



Utrecht University

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Fairness—Are algorithms a burden or a solution?

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Utrecht University

AI & Media Lab



Research



Teaching

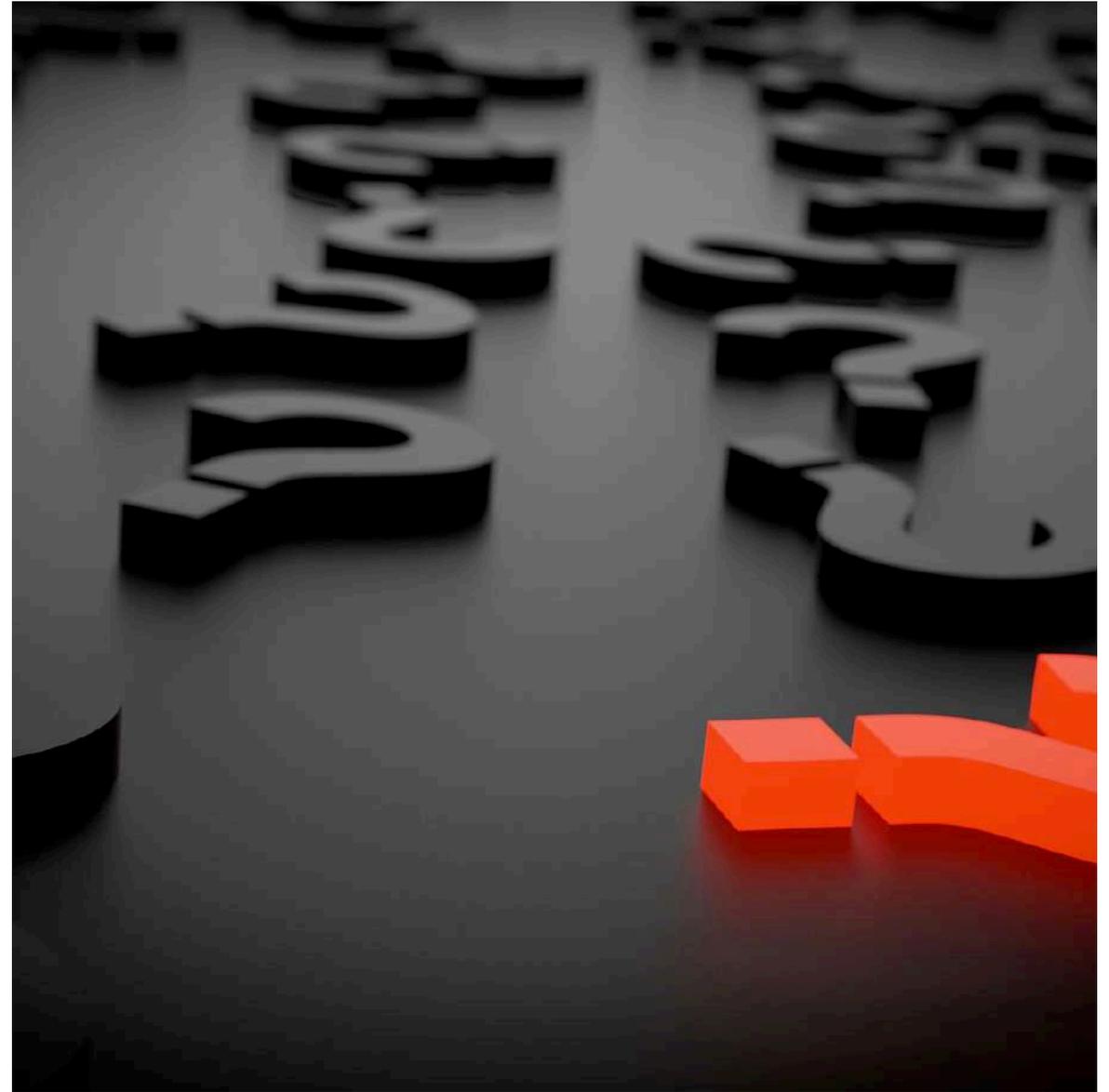


Christine Bauer, Fairness—Are algorithms a burden or a solution?

