# A Live Concert Performance Recommender System Utilizing User Ideal and Antithesis Ideal Setlist Preferences

**Ed Abel**
**University of Southern Denmark**
**abel@sdu.dk**

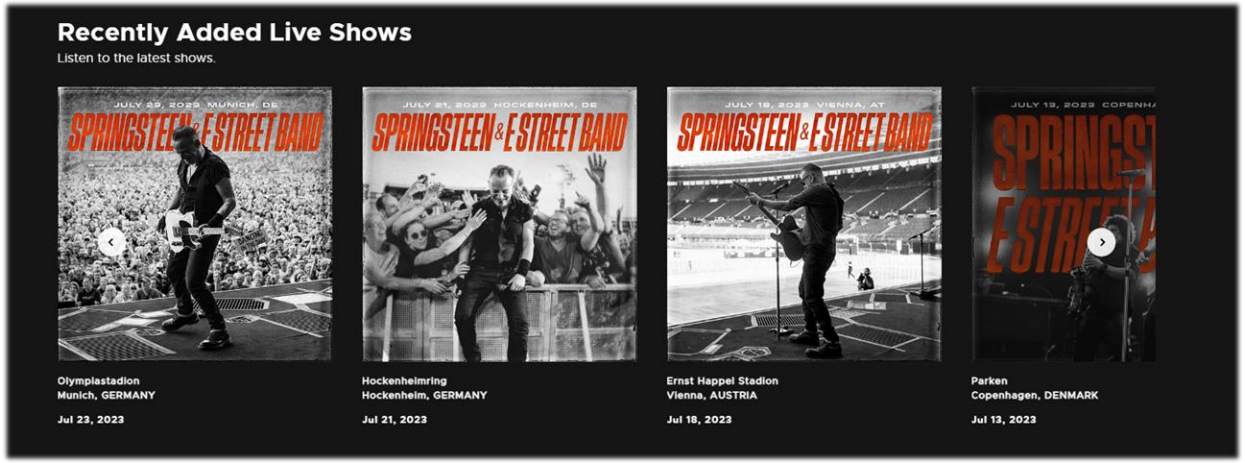
**Andrew Goddard**
**bossfansheff@gmail.com**

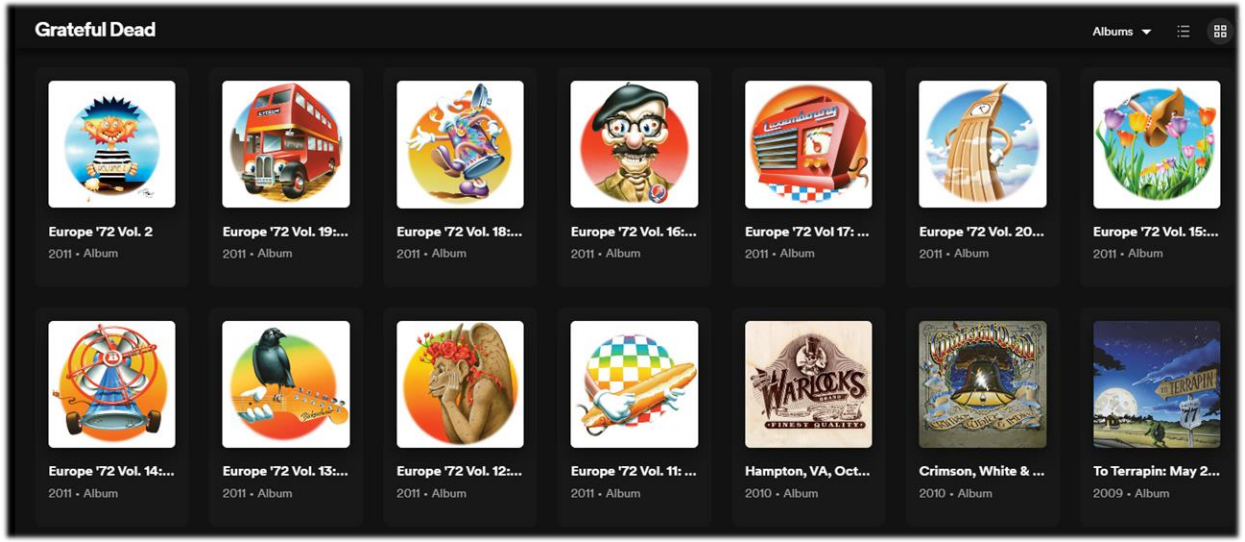
# Live Concert Recordings

- High quality historical live concert performance recordings
- For illustrious music artists becoming readily available

