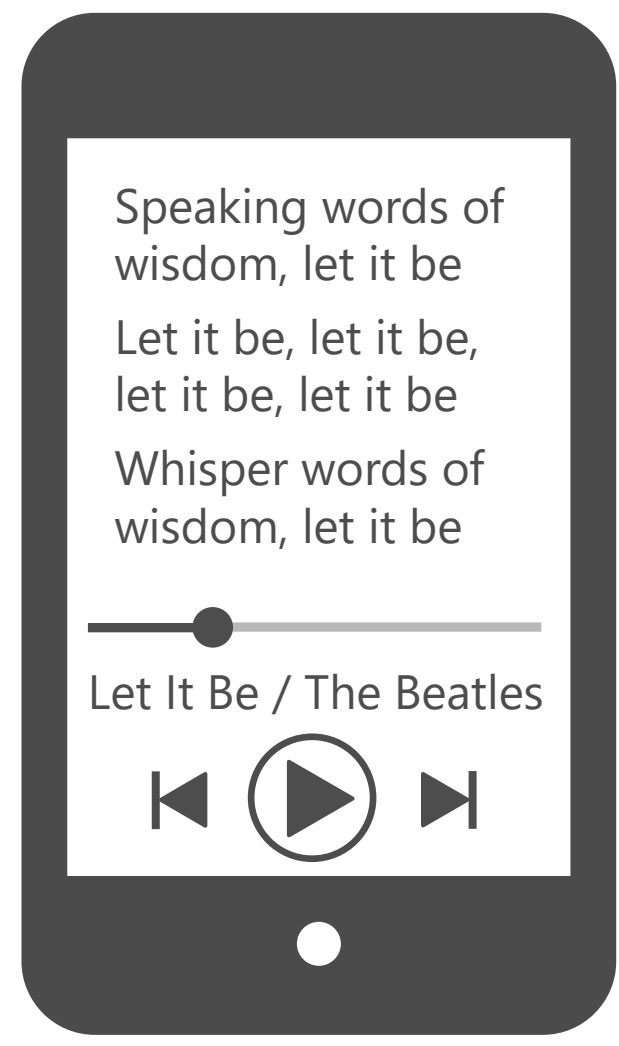


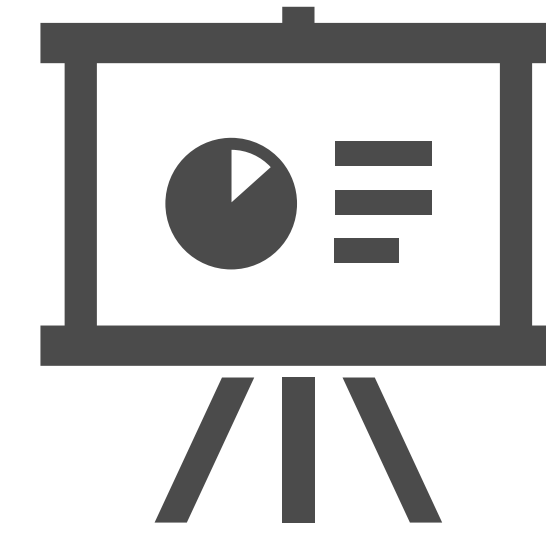
# Toward an Understanding of Lyrics-viewing Behavior While Listening to Music on a Smartphone

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- Some smartphone applications for online music services (e.g., Spotify and Apple Music) have provided **a function that enables a user to view song's lyrics while listening to the song**
- Such a function will become one of the main means for viewing lyrics**, given the current situation where music streaming services on smartphones have become a mainstream format for listening to music



## Various lyrics-related studies in MIR community

- Enable users to search for songs by words in lyrics
- Estimate the topics of lyrics for exploring songs
- Estimate the lyrics intelligibility for language learning



## More fundamental question remains unexplored

- Why and how do people view lyrics?**
- Investigate the behavior of viewing lyrics **on a smartphone while listening to music**

