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# Music Recommendation System

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# 01



## Problem Definition



# Why would listening to music be a problem?

01

People have become more efficient with the activities they perform.



02

Less time to invest in the search and consumption of good content such as music.



03

Nowadays people carry out their activities by listening to music.



04

Importance of recommend songs to the users in a more efficient way.





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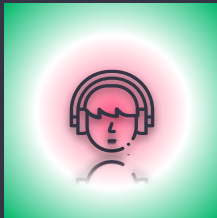
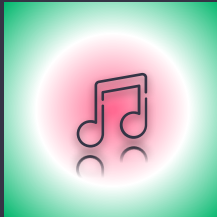
# 02



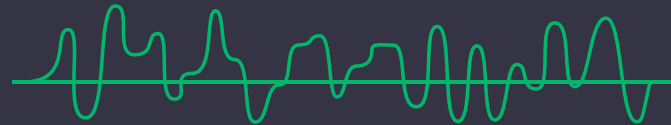
## Problem To Solve



# How can this problem be solved?



- Creation of a model that recommend things that you are likely to enjoy.
- Recommendation systems technique to recommend songs to the users in a precise way.





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# 03



## Approach for the solution



# Solution approach



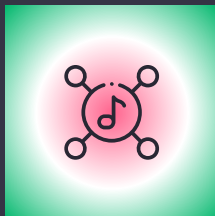
A total of 5 models were built to get to the best performance.

2:45



Hybrid model type that involves three models.

3:20



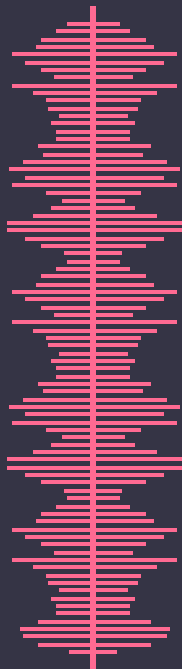
It was decided to opt for a hybrid type model to attack different problems that may arise.

2:10





# Final Model Solution



## 1

Follow

### Rank-Based RS

Full playlist



Help with the cold start problem when a new user joins the platform.

## 2

Follow

### User CF RS

Full playlist



Make personalized recommendations for users with similar preferences.

## 3

Follow

### Content-Based RS

Full playlist

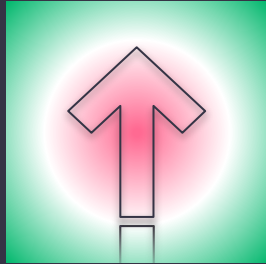


Cold start for new artists or songs that would like to start a music career on the platform.



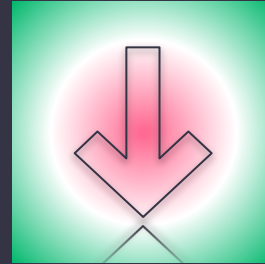


# How do we measure the model's performance?



**F<sub>1</sub> score**

Measures a model's accuracy. It combines the precision and recall scores of a model.



**RMSE**

Root Mean Square Error

Evaluating the quality of predictions. It shows how far predictions fall from measured true values.