- Providing fans with an unwieldly abundance of choice

# An Abundance of Choice

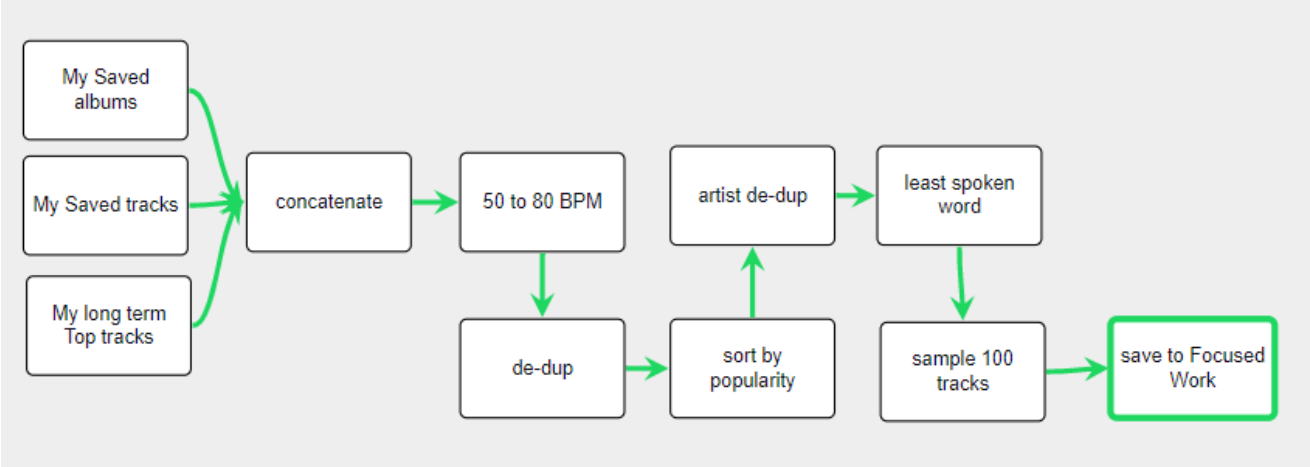


# Recommender Systems

- Look to curate personal content recommendations
- Tailored to a user
- Utilising knowledge of users, content, and/or interactions

- Utilised widely within the music domain e.g. Spotify
- Predominantly for tasks such as playlist curation
- Calculating individual songs to create a playlist sequence



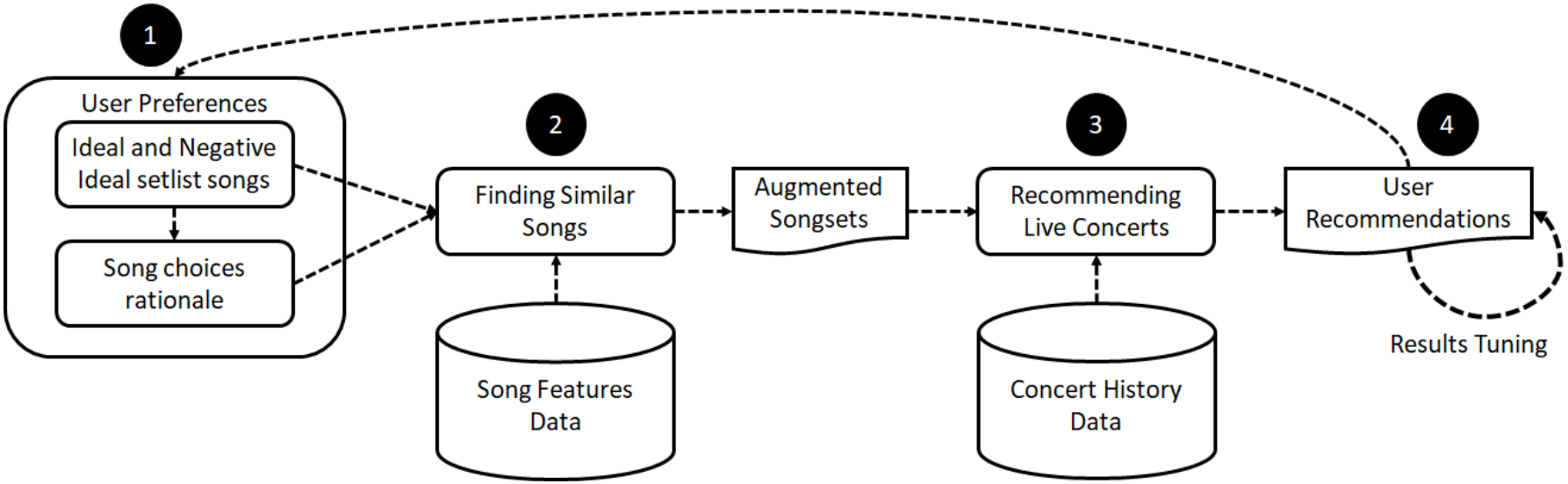
# Recommending Concert Performances

- Extensive work has explored playlist curation

- Recommendation of historic live performances less explored
  - Here each possible live performance (item)
  - Represents a fixed set of songs of the concert's setlist

- **We propose CPR:**
- **A Concert Performance Recommender system**
- **For historic live performance recordings**

# The Stages of CPR



# Cold Start User Bootstrapping

SDU

- Where there is a wealth of historic user data
  - Such as logs of every song that every user listens to
  - Collaborative Filtering techniques are widely employed

- CPR users envisaged as invariably **cold start users**
- For which collaborative methods generally not applicable

- For cold start users – could elicit explicit user data
- To aid searching for appropriate recommendations
  - Choice-based preference elicitation
  - Optimized questions to ask for the most information gain