## WHY do people view lyrics?

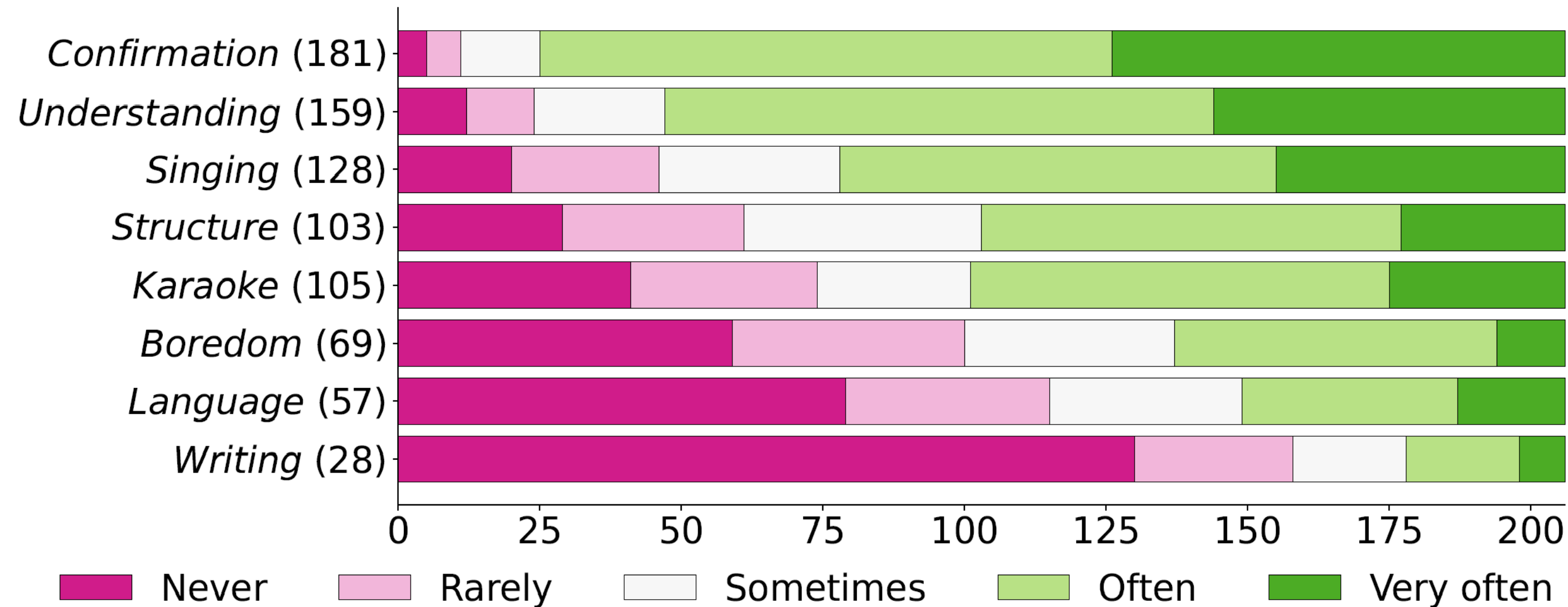
Conduct an online survey involving **206 participants**

### Reasons

| Reason        | The user wants to:   |
|---------------|--|
| Confirmation  | Confirm what the artist sings                                    |
| Understanding | More deeply understand the lyrics                                |
| Singing       | Sing to herself (not in public)                                  |
| Structure     | Figure out the structure of the lyrics, such as verse and chorus |
| Karaoke       | Practice for singing in public, as in karaoke                    |
| Boredom       | Get rid of her boredom by viewing lyrics                         |
| Language      | Learn a language with the lyrics                                 |
| Writing       | Study for writing lyrics   |

### Frequency of Reasons

Investigate **how often users view lyrics for each reason**



- Provide functions according to users' reasons for viewing lyrics:
- For *Understanding*, **displaying diverse interpretations of lyrics**
  - For *Singing* and *Karaoke*, **automatically judging singing skill**
  - For *Language*, **enabling users to see the meaning of a word in lyrics just by tapping the word**

### Behavior Details

Investigate **users' detailed behavior in terms of three aspects** (e.g., in terms of timing, for each reason, do users tend to decide to view lyrics before playing a song or after playing a song?)

