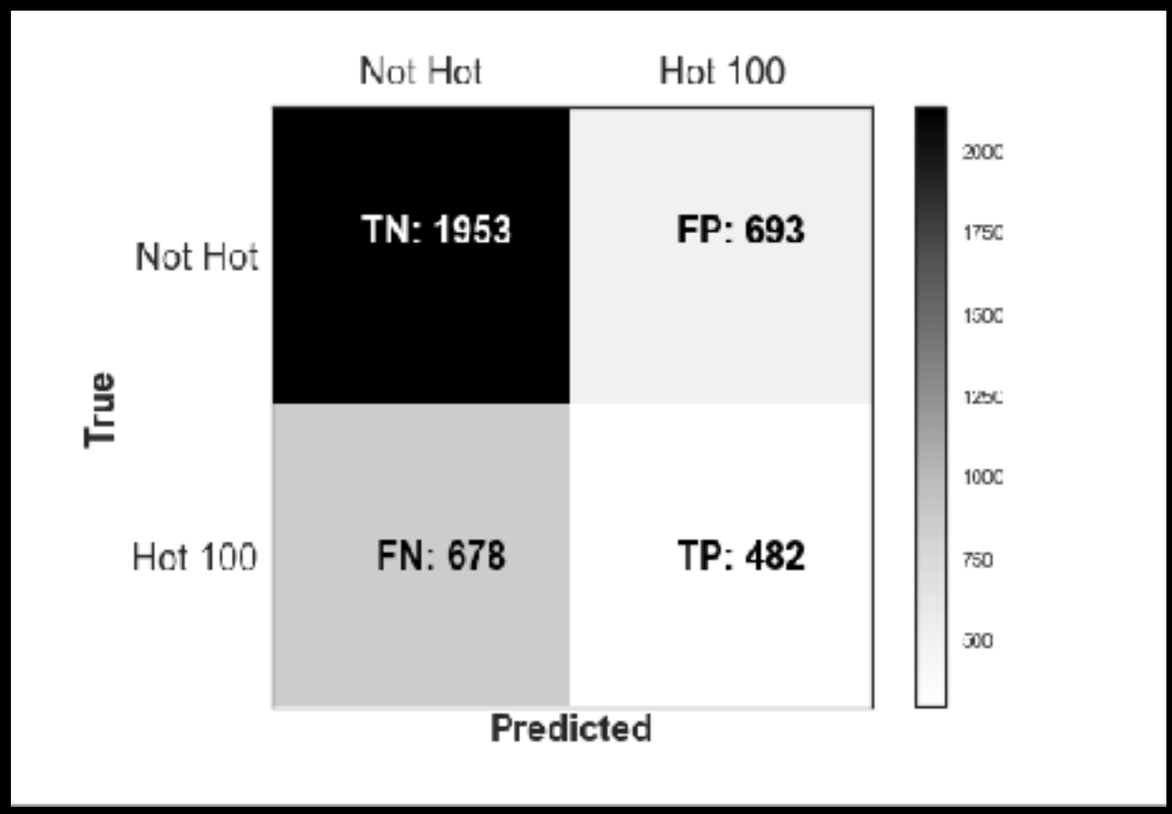
Stratified Train/Test Split - 70/30 class balance