- **Such approaches may risk disenfranchising a user**
- Information most desired internally for the algorithm
- Without consideration of its appeal or applicability to a user

# 1 User Elicitation

- CPR looks to provide appealing and flexible input for users
- User consideration as well as algorithm focus

User defines

- Which songs they like and why
- **Ideal Songs:** songs that would be part of an ideal concert for the user

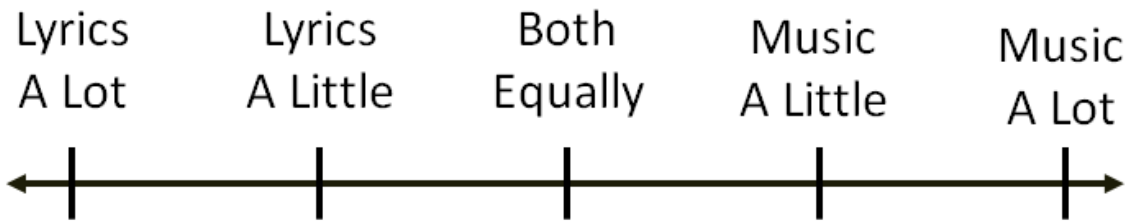
- Which songs they don't like and why
- **Negative Ideal Songs:** songs that would be part of the opposite of an ideal concert

- Provides flexibility
  - User can choose as many or little input as they want
  - Can choose songs associated with the artist but never played live

# 1 User Elicitation

- User can provide additional information
- Regarding why a song was chosen
- Key dimensions of Lyrics or Music

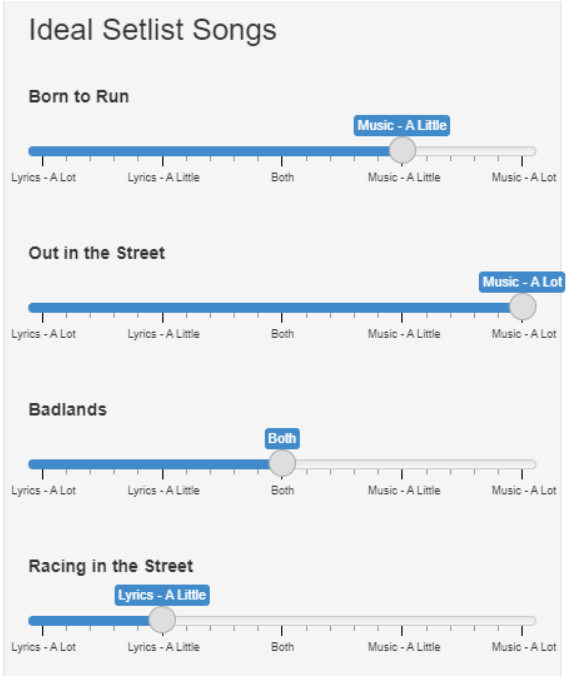
- Provided via a **5-point Pairwise comparisons scale**
- Provides user to define such info in intuitive and swift way



# 1 User Elicitation

- CPR can be applied to any legendary music artist
- Who has an illustrious touring history & available concerts

- **Taking Bruce Springsteen as an example**
- To illustrate the approach's data and operation



# 1 User Elicitation

- From user input have:
  - Set of Ideal Songs
  - Set of Negative ideal songs
  - And song choice reasons

