

Song Prediction System



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- We aim to build a song recommender system
- Listening histories of 1.2 million users for 1 million songs

d68dc6fc25248234590d7668a11e3335534ae4b4	SOQDMED12A67ADE731	1
d68dc6fc25248234590d7668a11e3335534ae4b4	SOAXGDH12A8C13F8A1	1
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9be82340a8b5ef32357fe5af957ccd54736ece95	SOFEGST12A58A7D682	1
9be82340a8b5ef32357fe5af957ccd54736ece95	SOKQXKD12A67ADB467	1
9be82340a8b5ef32357fe5af957ccd54736ece95	SOC0XGP12A81C21F2F	1
9be82340a8b5ef32357fe5af957ccd54736ece95	SOHYJRQ12A8C142535	3
9be82340a8b5ef32357fe5af957ccd54736ece95	SOZEVSH12AF72AC266	1
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9be82340a8b5ef32357fe5af957ccd54736ece95	S0ORFBA12A8C13E49E	1
9be82340a8b5ef32357fe5af957ccd54736ece95	SOIYBYP12A6D4F7761	1

- Given some listening history for a target user, suggest more songs for him
- Training:
 - 48,373,586 triplets
- Evaluation (half listening-histories):
 - 1,450,933 triplets
 - 110,000 users
 - 380,000 songs
- Submit 500 recommendations each for all users
 - 55,000,000 recommendations in all 🤖

Recommender Systems

Last.fm



Ozzy Osbourne
34,623,251 plays (1,482,785 listeners)

[+ Add to Your Library](#)


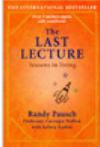


heavy metal, hard rock, metal, classic rock, rock

John Michael "Ozzy" Osbourne (born 3 December 1948) is an English singer-songwriter. Throughout an extraordinary career, which has so far spanned five decades, he has become one of the most successful and influential heavy metal artists of all time.

Similar Artists from Your Library

-  Black Sabbath
-  Iron Maiden
-  Metallica

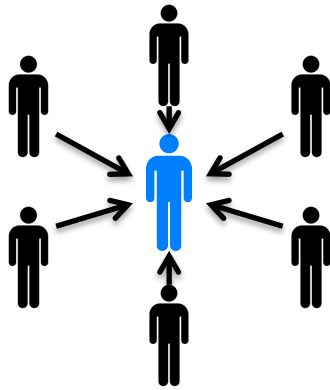
Recommendations Based On Your Interest [View More Recommendations For You »](#)

 <p>Funscool Kiddy Starlinks ★★★★★ Rs. 149</p>	 <p>The Last Lecture 1st Edition (Paperback) by Randy Pausch ★★★★★ Rs. 295 Rs. 195 (34% Off)</p>	 <p>To the Elephant Graveyard 01 Edition (Paperback) by Tarquin Hall ★★★★★ Rs. 299</p>	 <p>Nokia Headset WH-205 (Black) ★★★★★ Rs. 320</p>	 <p>Picture of Dorian Gray, The paperback / softback Edition by Oscar Wilde ★★★★★ Rs. 519</p>	 <p>SanDisk Cruzer Blade 8 GB Pen Drive (Black & Red) ★★★★★ Rs. 325</p>
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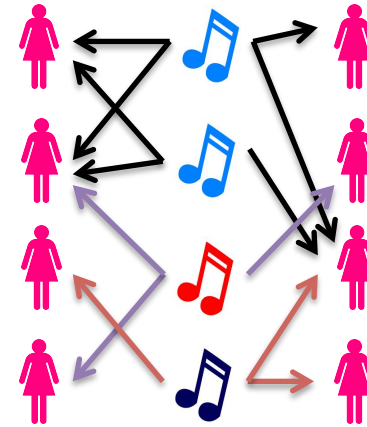
Flipkart

Recommender Systems

- Collaborative filtering



User based



Song based

- Content Based filtering



Genre



Year



And so on...