| Reason        | Timing     |             | Repetition |              | Percentage |              |
|---------------|------------|-------------|------------|--------------|------------|--------------|
|               | Before     | After       | Once       | Many         | Partial    | Most         |
| Confirmation  | 49         | <b>95**</b> | 70         | <b>111**</b> | 53         | <b>84**</b>  |
| Understanding | 60         | <b>70</b>   | 38         | <b>121**</b> | 20         | <b>116**</b> |
| Singing       | 50         | <b>51</b>   | 36         | <b>92**</b>  | 16         | <b>85**</b>  |
| Structure     | 29         | <b>46*</b>  | 33         | <b>70**</b>  | 18         | <b>57**</b>  |
| Karaoke       | <b>55*</b> | 33          | 14         | <b>91**</b>  | 13         | <b>78**</b>  |
| Boredom       | 12         | <b>39**</b> | 29         | <b>40</b>    | 19         | <b>31</b>    |
| Language      | <b>27</b>  | 18          | 12         | <b>45**</b>  | 2          | <b>39**</b>  |
| Writing       | <b>11</b>  | 10          | 3          | <b>25**</b>  | 2          | <b>17**</b>  |

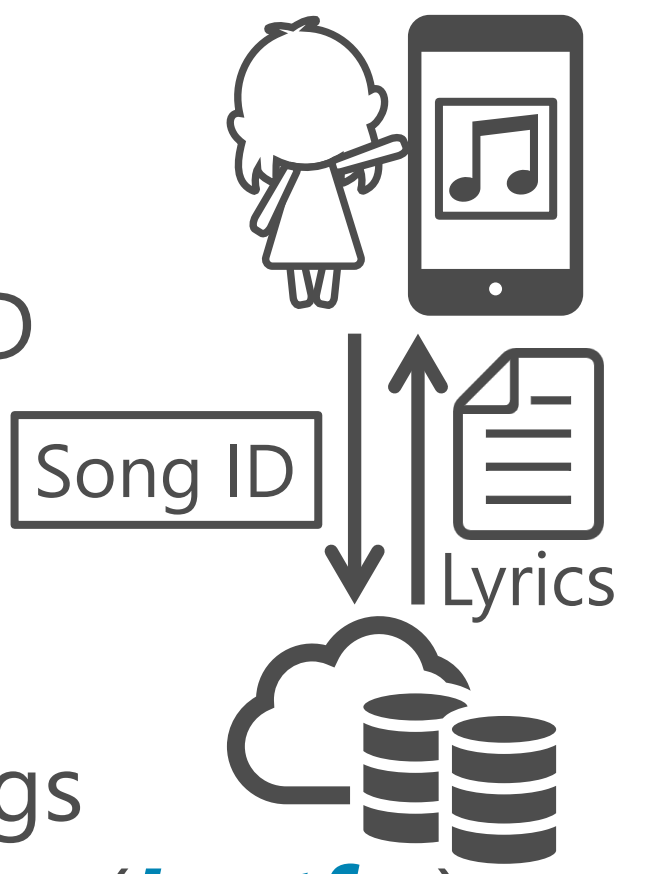
- Timing: for reasons with high frequency in the "After" group, **enable users to quickly execute the corresponding functions**
- Percentage: for a user who stops viewing lyrics within a short time, **provide information related to the played song because she is likely bored**