## Ideal Songs

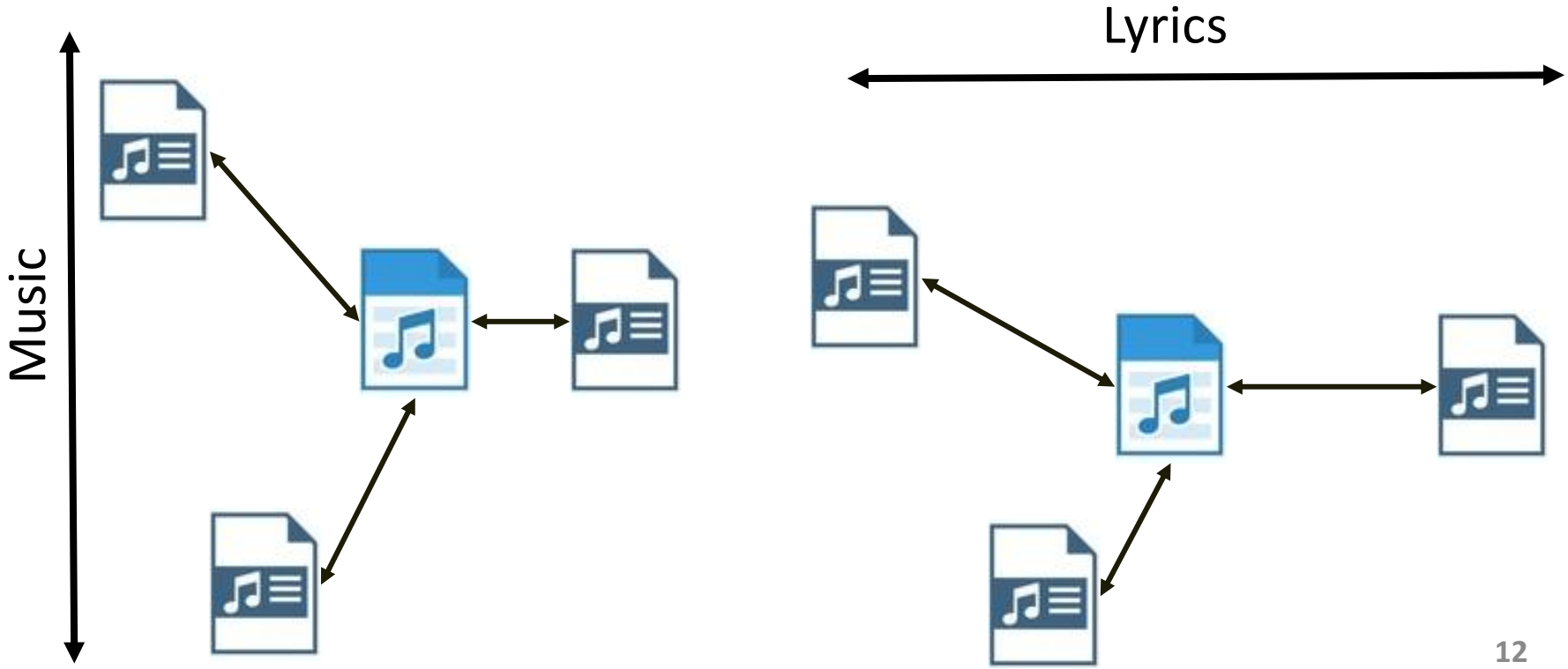
| Song Title | Rationale |
|---|---|
| Born To Run | Music A Little |
| Out In The Street | Music A Lot |
| Badlands | Both Equally |
| Racing In The Street | Lyrics A Little |
| Point Blank | Lyrics A Little |
| Long Walk Home | Both Equally |
| Born In The U.S.A | Lyrics A Lot |
| The Rising | Music A Little |
| Waitin' On A Sunny Day | Music A Lot |
| You're Missing | Both Equally |
| Independence Day | Lyrics A Little |
| The Last Carnival | Lyrics A Lot |

## Negative Ideal Songs

| Song Title | Rationale |
|---|---|
| Outlaw Pete | Music A Little |
| Kitty's Back | Lyrics A Lot |
| 57 Channels (And Nothin' On) | Both Equally |
| Cadillac Ranch | Both Equally |
| Ramrod | Music A Lot |
| Let's Be Friends (Skin To Skin) | Both Equally |
| Crush On You | Music A Little |
| Mary Queen Of Arkansas | Lyrics A Little |

# 2 Finding Similar Songs

- Next CPR explores finding "*similar*" songs
- Determining most similar songs for each chosen user song
- Taking into account why it was chosen



# 2 Finding Similar Songs

SDU

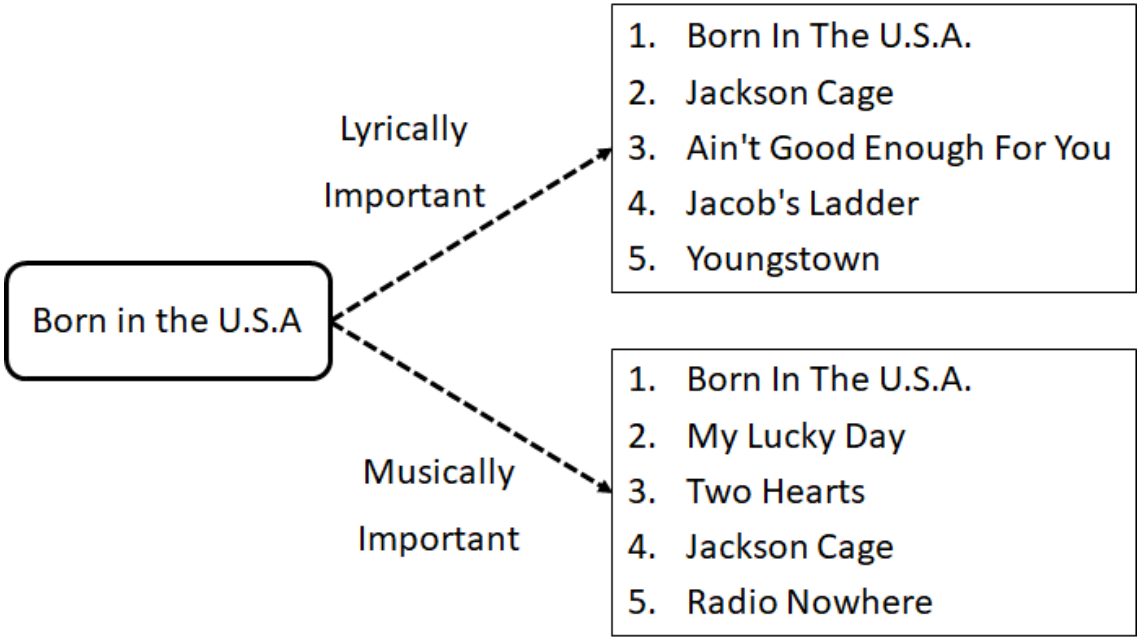
- Song data for finding similar songs
- Taking into account why it was chosen
- Weighted Euclidean distance between numerical features

- **Musicality features:** songs' musicality data from Spotify API
- Numerical features such as Danceability, Energy, Tempo etc.