K-Nearest Neighbors = 5



Accuracy: 64%
Precision: 37%
Recall: 25%
F-1: 30%
AUC: 0.60

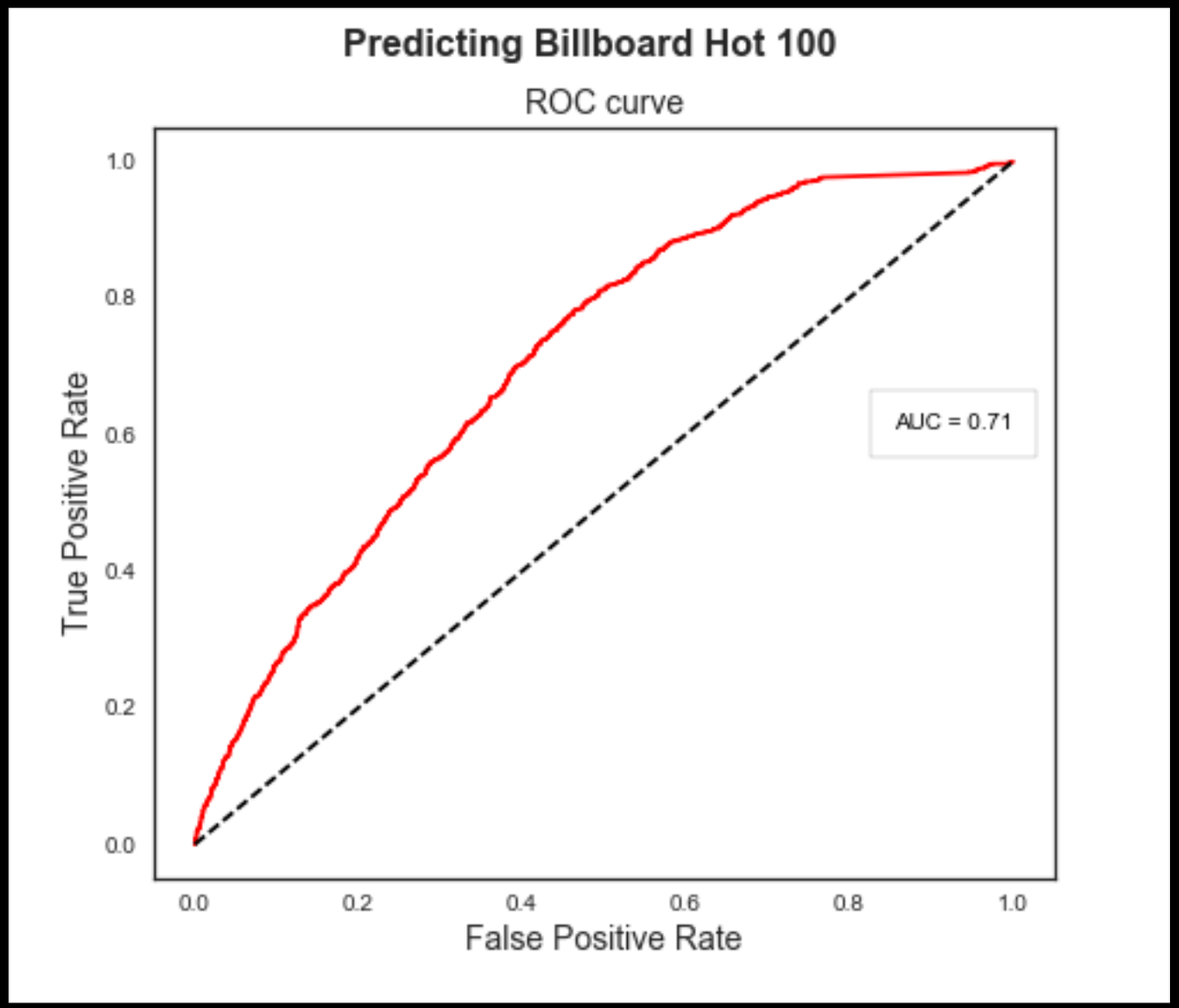
Decision Trees



Accuracy: 64%
Precision: 41%
Recall: 41%
F-1: 41%
AUC: 0.54

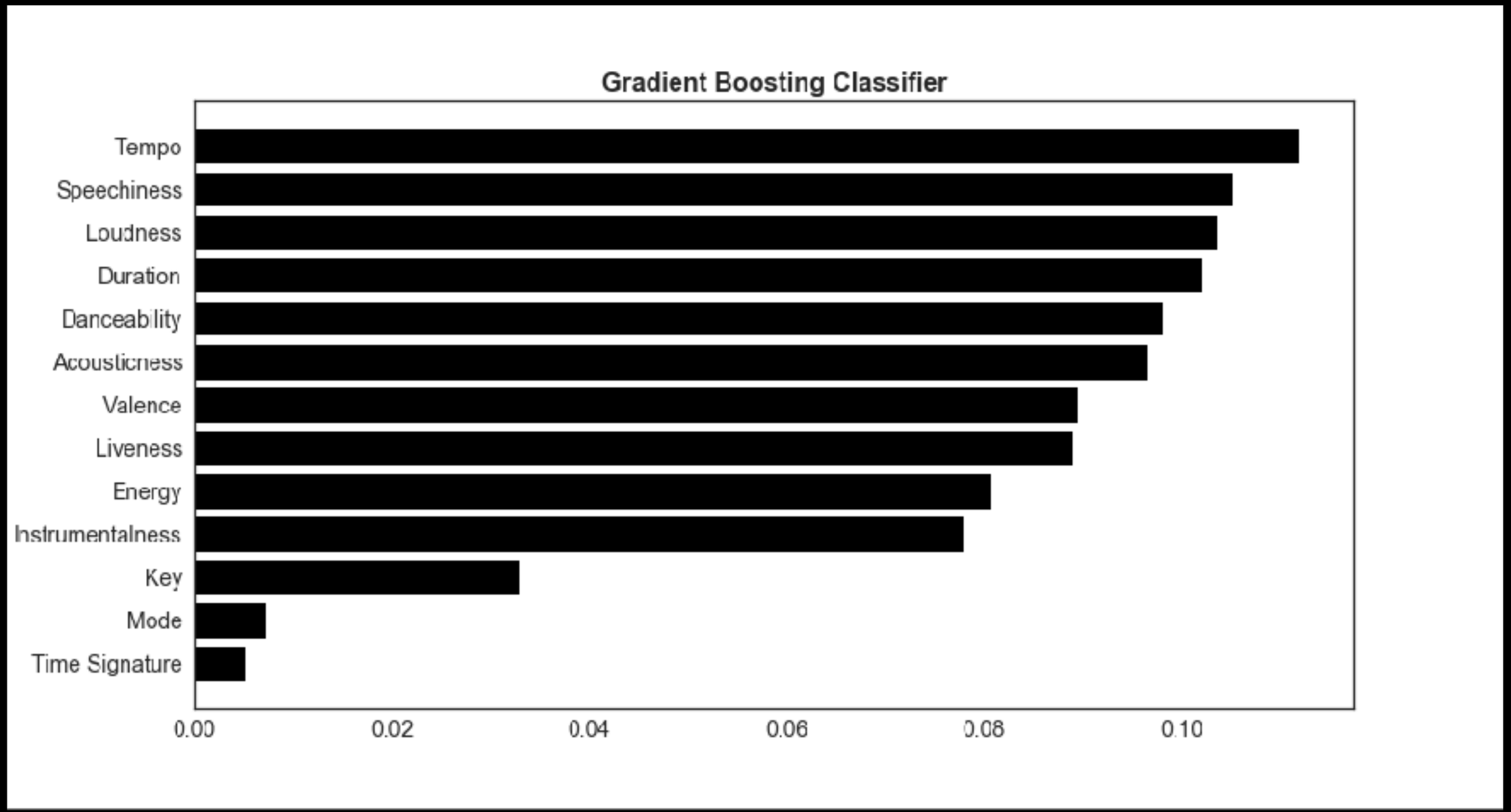