Similarity Measures

- **Cosine Similarity:** $\frac{\text{Number of songs}(A) \cap \text{Number of songs}(B)}{\sqrt{\text{Number of songs}(A)}\sqrt{\text{Number of songs}(B)}}$
- **Pearson Similarity:** Similar but incorporates 'count' data
- **User-based:** for user i

$$\text{Predicted Rating}(s) = \sum_j S_{ij} R_j(s)$$

- **Item-based:** for user i

$$\text{Predicted Rating}(s) = \sum_v S_{sv} R_i(v)$$

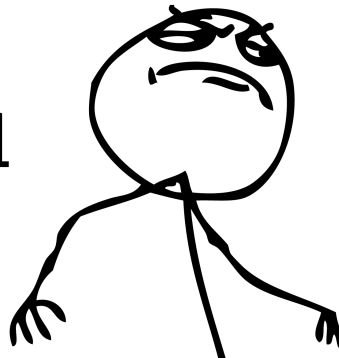


Data

- Each user has heard 13 distinct songs on average
- Each song has been heard by 4 distinct users on average
- Sparse Data: Cosine Similarity expected to work best

Results

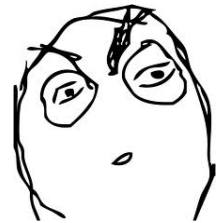
- mAP measure for precision
- Baseline (popularity): 0.0238 (80th)
- User-based (Pearson): 0.05908 (51st)
- User-based(Cosine): 0.08061 (30th)
- Song-based(Cosine): 0.08852(26th)
- Top Result: 0.1791



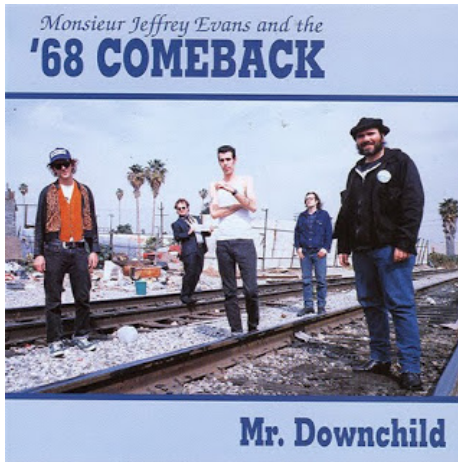


Clustering

- How close is Song-based similarity to content-based filtering?
- Clustered songs based on cosine similarities
 - Level 0: 8573 clusters
 - Level 5: 19,318 clusters



Cluster 0 (38 songs)



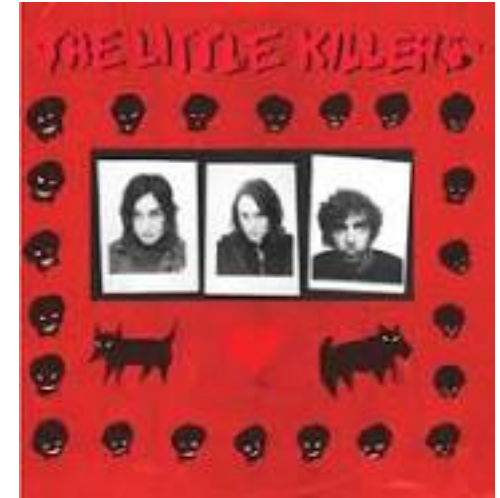
'68 Comeback(18): Garage Rock
Memphis

Oblivians(5): Garage Rock
Memphis

OBLIVIANS



GO! PILL-POPPER!



The Little Killers(7): Garage Rock
New York



Cluster 1 (36 songs)



Sonora Carruseles (8): Salsa band
Columbia

Olodum (6): Samba
Brazil



Fruko Y Sus Tesos (11): Salsa band
Columbia



OLODUM



Further Work

- Recommendations for small subset of users



- Comparison of different approaches





Thank You