- **Lyrical features:** songs' textual lyrics data analysis
- Numerical data from topic analysis
  - Latent Dirichlet allocation (LDA)
  - Finding latent underlying themes and determining to what extent every song represents different topics
- Additional Sentiment analysis

# 2 Finding Similar Songs

- Songs considered similar different based on why it was chosen




- For each song the output is a set of songs and each's similarity score
  - Original song has similarity 1 (only retained if ever played live)
  - Others have factional value based on distance similarity
  - So the similar songs have more impact in final recommendations

# 2 Finding Similar Songs

SDU

## Augmented Ideal Song Set

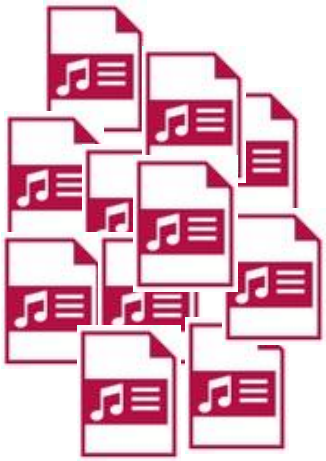
Ideal Songs

Ideal Similar Songs

## Augmented Negative Ideal Song set

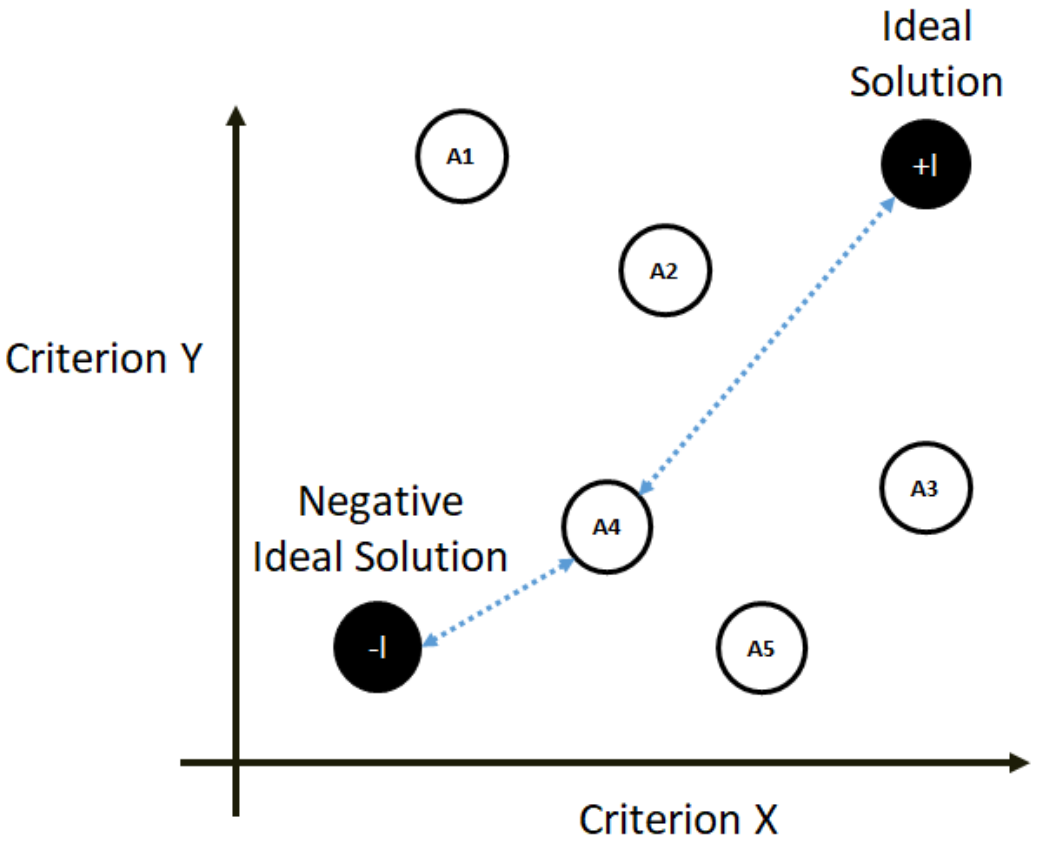
Negative Ideal Songs

Negative Ideal Similar Songs



# 3 Curating Recommendations

- **TOPSIS**
- Technique for Order of Preference by Similarity to Ideal Solution
- Multi-criteria decision analysis method



