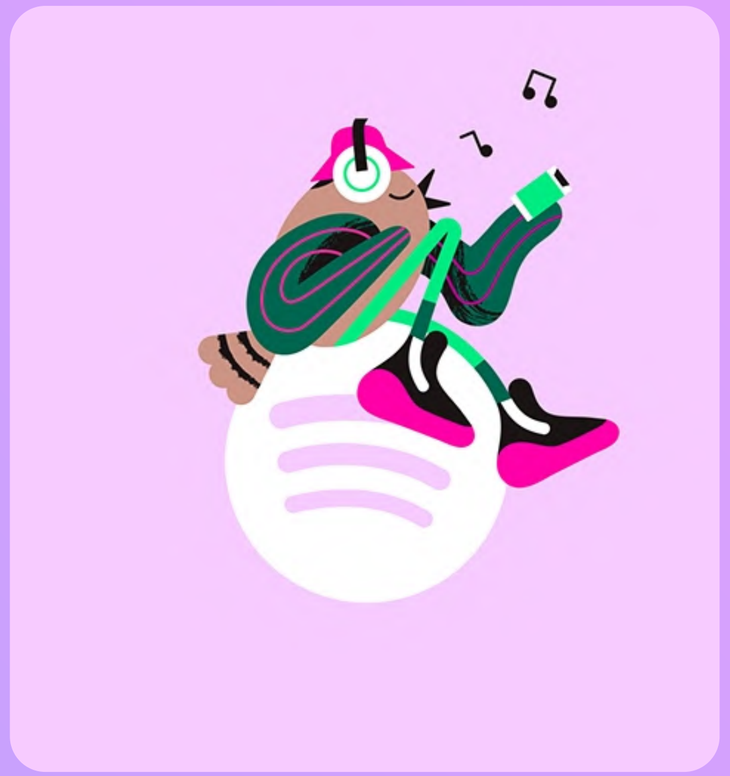
Spotify

Exploring Music Classification with Spotify API

Predicting Song Categories



Team

Pınar Yıldız

Halil Kolatan

Muhammed Maral

GitHub Streamlit

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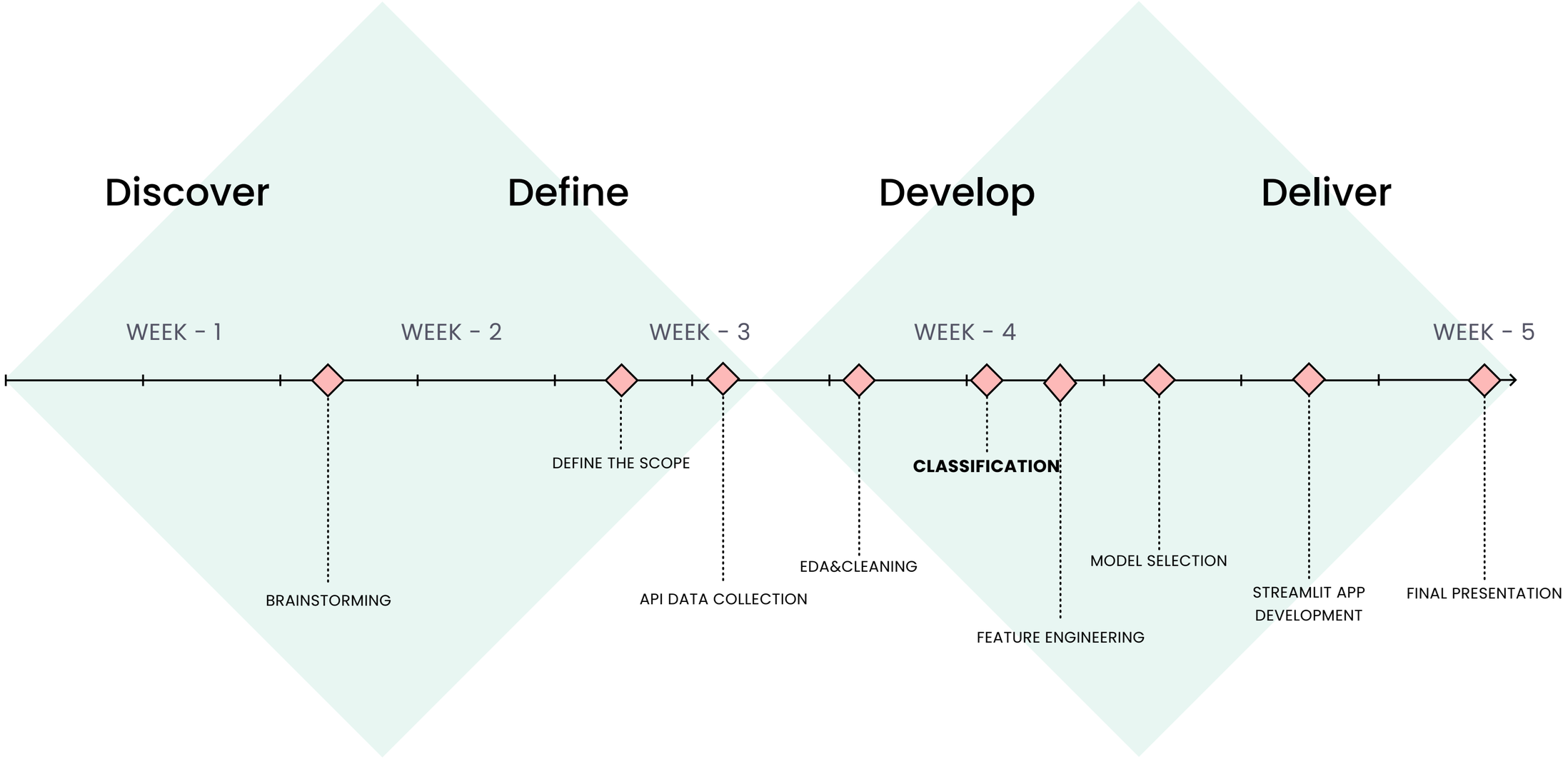
PROJECT OVERVIEW



MOTIVATION

PERSONA

Data Engineer and CO-Owner of DS Academy

ZEKERIYA

AGE: 48
EDUCATION: COMPUTER PROGRAMMING
LOCATION: ISTANBUL

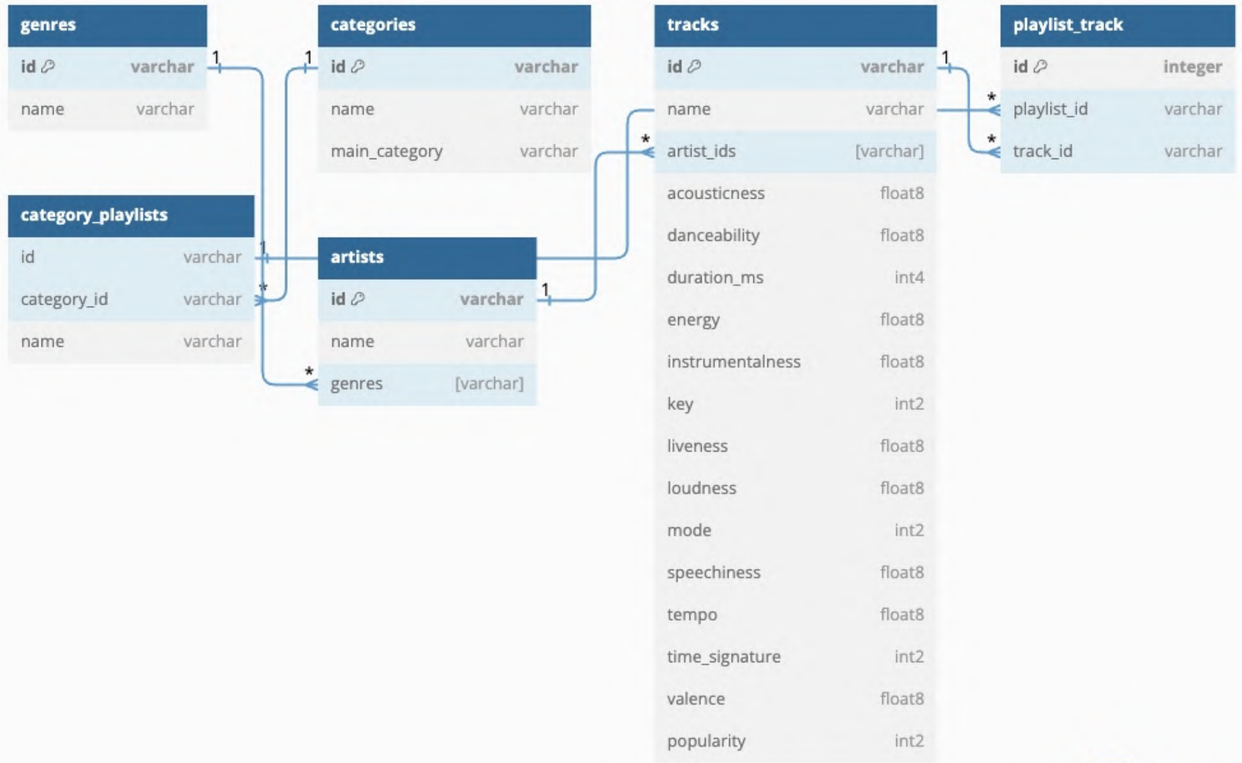
Meet Zekeriya Besiroglu, a passionate Big Data Architect and Google Cloud Certified Engineer. When it comes to music, Zekeriya's heart beats for rock. With our Spotify genre classification project, he explores music that matches his taste and energy level. Always in the mood for active songs, Zekeriya uses the project's personalized inputs to discover new rock tracks that keep him in high spirits.