Gradient Boosting w/ Decision Trees

Accuracy: 71%
Precision: 53%
Recall: 33%
F-1: 40%
AUC: 0.71

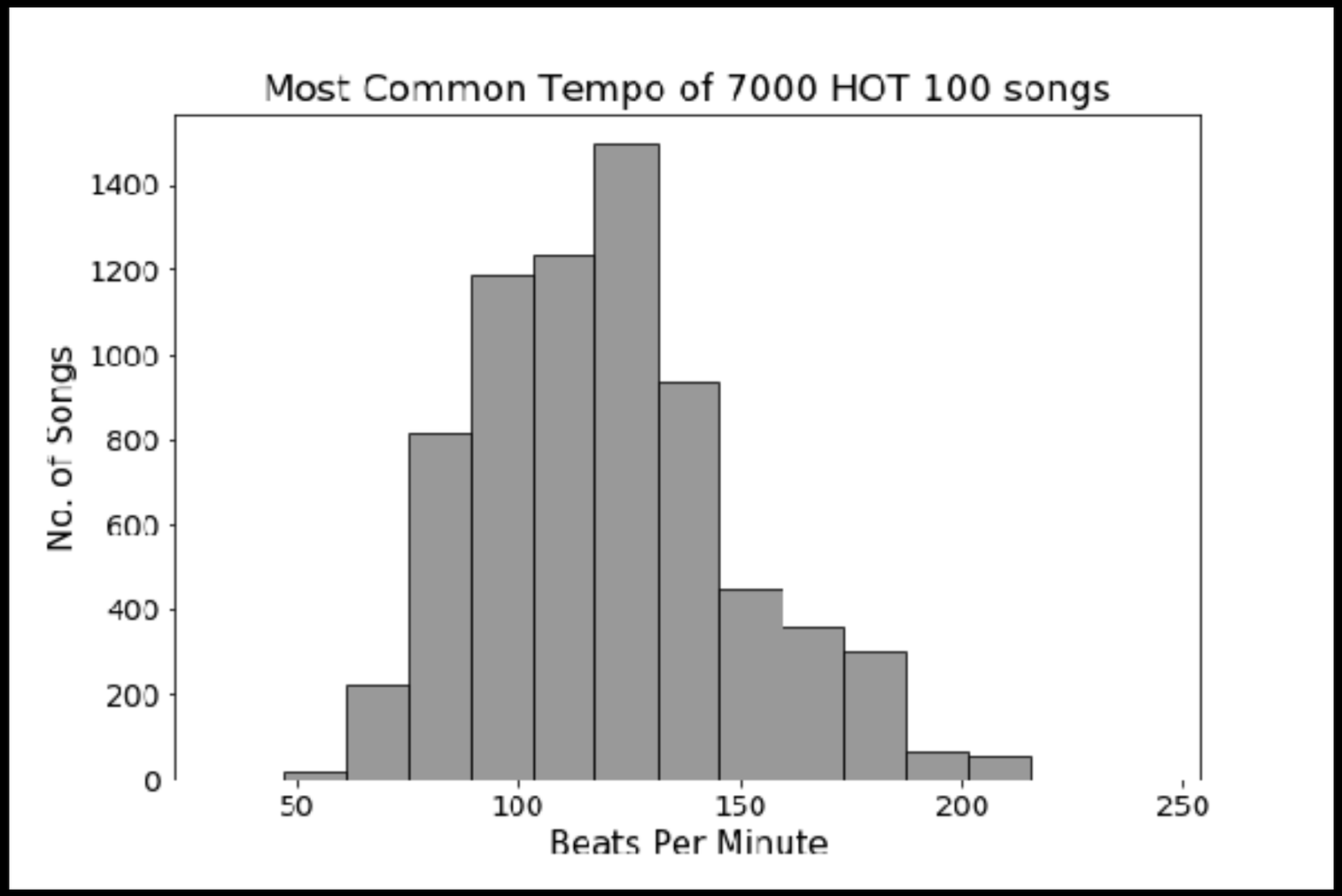


Parameter fine-tuning
Scoring on Recall

Feature Importance



Billboard HOT 100:



Most common Key Signature: C Major (“Let it Be”, “Bad Romance”)

Least common Key Signature: D Minor (Beethoven’s 9th)

“Speechiest” song - “C.R.E.A.M. - Cash Rules Everything Around Me”

Final Thoughts

How does popular taste change over time?

More data and granular features needed

THANKS!