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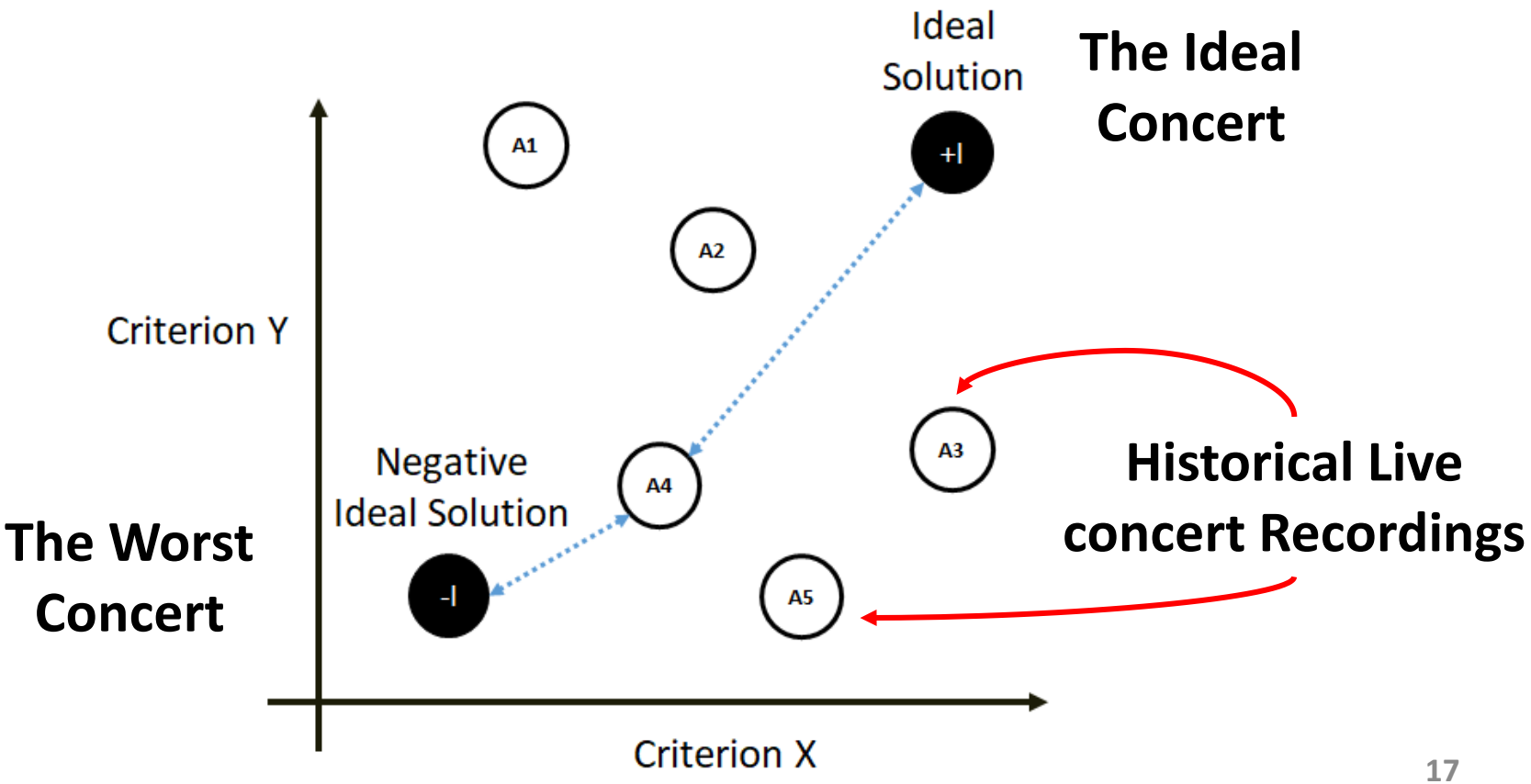

# 3 Curating Recommendations

SDU

- **Determine a Relative Closeness Value for each concert**

**1. Closeness of concert to the Augmented Ideal song set**

- Determine augmented Ideal songs present in concert's setlist
- Considering similarity scores of the intersection songs
- More similar missing songs have more impact when present
- The lower the value the closer the concert to the ideal

**2. Closeness of concert to the Augmented Negative Ideal song set**

- Similar measure but considering the Augmented negative songs

**3. Relative Closeness Value:** for a concert, akin to as in TOPSIS calculation

$$Relative\ Closeness\ Value = \frac{closeness\ to\ negative\ ideal}{closeness\ to\ negative\ ideal + closeness\ ideal}$$

# 3 Curating Recommendations

- Determine a ranking of concerts based on Relative Closeness Values
- Finally normalize Relative Closeness Values
- Quantified to the top-ranking alternative

- Present to the user the *top x* Ranking concert recommendations

| | Gig Date | Tour Name | Relative Score |
|---|---|---|---|
| 1 | 16/07/2016 | The Ties That Bind Tour | 1 |
| 2 | 20/08/2002 | The Rising Tour | 0.9545 |
| 3 | 11/04/1999 | E Street Band Reunion Tour | 0.9364 |
| 4 | 08/05/2013 | Wrecking Ball World Tour | 0.9088 |
| 5 | 14/07/2009 | Working on a Dream Tour | 0.9080 |
| 6 | 04/12/2002 | The Rising Tour | 0.8940 |
| 7 | 08/07/2008 | Magic Tour | 0.8882 |
| 8 | 02/12/2002 | The Rising Tour | 0.8865 |
| 9 | 10/08/2002 | The Rising Tour | 0.8833 |
| 10 | 12/08/2002 | The Rising Tour | 0.8833 |