2.DATA COLLECTION

TOOLS USED

Python
PostgreSQL
supabase
Streamlit
scikit learn
pandas
NumPy
Spotify
Spotipy

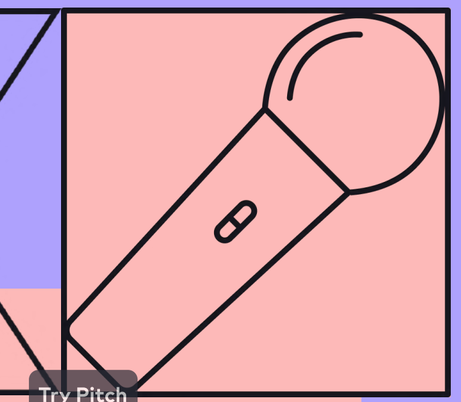
API STRUCTURE



DATAFRAME

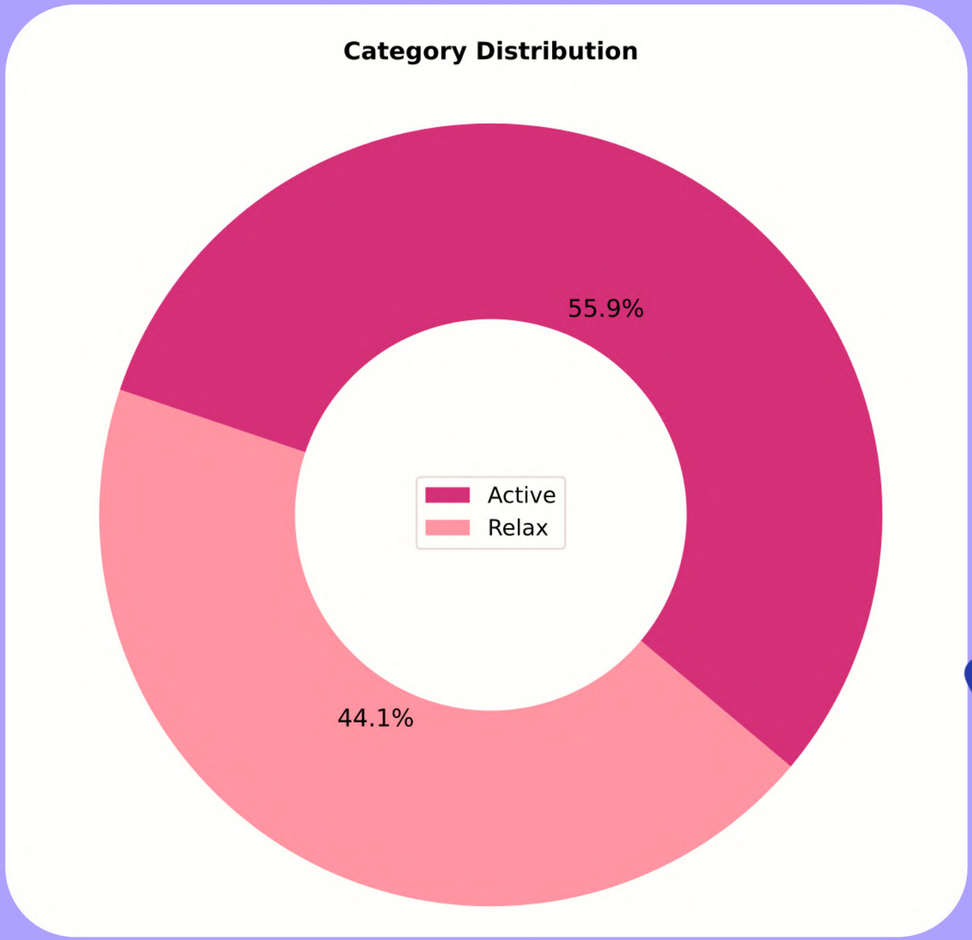
	id	name	acousticness	danceability	duration_ms	energy	instrumentalness	key	liveness	loudness	mode	speechiness	tempo	time_signature	valence	popularity	category_name
0	087fGGq27BXXpxKAlbBwNM	Rhythm Is A Dancer - 7' Edit	0.27300	0.794	225882	0.7450	0.000414	9.0	0.1430	-11.367	0.0	0.0370	124.249	4.0	0.7060	32	relax
1	0CsM8VGDi38kusMv3pxyj1	True - Single Edit	0.45900	0.742	329146	0.5330	0.148000	0.0	0.0640	-9.098	1.0	0.0288	97.395	4.0	0.3910	73	relax
2	0DiWol3AO6WpXZgp0goxAV	One More Time	0.01940	0.613	320357	0.6970	0.000000	2.0	0.3320	-8.618	1.0	0.1330	122.746	4.0	0.4760	80	relax
3	0LzeivEHO16a8eBQGlpVkE	Love Shack - Edit; 2019 Remaster	0.11000	0.704	262586	0.8280	0.000000	5.0	0.7470	-7.304	0.0	0.0514	133.496	4.0	0.8660	61	relax
4	0MHXrqn909p0LRTPsNsGEi	Move on Up - Single Edit	0.41700	0.538	165789	0.9690	0.001540	11.0	0.1190	-5.626	0.0	0.0906	138.652	4.0	0.9280	73	relax
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29040	2riw7lzJhEHDNDNQKj3ml9	Sojourner Truth	0.96800	0.264	330146	0.0783	0.251000	8.0	0.0722	-19.087	1.0	0.0457	82.021	4.0	0.0634	22	NaN
29041	6T572wD8zgOLOlB9TzxUmh	Pool Party	0.02930	0.543	238000	0.6120	0.653000	0.0	0.1070	-7.832	0.0	0.0318	172.035	4.0	0.2770	48	NaN
29042	6lrRIfQDcikJ5y5DtyZPuJ	Can't Let You Go (feat. Mike Shorey & Lil' Mo)	0.23100	0.646	223973	0.6000	0.000000	9.0	0.0794	-6.569	1.0	0.4580	192.082	4.0	0.8110	68	NaN
29043	7ITCyjmVcBWKAe38V8epGU	Swaggin' At The Partment	0.00183	0.562	124667	0.9310	0.884000	9.0	0.5240	-5.377	1.0	0.0743	92.532	4.0	0.4670	11	NaN
29044	42F16X6WRCAFwPyRY4nH7O	Dou	0.98200	0.540	369626	0.1670	0.833000	1.0	0.0643	-15.765	0.0	0.0393	93.990	3.0	0.3940	41	NaN

29045 rows × 17 columns



Try Pitch

3.EXPLORATORY DATA ANALYSIS



- Total Data → 29045 Rows & 17 Columns
- Total 14 Features
- **Two Main Category**
  - **Active**: Pop, Hip-Hop, Top Lists, Trending, Dance/Electronic, Rock, Workout, Summer, Focus
  - **Relax**: Chill, Sleep, Classical, Student, Travel, Tastemakers

4.DATA CLEANING & CLASSIFICATION

Removed Columns

Song Name **Song ID**

Removed Rows

- **Duplicated Songs** → **9809 Rows**
- **Rows without Category Name** → **3914 Rows**
- **Empty Rows** → **75 Rows**