## HOW do people view lyrics?

Analyze **23 million** lyrics request logs for a year

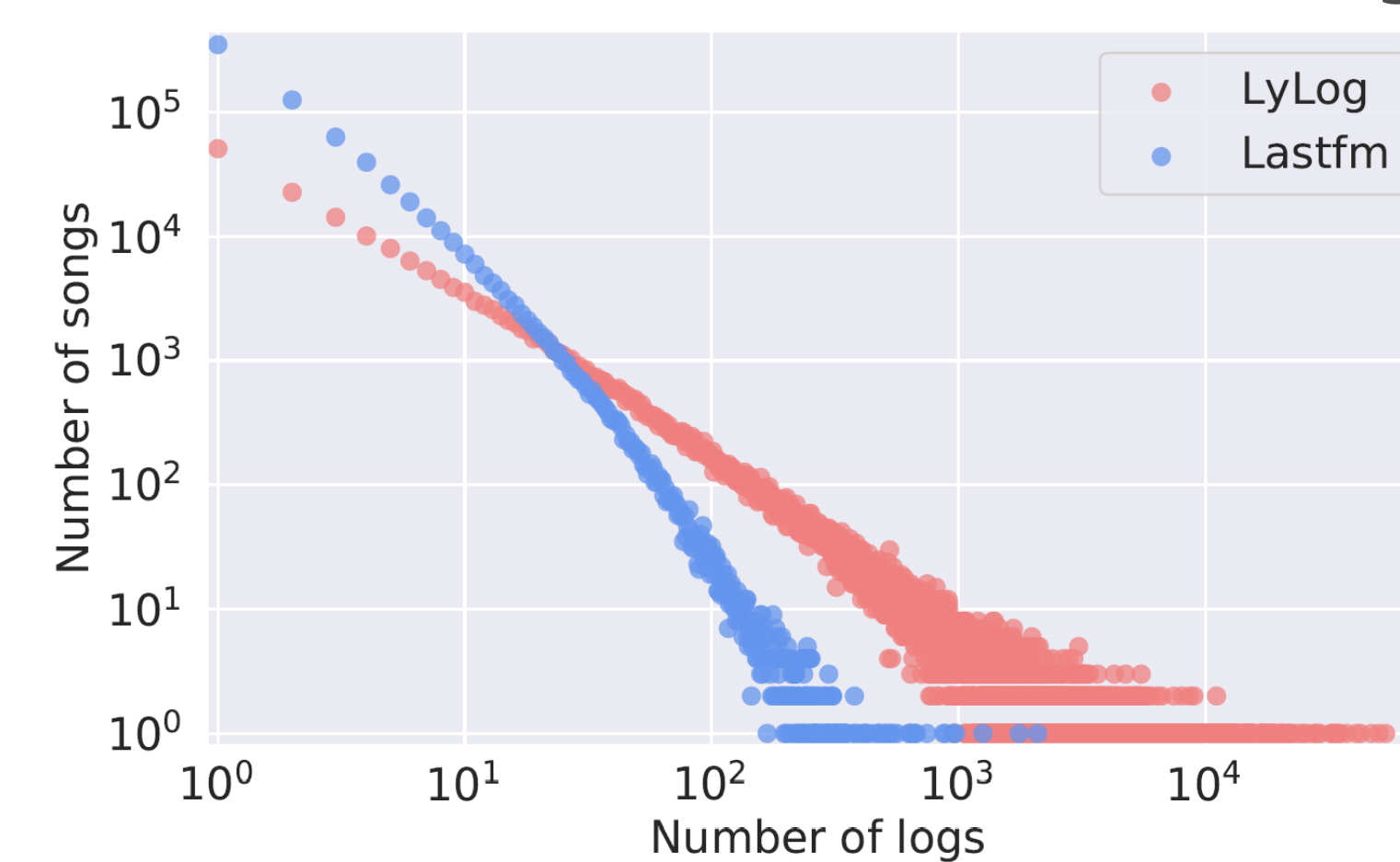
### Lyrics Viewing Logs

- Collect logs from an iOS application of a Japanese online music service
- Logs include the timestamp, user ID, and song ID
- The application gets a song's lyrics only when a user explicitly requests them**
- The dataset (**LyLog**) consists of 611,895 users, 214,434 songs, and 23,034,417 logs
- For comparison, music listening dataset of Last.fm (**Lastfm**) consisting of 660 users, 718,466 songs, and 2,932,430 logs