# 4 Interactive Tuning

SDU

- For any recommendation row - can get aligned song info

| | Gig Date | Tour Name | Relative Score |
|---|---|---|---|
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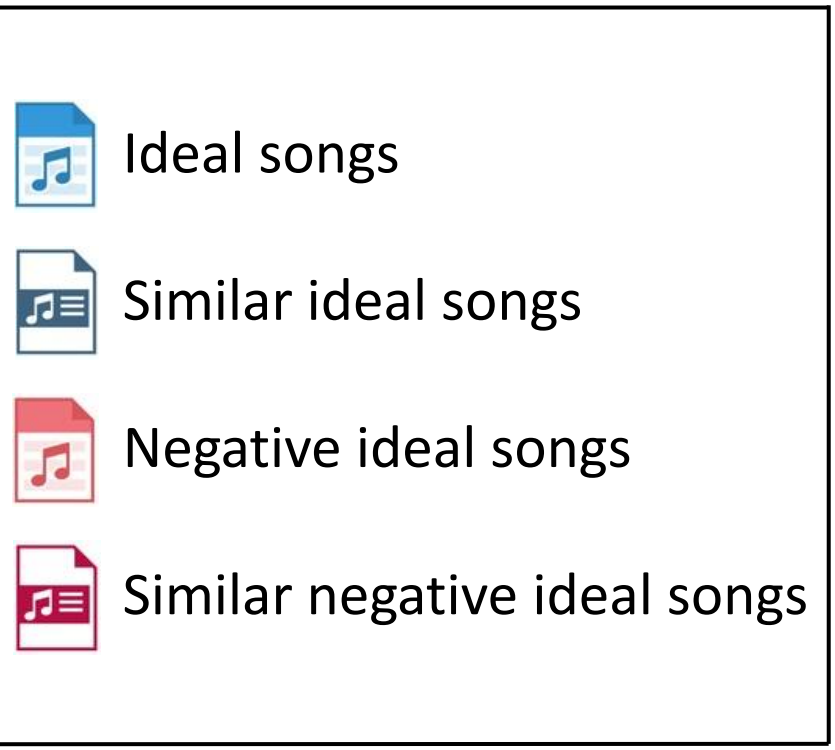


**5 of the top 10 are from a single Tour**

# 4 Interactive Tuning

SDU

- Slicing/constraint on the results and see updated results

- For example – only 1 from each tour

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|---|---|---|---|
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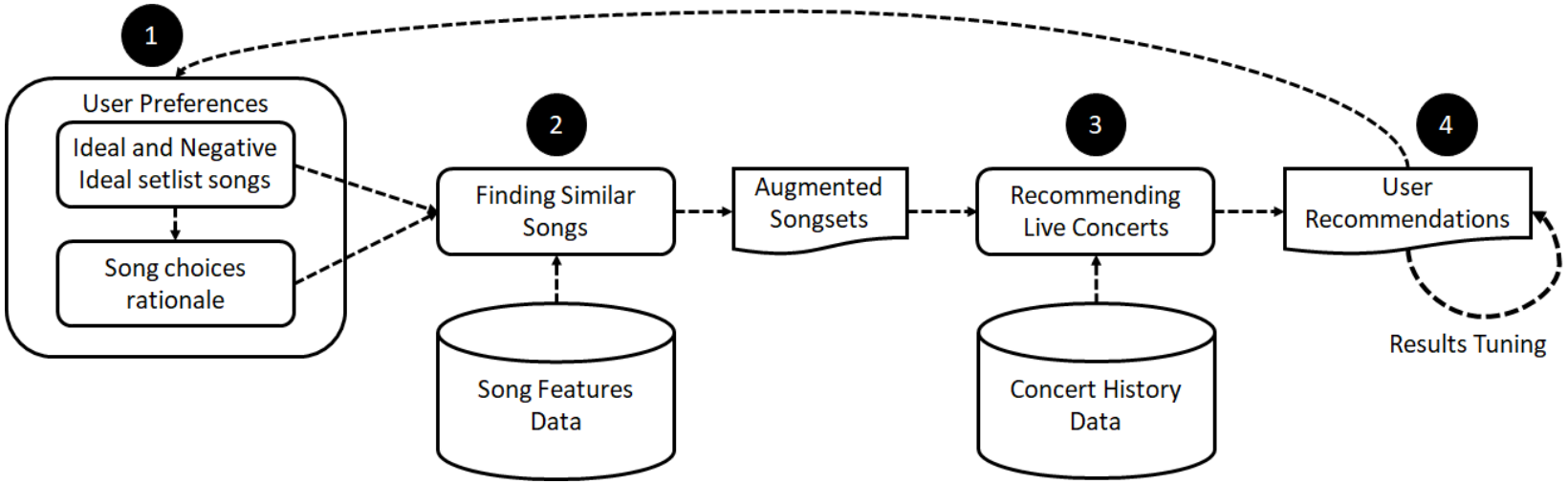
| 5 | 14/07/2009 | Working on a Dream Tour | 0.9080 |
| 6 | 08/07/2008 | Magic Tour | 0.8882 |
| 7 | 07/02/2014 | High Hopes Tour | 0.8780 |
| 8 | 28/08/1984 | Born in the USA Tour | 0.7846 |
| 9 | 27/04/1996 | Ghost of Tom Joad Tour | 0.7751 |
| 10 | 04/11/1978 | Darkness Tour | 0.7395 |