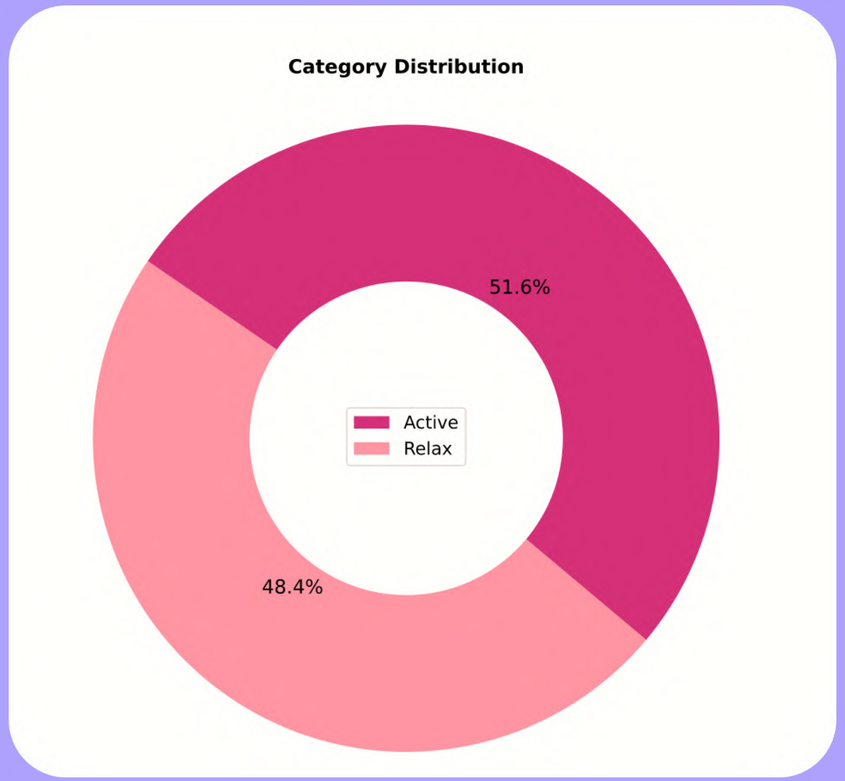
Edited Columns

Category Name → **Mood**

Active & Relax → 1 & 0

New Dataframe Rows

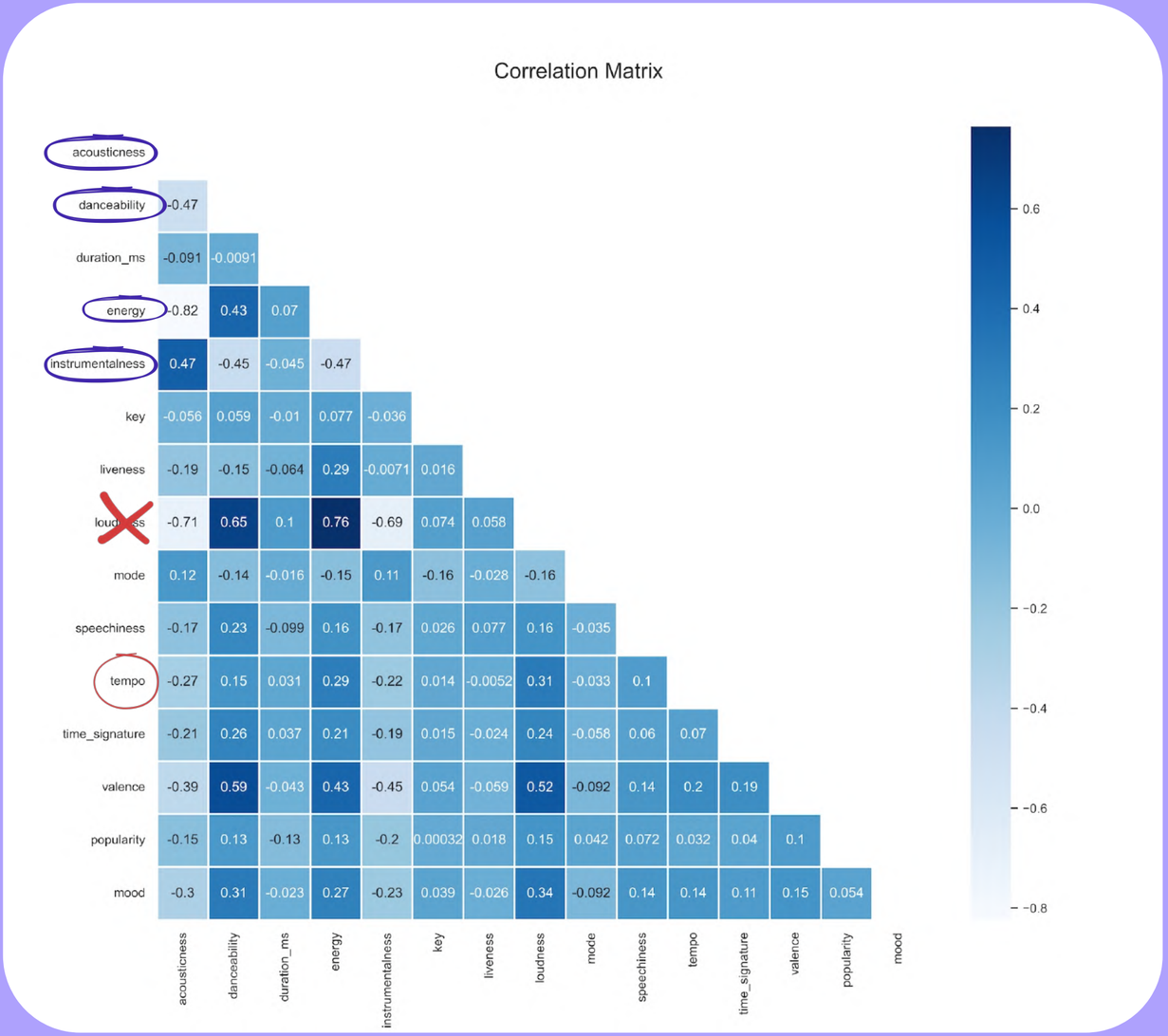
29045 → 15247



5.FEATURE ENGINEERING

5. Feature Engineering

- The relationships between the features in our dataset are **generally weak**.
- **Important Features**: Energy, Acousticness, Danceability, Instrumentalness + Tempo
- These four features are important factors that influence our models. We will examine them in detail later.



6.MODEL SELECTION

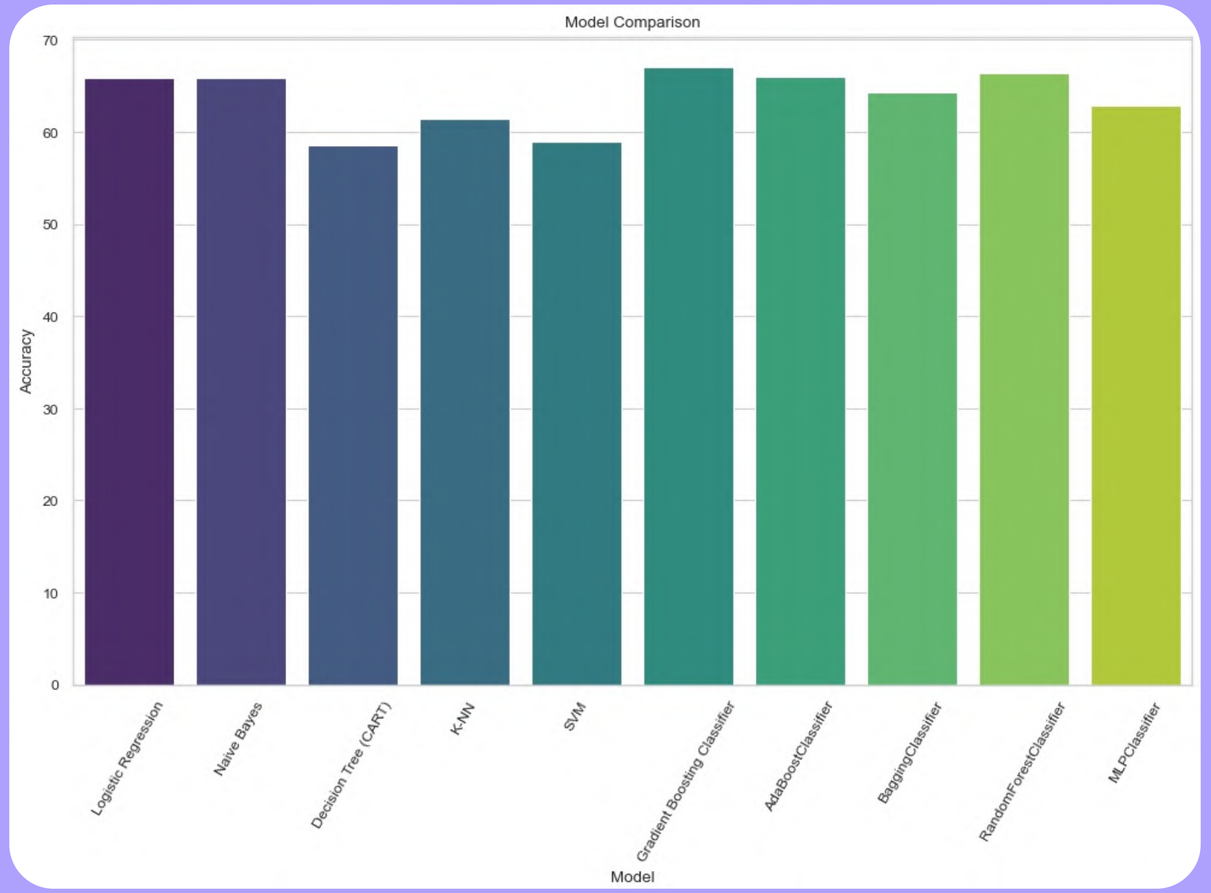
Train-Validation-Test Split

%56.25 Train

%25 Test

%18.75 Validation

- **Model Selection:** We have selected three models, namely **KNN**, **Random Forest Classifier** and **Gradient Boosting Classifier**, for conducting detailed analysis on our dataset.
- These models will be examined in detail.