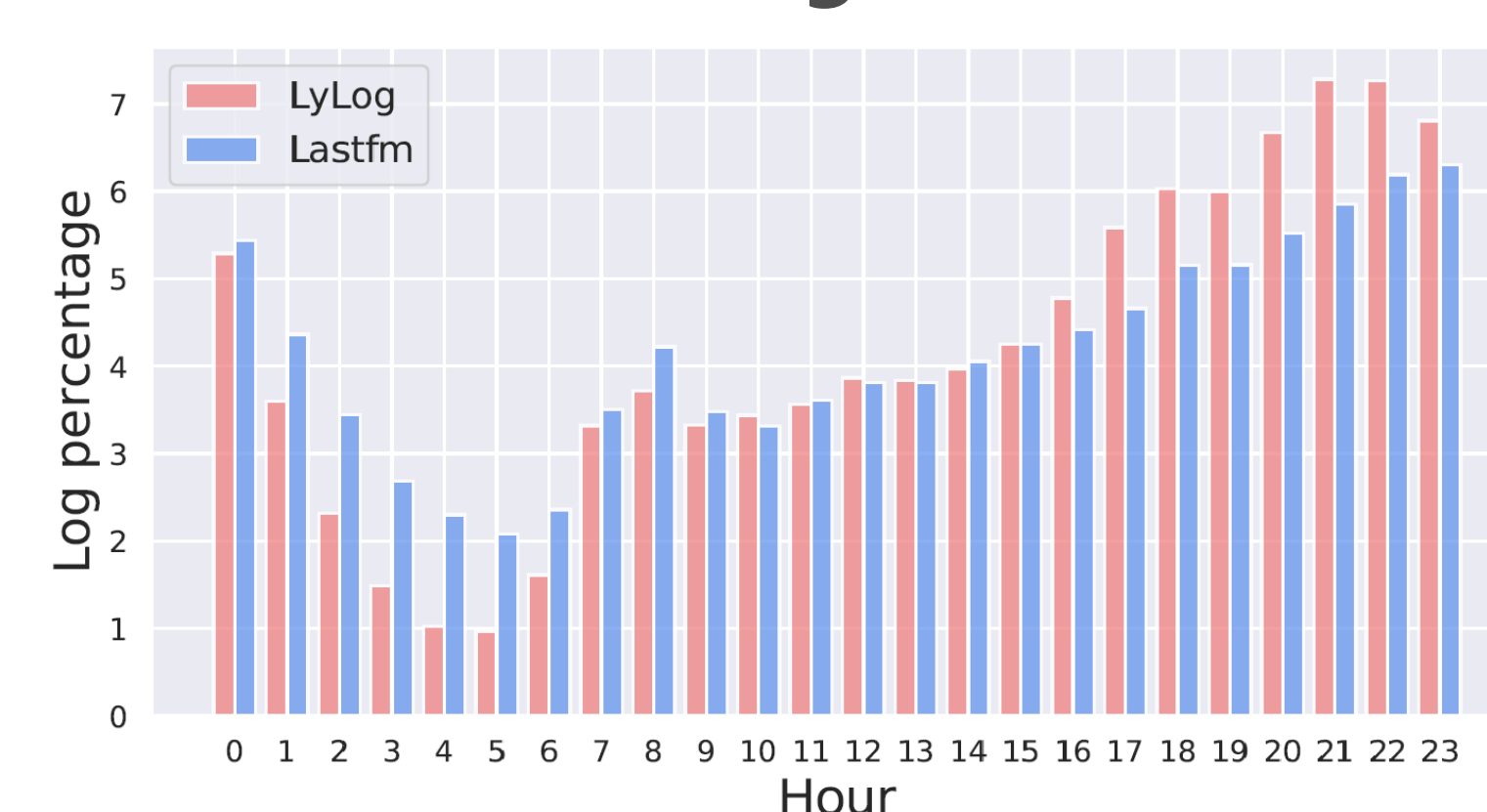
### Basic Statistics

#### Distribution of the number of logs per song



- There are  $y$  songs that have  $x$  logs
- LyLog is more biased to popular songs**: top 6.64% of the popular songs dominates 80% of whole logs (34.8% for *Lastfm*)