# 4 Interactive Tuning

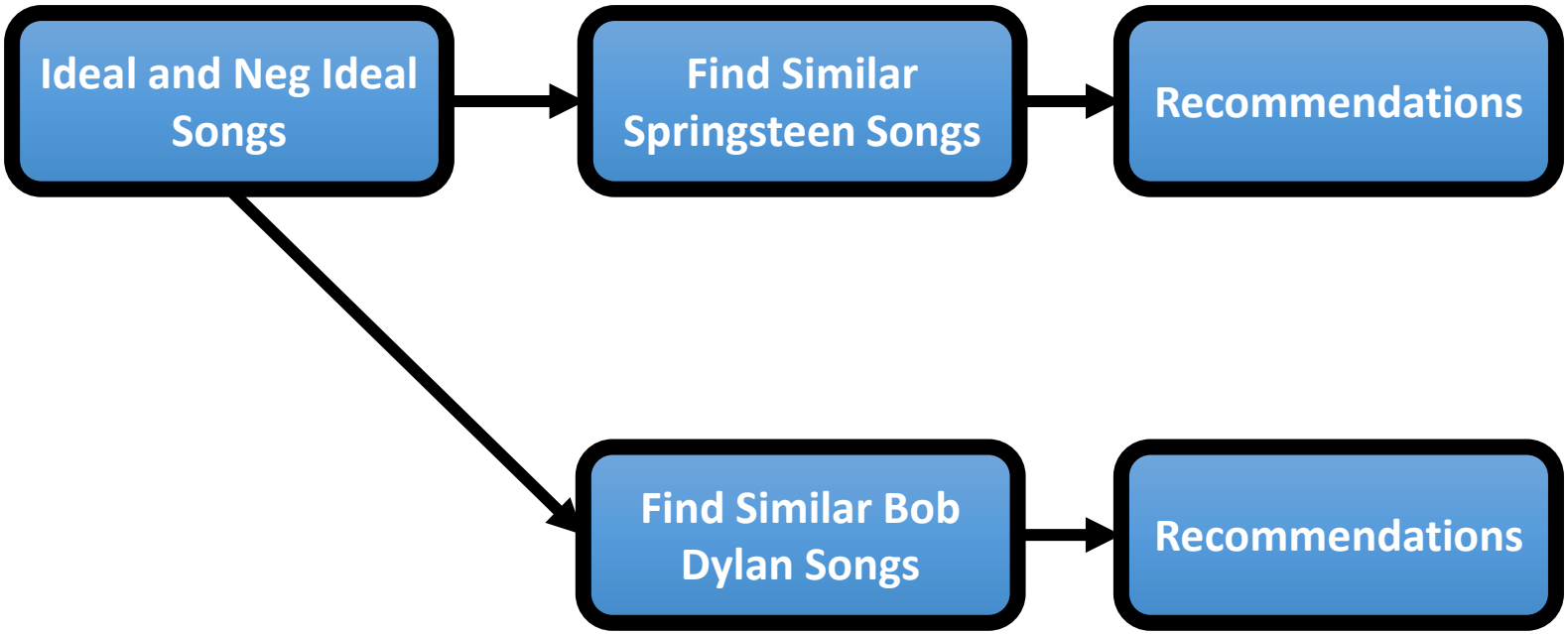
- Additional User tuning – modifying preferences

- Adding or removing songs from ideal and negative ideal sets
- Updating a song's choice rationale
- Providing feedback that a similar song is inappropriate
  - Removing similar song
  - Providing feedback to tune more suitably for the user



# Future Plans

- Across artists
- Denoting preferences in terms of one artist
- Getting recommendations for another artist based on input



# Future Plans

- Exploration of sequence position
- To compare to bag of words akin approach

- How might sequence order be considered
- Having multiple negative ideal songs together vs spread out?
- Crucial positions like first song and last few songs?

- Trade-off between
  - Additional user effort
  - Added information's semantics

# CPR Summary

- **A Recommender system for historic live concert recordings**

- User preferences elicited as:
  - Songs that would be part of an ideal concert for the user
  - Songs that would be part of the opposite of an ideal concert
  - Along with information regarding why songs are chosen
    - More due to their lyrics
    - More due to their musicality

- User's preferences utilised to make recommendations
- Of historic live concert recordings aligned to the preferences

- Provides details regarding why the concerts are recommended
- Provides user tuning

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