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# 04



## Key findings and Insights



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# Rank Based





## Your top 10 songs



#1

**Victoria**

Old 97's



#6

**Transparency**

White Denim



#2

**The Big Gundown**

The Prodigy



#7

**Video Killed**

The Buggles



#3

**Brave The Elements**

Colossal



#8

**Sehr kosmisch**

Harmonia



#4

**Greece 2000**

Three Drives



#9

**Luvstruck**

Southside Spinners



#5

**Secrets**

OneRepublic



#10

**You're The One**

Dwight Yoakam





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# Optimized User-User





## Predicting play\_count value



user_id	6958
song_id	1671
Real value	2
Estimated value	1.96

Real value  
known



Real value  
unknown



user_id	6958
song_id	3232
Real Value	None
Estimated Value	1.45



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# Content Based





# Analyzing recommended songs

● **Rock** 34%

The Killers, Foo  
Fighters

● **Electronic** 12%

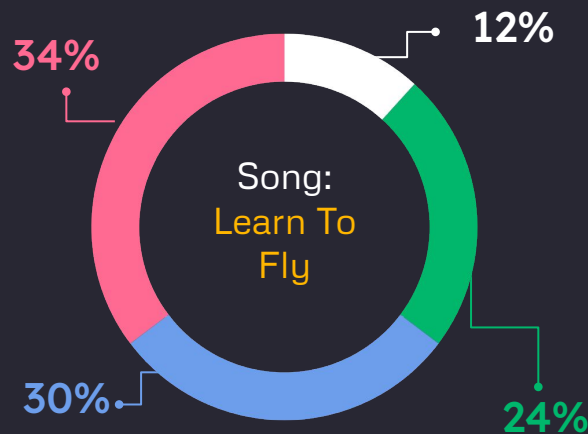
Boom Bip, The  
Killers

● **Alternative  
Indie** 30%

The Killers, The  
Postal Service

● **Pop** 24%

Cut Copy, Aloe  
Blacc







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05



Recommendations  
and next steps



# Business Solution



## Main Objective

Keep users having long listening sessions.



## Playlists

Automatic playlist creation.

Time

Behavior

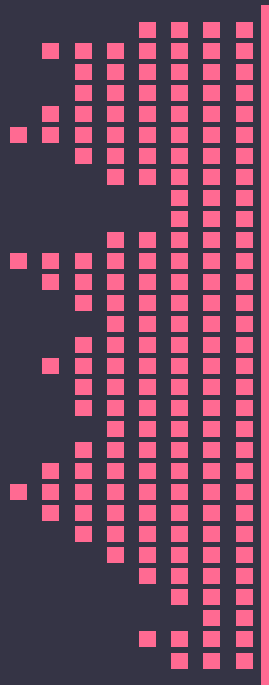
Mood



# Improving our model



- Addition of artist and song metadata.
  - Featured artists
  - Lyrics
  - Language
  - Instruments used
- Analyze different types of interactions
  - Library saves
  - Playlist adds
  - Shares
  - Skips





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# Thank you!

Do you have any questions?

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# Appendix





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# Model Comparison

RMSE: 1.0521  
Precision: 0.413  
Recall: 0.721  
F\_1 score: 0.525

Technique	Model	RMSE	F_1 Score
Collaborative Filtering	User-User Baseline Model	1.0878	0.504
	Optimized User-User Model	1.0521	0.525
	Item-Item Baseline Model	1.0394	0.397
	Optimized Item-Item Model	1.0328	0.506
	Matrix Factorization Baseline Model	1.0252	0.498
	Optimized Matrix Factorization Model	1.0141	0.502
Cluster Based	Cluster Based Baseline Model	1.0487	0.472
	Optimized Cluster Based Model	1.0654	0.465



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# Predictions

```
sim_user_user_optimized.predict(6958, 1671, r_ui = 2)
```

```
Prediction(uid=6958, iid=1671, r_ui=2, est=1.962926073914969, details={'actual_k': 24, 'was_impossible': False})
```

```
sim_user_user_optimized.predict(6958, 3232, verbose = True)
```

```
user: 6958      item: 3232      r_ui = None    est = 1.45    {'actual_k': 10, 'was_impossible': False}  
Prediction(uid=6958, iid=3232, r_ui=None, est=1.4516261428486725, details={'actual_k': 10, 'was_impossible': False})
```



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# Recommendations based on the User

```
ranking_songs(recommendations, final_play)
```

	song_id	play_freq	predicted_play_count	corrected_play_count
0	5531	1427	2.553335	2.579807
1	317	836	2.518269	2.552855
3	4954	338	2.406776	2.461169
4	8635	259	2.396606	2.458743
2	5943	830	2.390723	2.425434





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# Recommended

## Songs Content Based

Song	Artist name	Genres
Learn To Fly	Foo Fighters	Alternative Rock / Pop rock
Everlong	Foo Fighters	Post-grunge / Alternative Rock / Hard Rock
The Pretender	Foo Fighters	Hard Rock
Nothing Better (Album)	The Postal Service	Alternative Indie / Folk / Rock
From Left To Right	Boom Bip	Dance / Electronic

Lifespan Of A Fly	The Bird and the Bee	Jazz / French Indie / Pop / Dance Electronic / Alternative Indie
Under The Gun	The Killers	Alternative Indie / Rock / Dance Electronic
I Need A Dollar	Aloe Blacc	Soul / Pop
Feel The Love	Cut Copy	Vocal / Easy Listening / Pop

All The Pretty Faces	The Killers	Alternative Indie / Rock
Bones	The Killers	Alternative Indie / Rock