7.KNN

Model Control

Best Score → 66.24%

Accuracy Score → 65.58%

GridSearchCV → **Best Optimization Parameters**

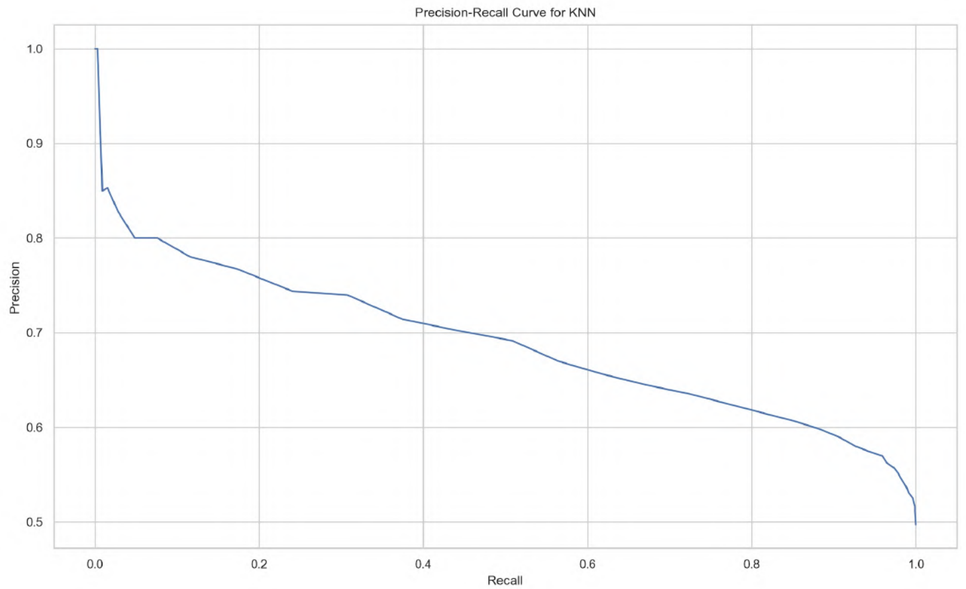
Best Parameters
n neighbors: 37

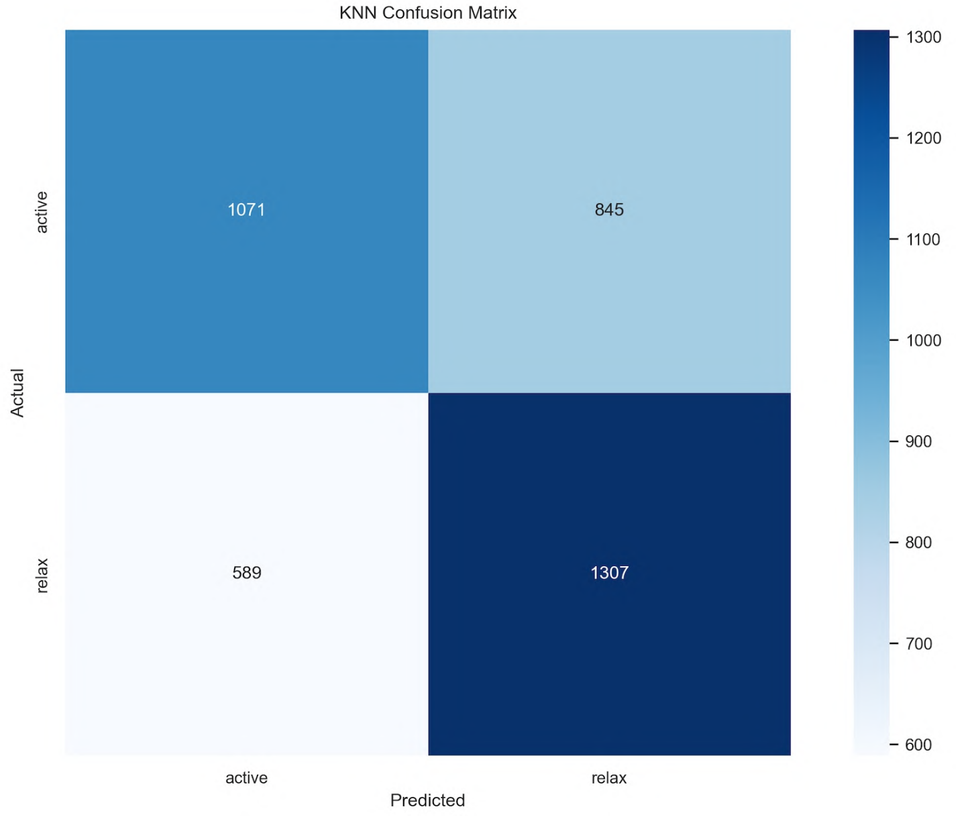
Model Evaluation

Class	Precision	Recall	F1-Score
Class 0	0.71	0.54	0.61
Class 1	0.62	0.77	0.69
Macro Avg	0.66	0.66	0.65
Weighted Avg	0.67	0.66	0.65