#### Distribution of logs over the hours of the day

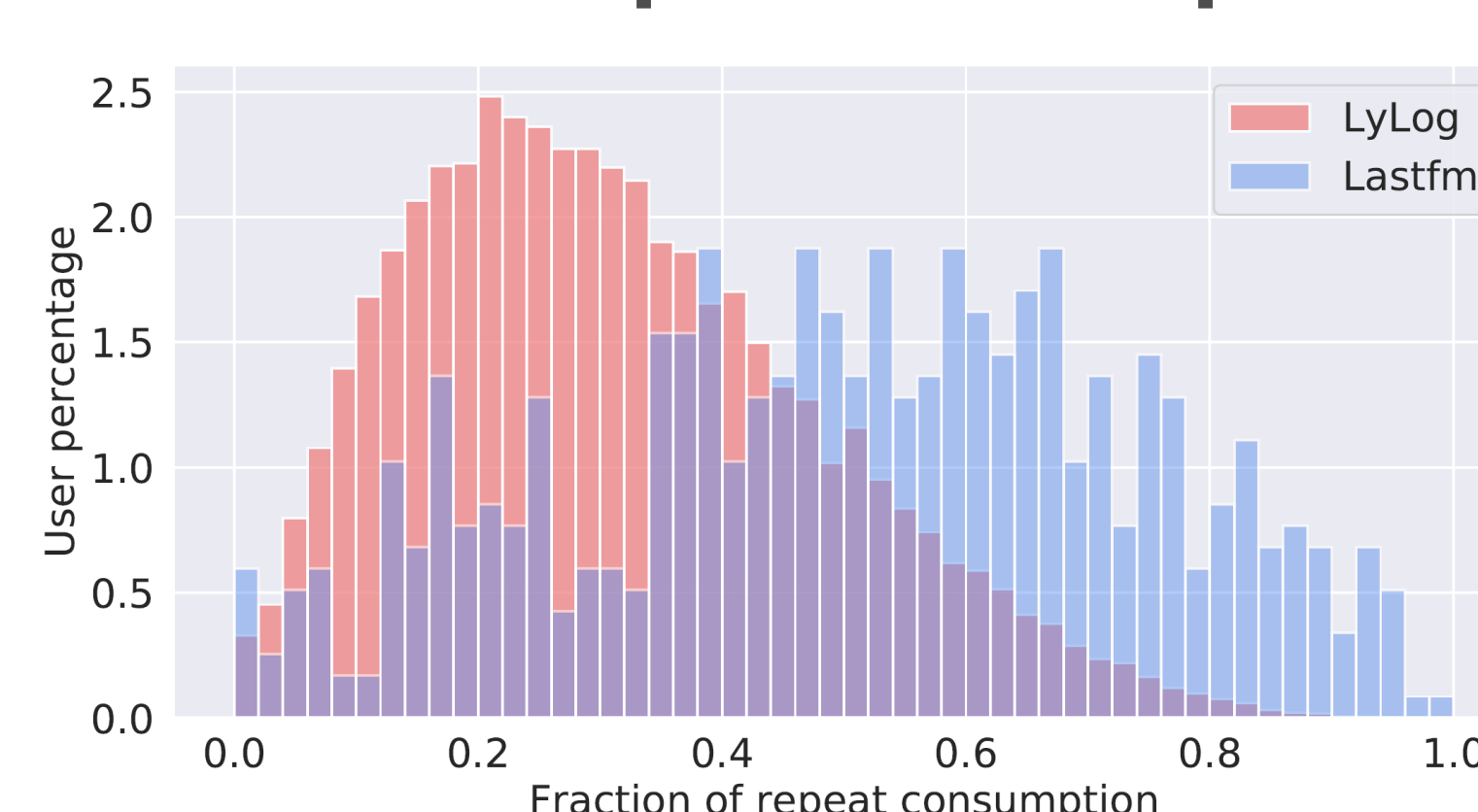


- People tend to view more lyrics after coming back home at night and before going to bed**
- Because viewing lyrics requires users to interact with the app more actively

### Repeat Consumption

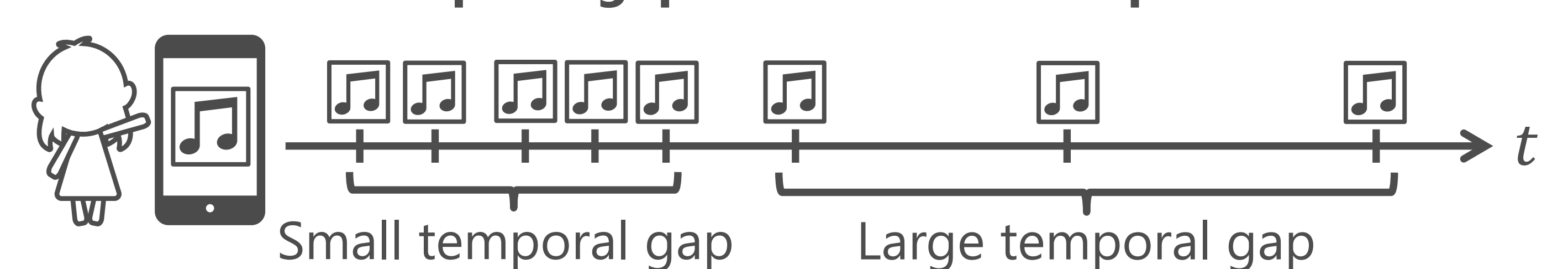
It has been reported that a user often listens to the same song repeatedly over time; what about lyrics viewing behavior?

#### Fraction of repeat consumption for each user



- An average of 37.8% of user's viewed lyrics have already been viewed by the user** (60.4% for *Lastfm*)
- Still high compared to other domains (e.g., 26% for watching videos)

#### Transition of temporal gap between consumptions



- When a user repeatedly views the lyrics of a song, **the gap grows over time as she gets bored with it**
- For such a user, recommend novel lyrics related in terms of the topic to expand her interest to other songs