AUC Score → 0.656

Model Evaluation





Learning Curve

8.RANDOM FOREST CLASSIFIER

Model Control

Best Score → 66.98%

Accuracy Score → 66.13%

GridSearchCV → Best Optimization Parameters

Best Parameters

Max Depth: 10

Min Samples Leaf: 5

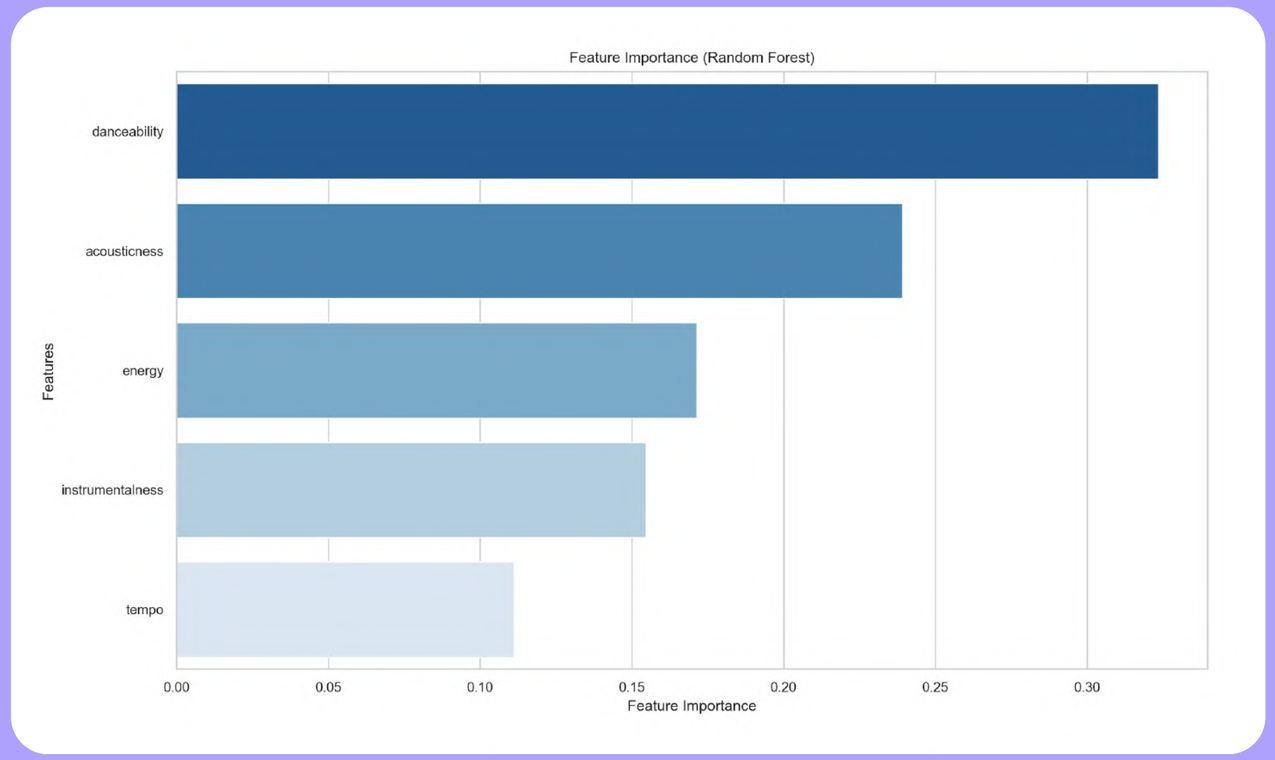
Min Samples Split: 2

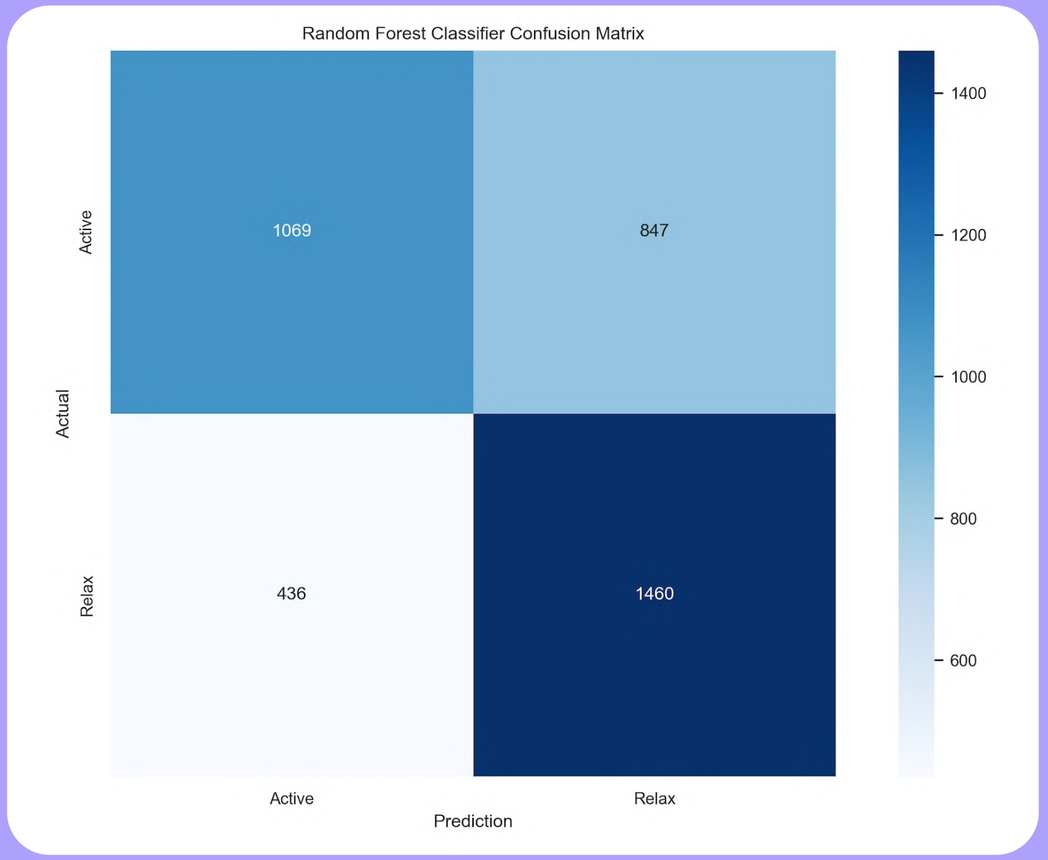
Model Evaluation

Class	Precision	Recall	F1-Score
Class 0	0.70	0.56	0.63
Class 1	0.63	0.76	0.69
Macro Avg	0.67	0.66	0.66
Weighted Avg	0.67	0.66	0.66

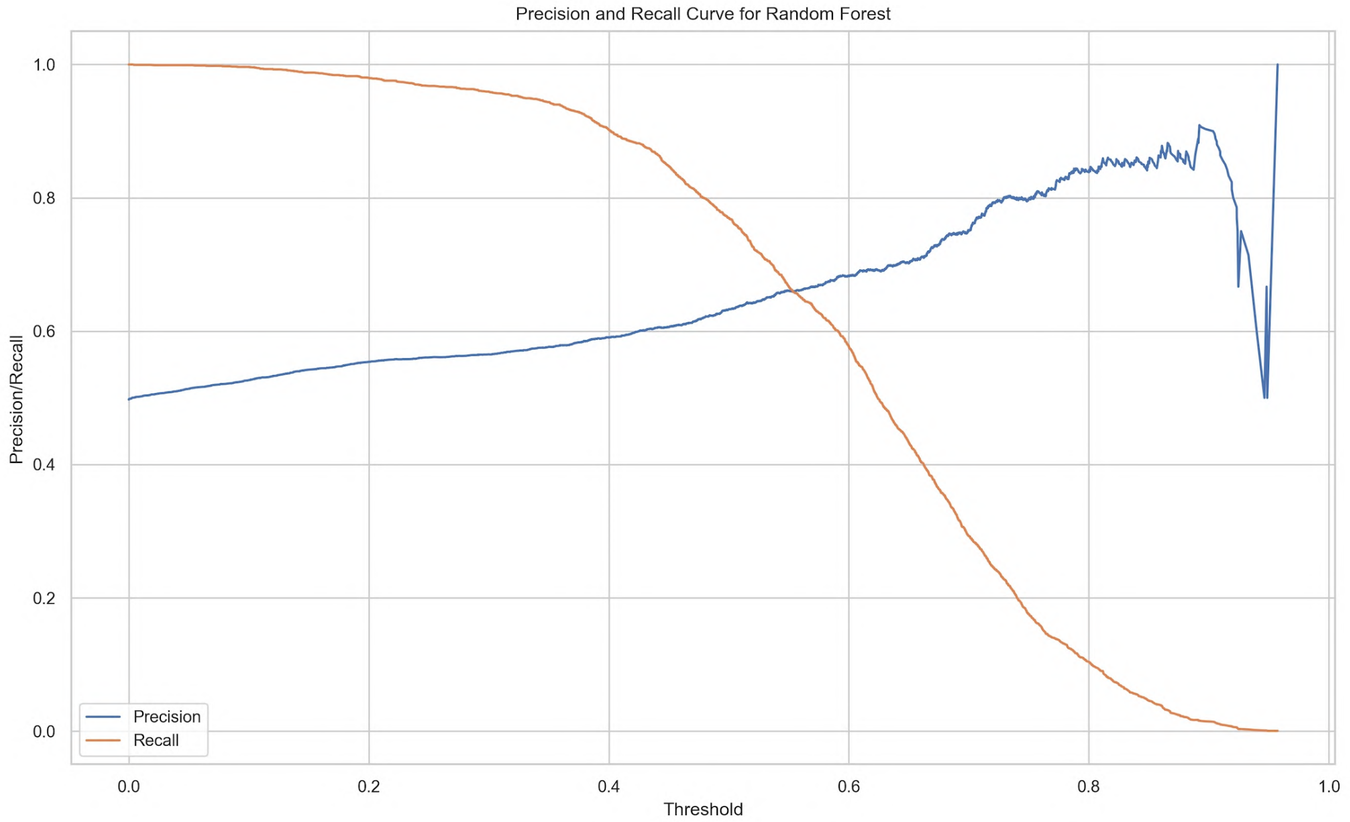
AUC Score → 0.661

Model Evaluation

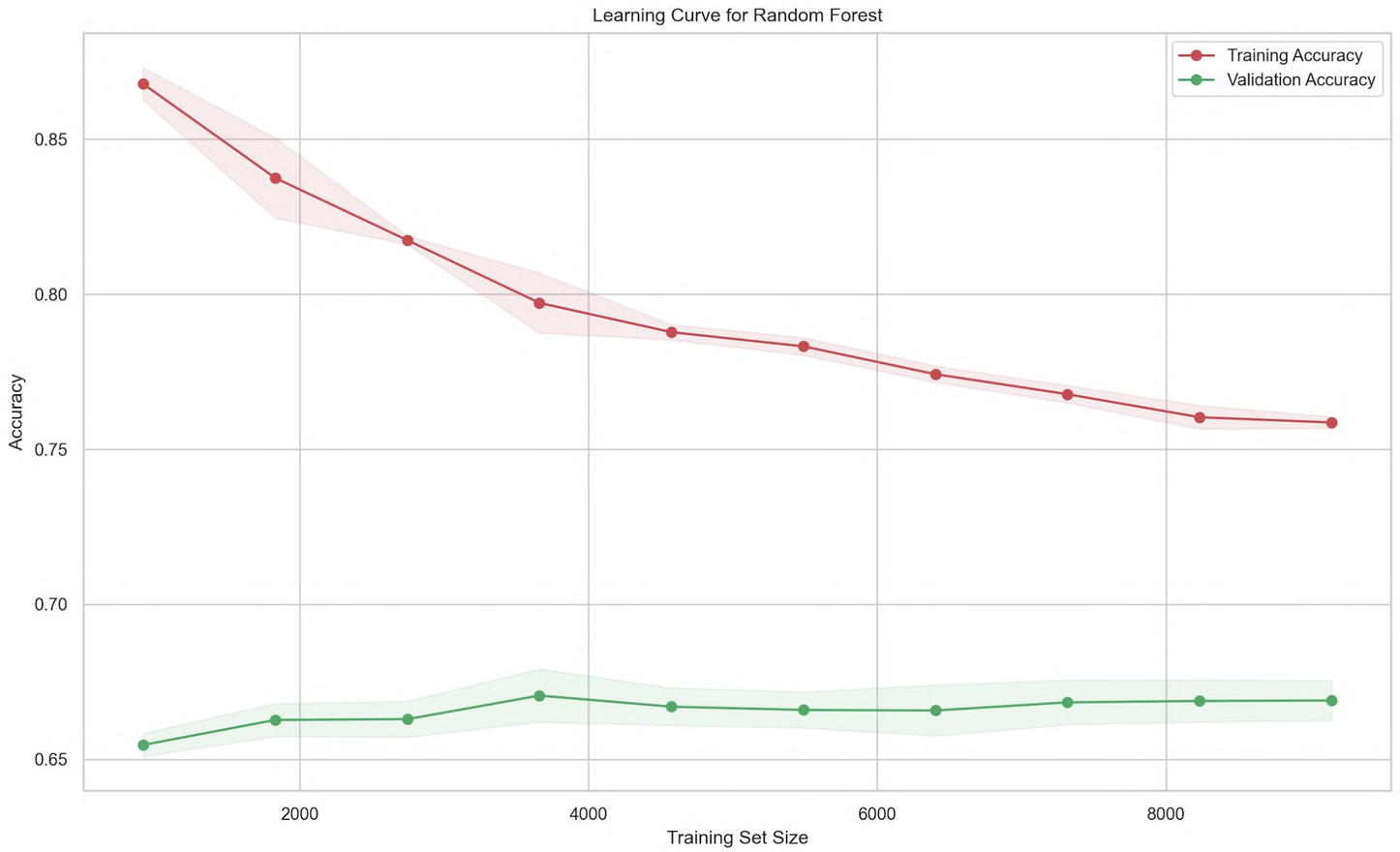




Model Evaluation



Learning Curve



9.GRADIENT BOOSTER CLASSIFIER

Model Control

Best Score → 66.79%

Accuracy Score → 65.51%

GridSearchCV → Best Optimization Parameters

Best Parameters

Max Depth: 3

Learning Rate: 0.05

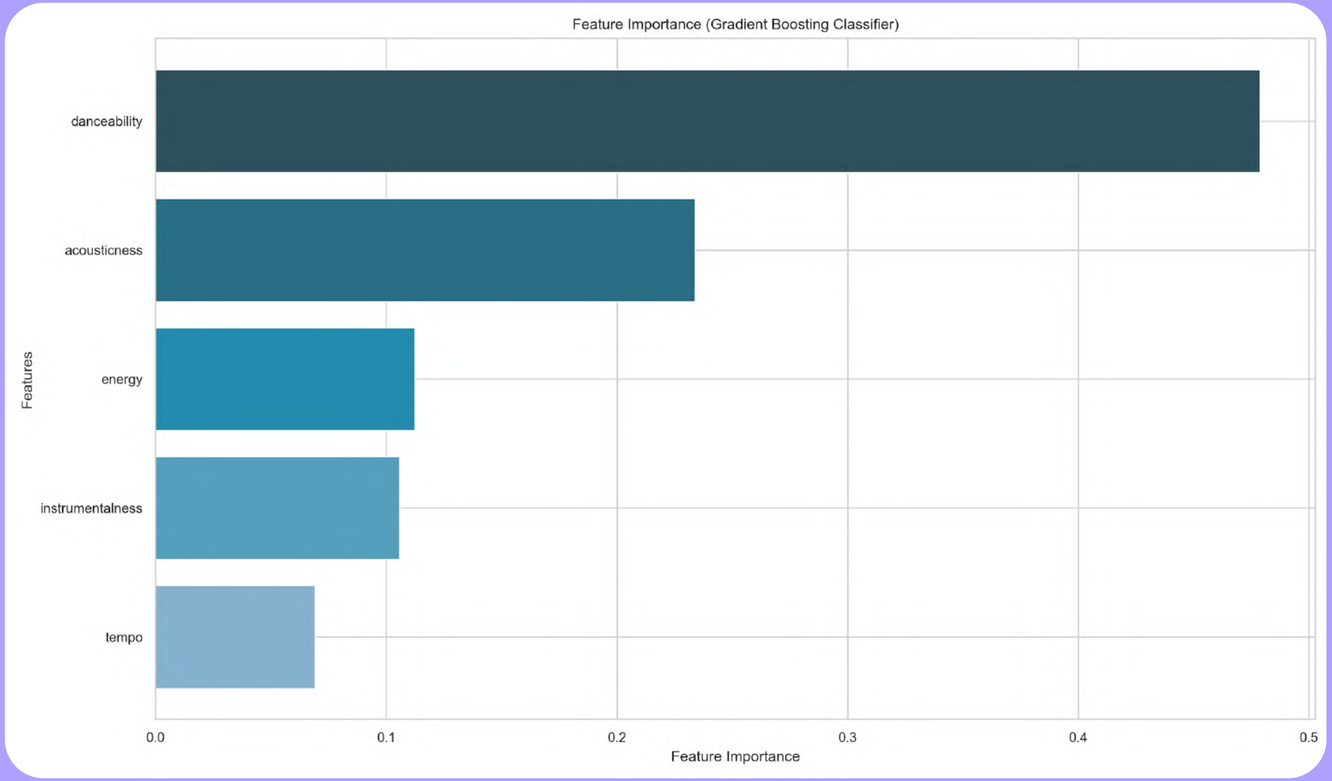
n Estimators: 100

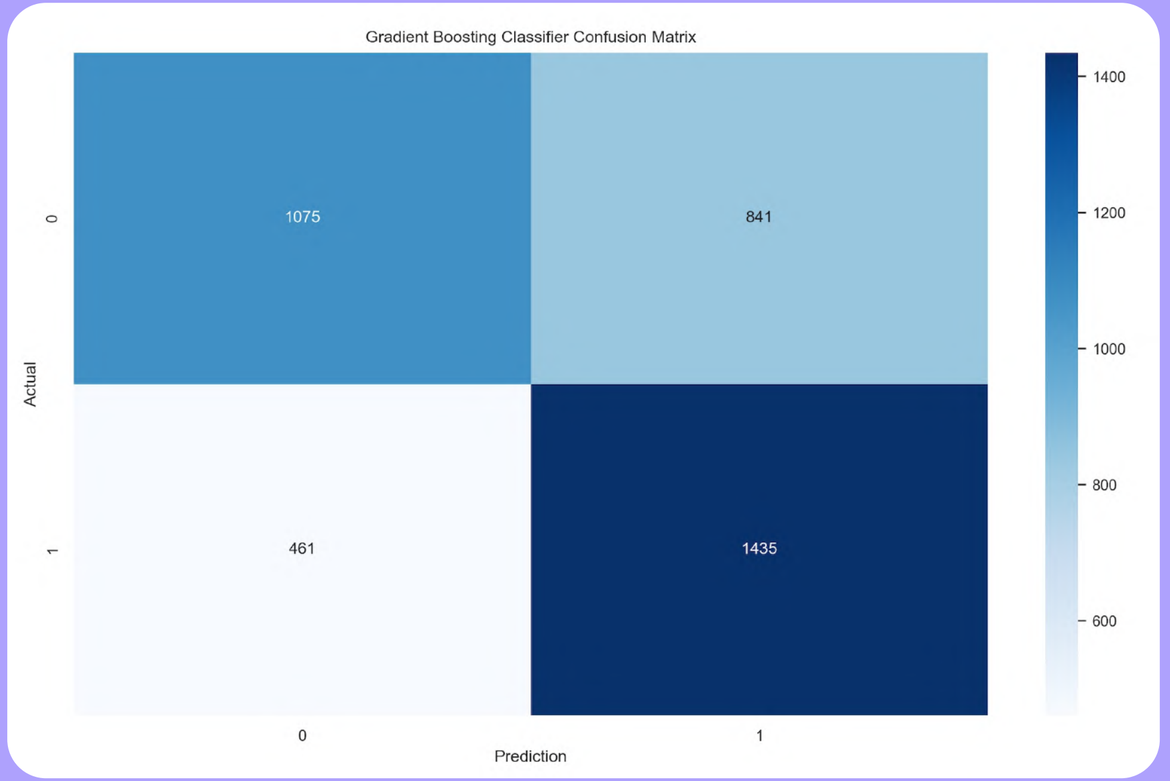
Model Evaluation

Class	Precision	Recall	F1-Score
Class 0	0.70	0.55	0.62
Class 1	0.63	0.76	0.69
Macro Avg	0.66	0.66	0.65
Weighted Avg	0.66	0.66	0.65

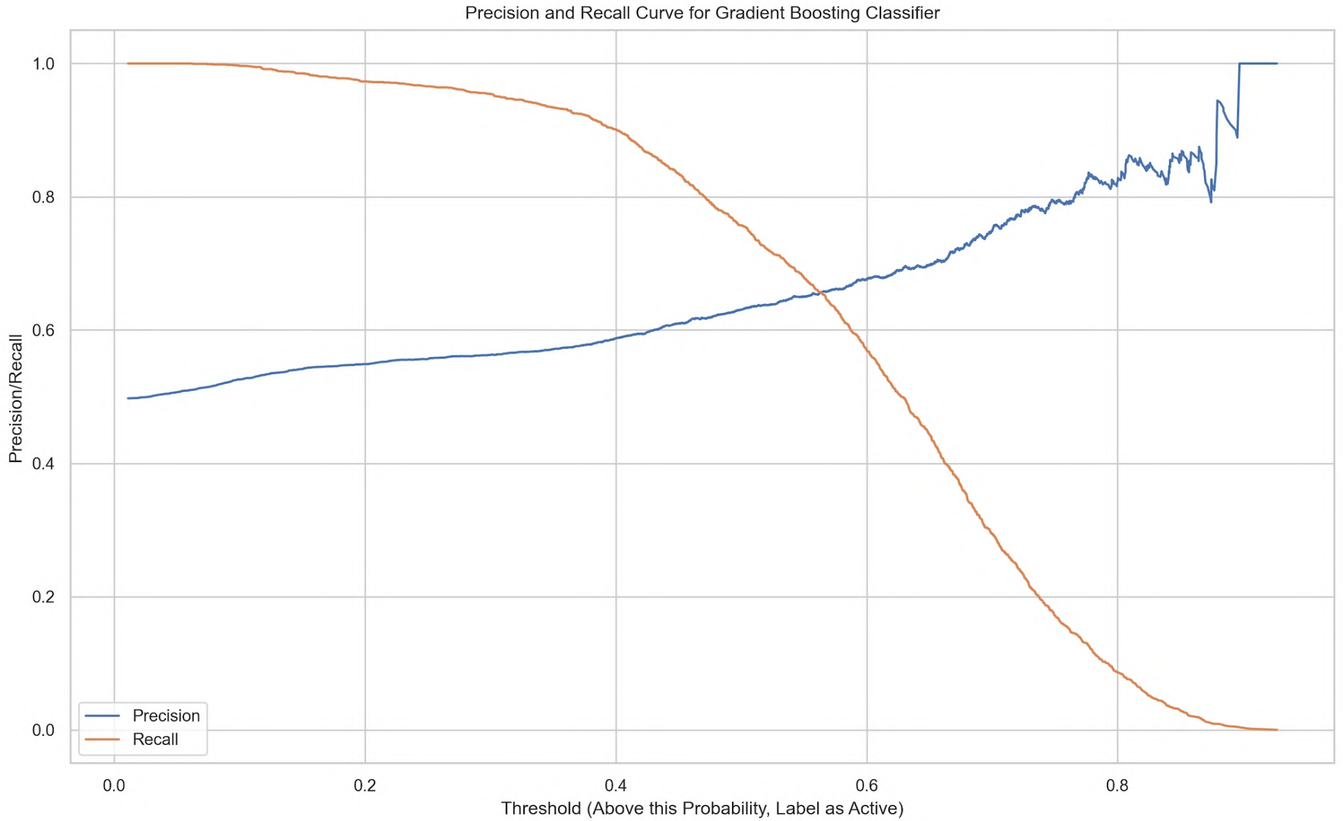
AUC Score → 0.724

Model Evaluation

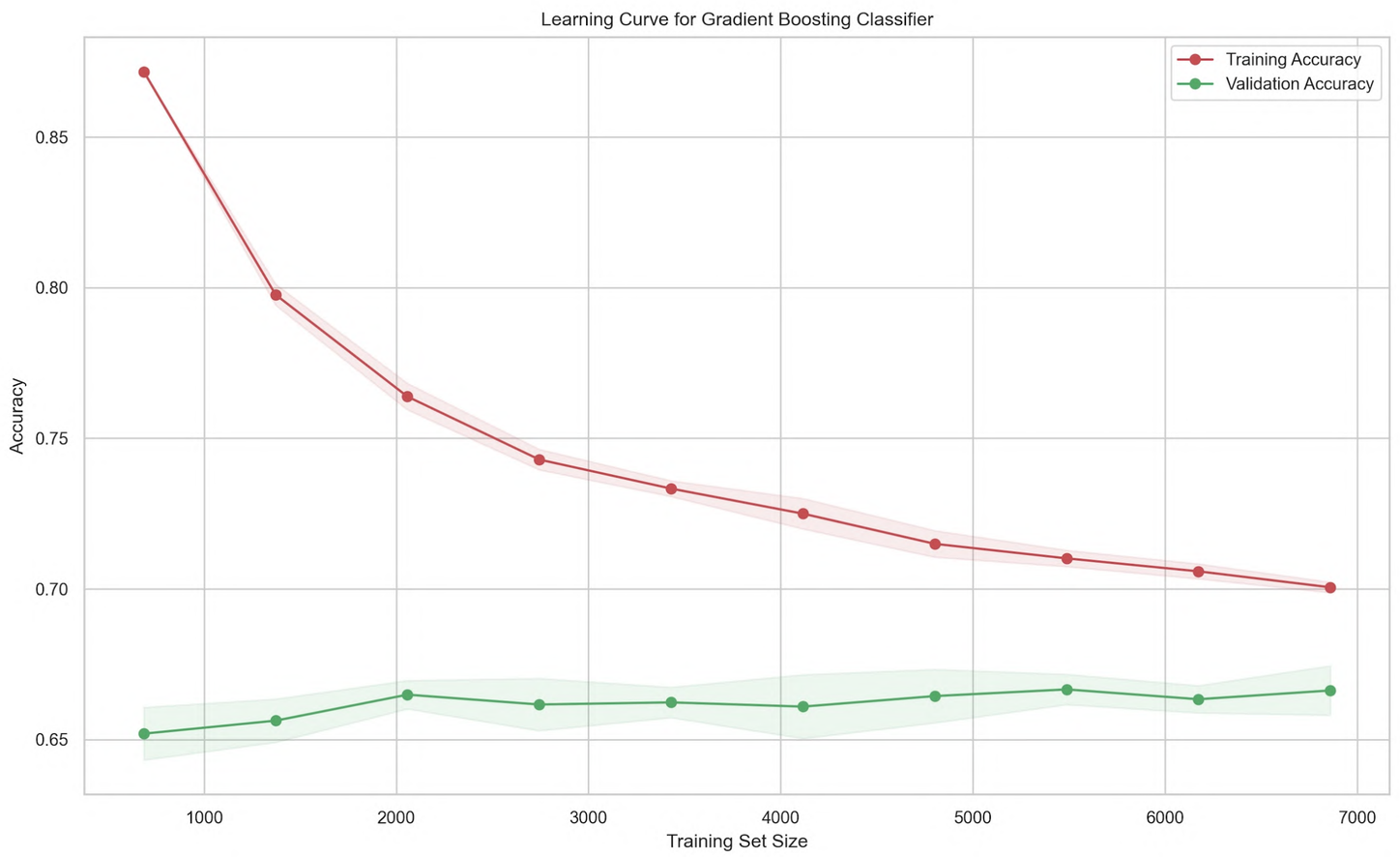




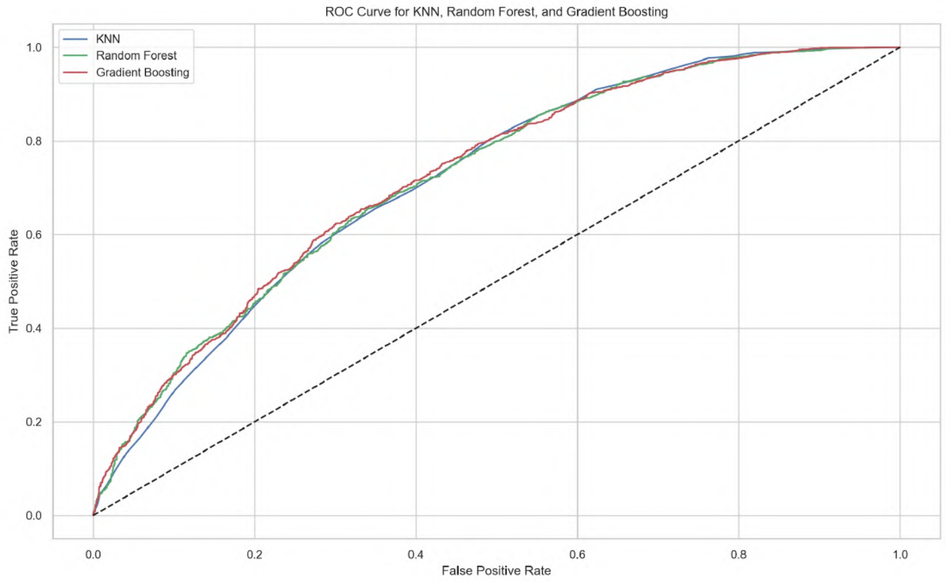
Model Evaluation

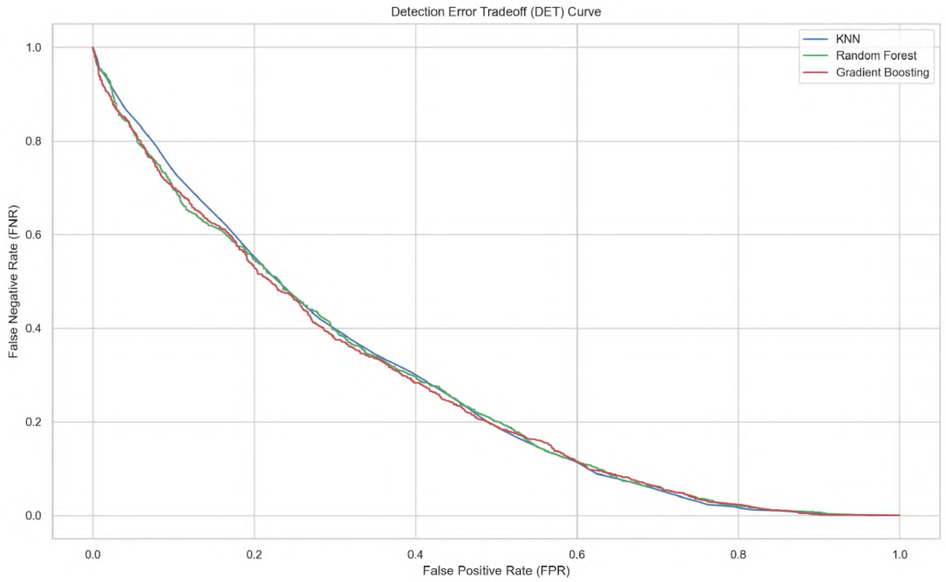


Learning Curve



ROC & DET Curve

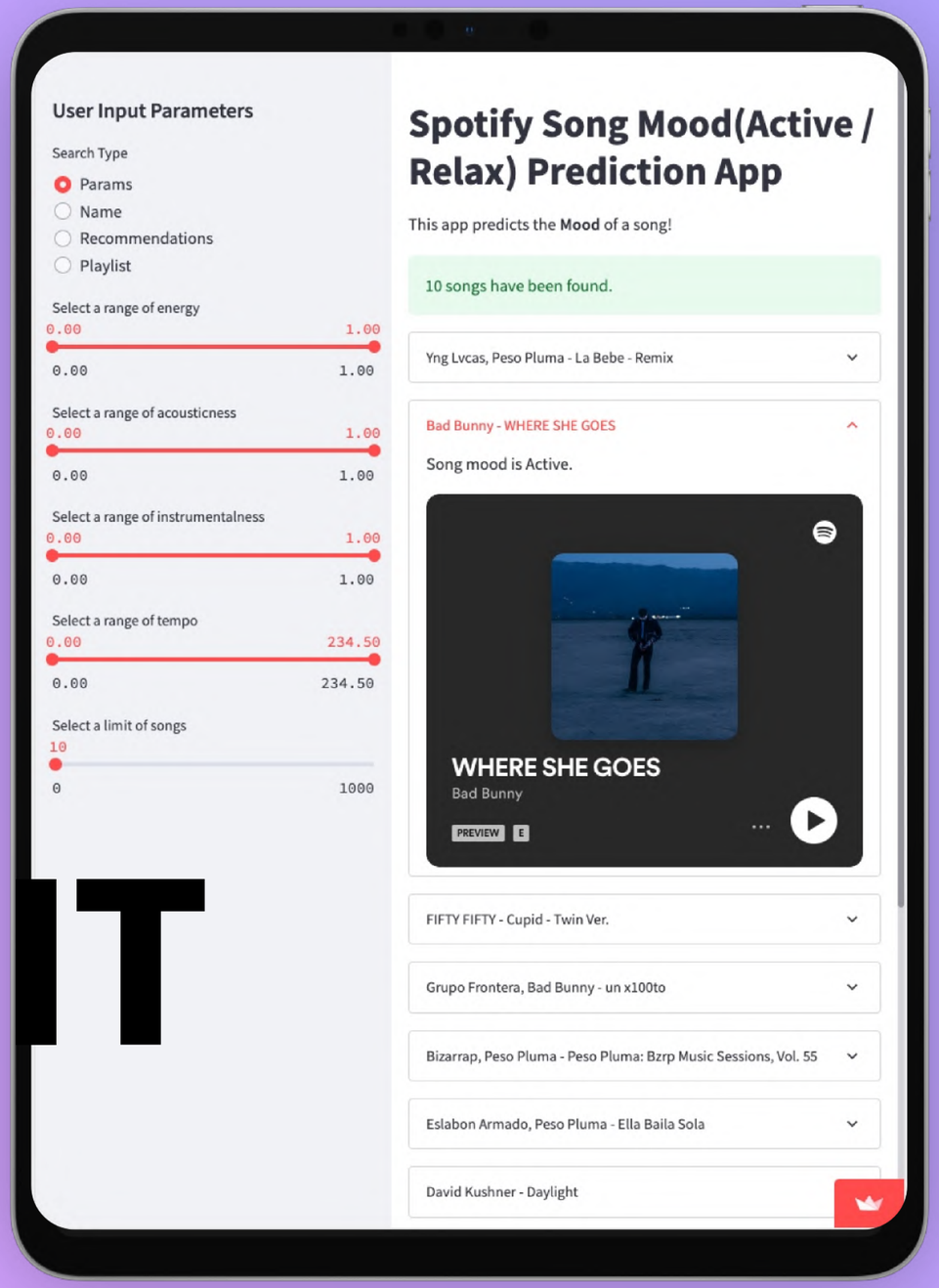


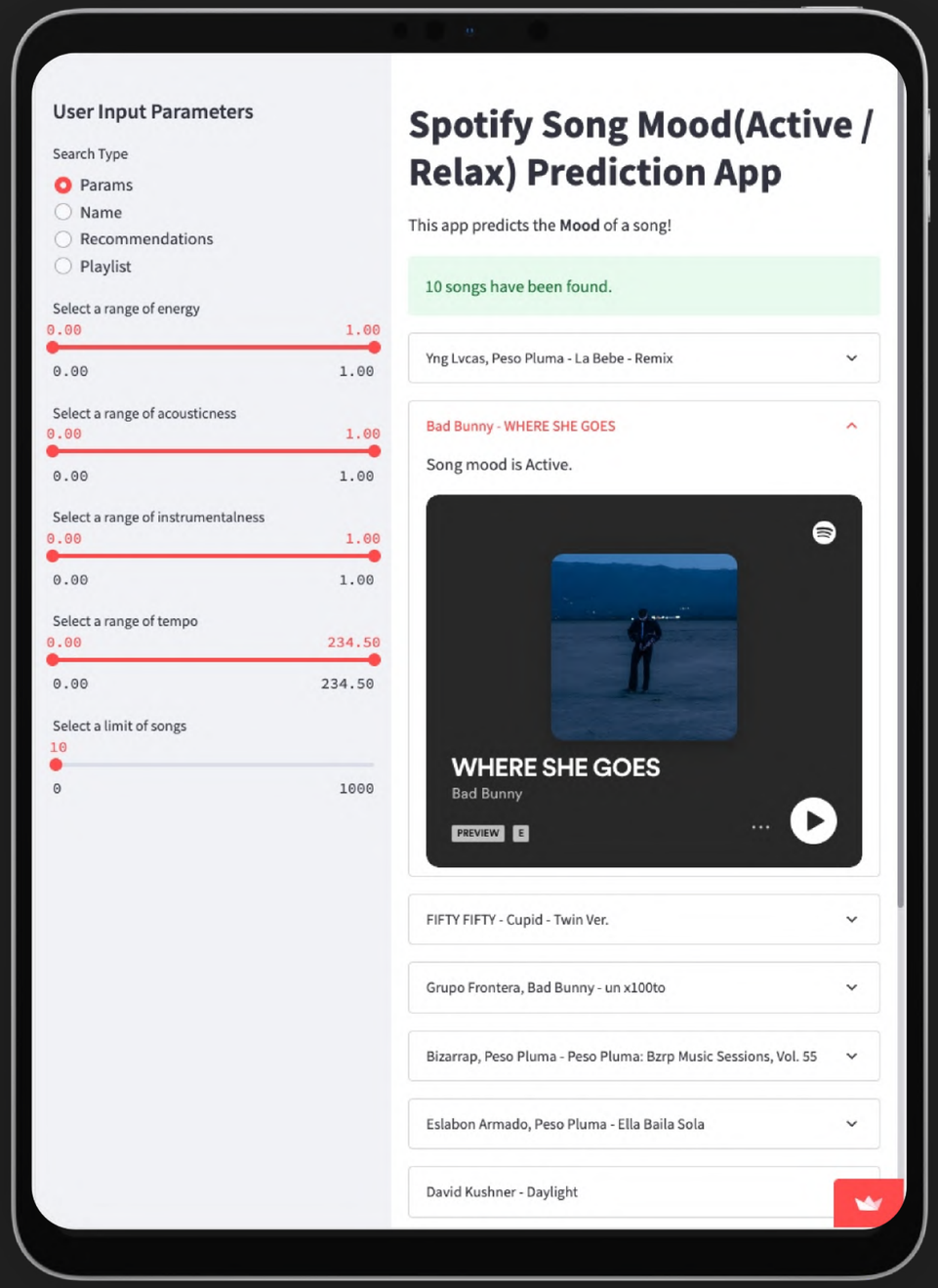


Click the link to Discover.

Streamlit

10.STREAMLIT LIVE DEMO




User Input Parameters
Search Type
Params
Name
Recommendations
Playlist
Select a range of energy
0.00
1.00
0.00
1.00
Select a range of acousticness
0.00
1.00
0.00
1.00
Select a range of instrumentalness
0.00
1.00
0.00
1.00
Select a range of tempo
0.00
234.50
0.00
234.50
Select a limit of songs
10
0
1000
Spotify Song Mood(Active / Relax) Prediction App
This app predicts the Mood of a song!
10 songs have been found.
Yng Lvcas, Peso Pluma - La Bebe - Remix
Bad Bunny - WHERE SHE GOES
Song mood is Active.
WHERE SHE GOES
Bad Bunny
PREVIEW
E
FIFTY FIFTY - Cupid - Twin Ver.
Grupo Frontera, Bad Bunny - un x100to
Bizarrap, Peso Pluma - Peso Pluma: Bzrp Music Sessions, Vol. 55
Eslabon Armado, Peso Pluma - Ella Baila Sola
David Kushner - Daylight

Song Name	Predicted	Actual
Another Love	Active	Active
Lover	Active	Active
Someone You Loved	Active	Active
Self Love	Active	Active
Lovers Rock	Active	Relax
All of the girls	Active	Relax
Girl with the tattoo	Relax	Active
When the party over	Relax	Relax
Vor Deinen Thron	Relax	Relax
Solo Piano	Active	Relax

6/10

11.CONCLUSION& FUTURE WORK

- **Spotipy** API
- **KNN** Modelling for Streamlit
- **66.24%** Prediction rate
- **Equal** distribution of target class
- **Streamlit** UI for tangible use-case.

Model	Best Score	Accuracy Score	AUC Score
KNN	66.24%	65.58%	0.656
Random Forest Classifier	66.98%	66.13%	0.661
Gradient Booster Classifier	66.79%	65.61%	0.724

Future Works:

- Spotify sign-in to sync all playlists
- Playlist classification (Active / Relax)
- Danceability Feature addition