Interactive intelligent systems
context-adaptivity

Context-aware recommender systems
Music sector
Fairness

Why do we need music recommendation?



We are confronted with information overload and choice overload.

A typical online music platform provides access to ~50 million music tracks.



Everybody is different...



<https://marketinginsidergroup.com/wp-content/uploads/2016/06/150-People.jpg>



<https://cdn.pixelmedia.com/wp-content/uploads/2016/01/personalization-of-a-website.jpg>

... and has different preferences and demands.

*We need the ‘right’ information,
at the ‘right’ time,
in the ‘right’ place,
in the ‘right’ way,
to the ‘right’ person.*

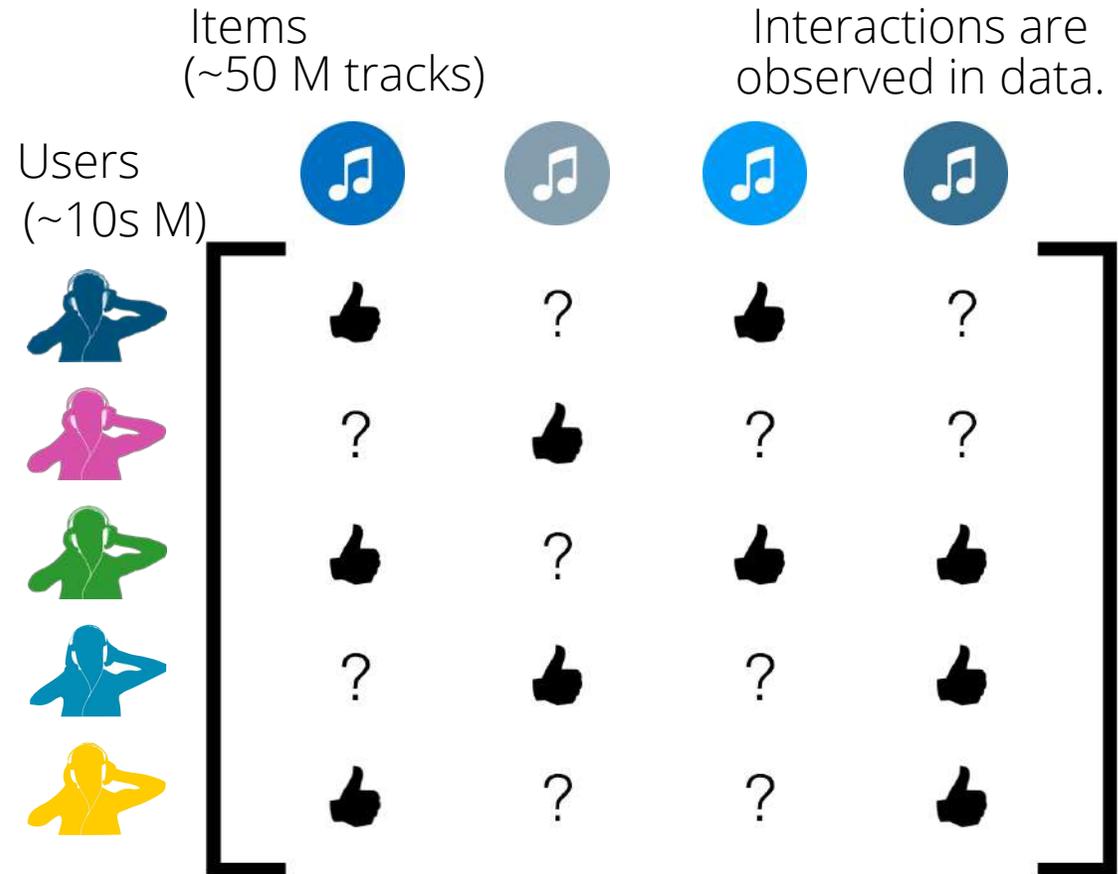
Gerhard Fischer (2012)—and many others

Gerhard Fischer (2012). Context-aware systems: the “right” information, at the “right” time, in the “right” place, in the “right” way, to the “right” person. In Proceedings of the International Working Conference on Advanced Visual Interfaces (AVI '12), pp 287–294. DOI: 10.1145/2254556.2254611

Recommendation as a matrix completion problem

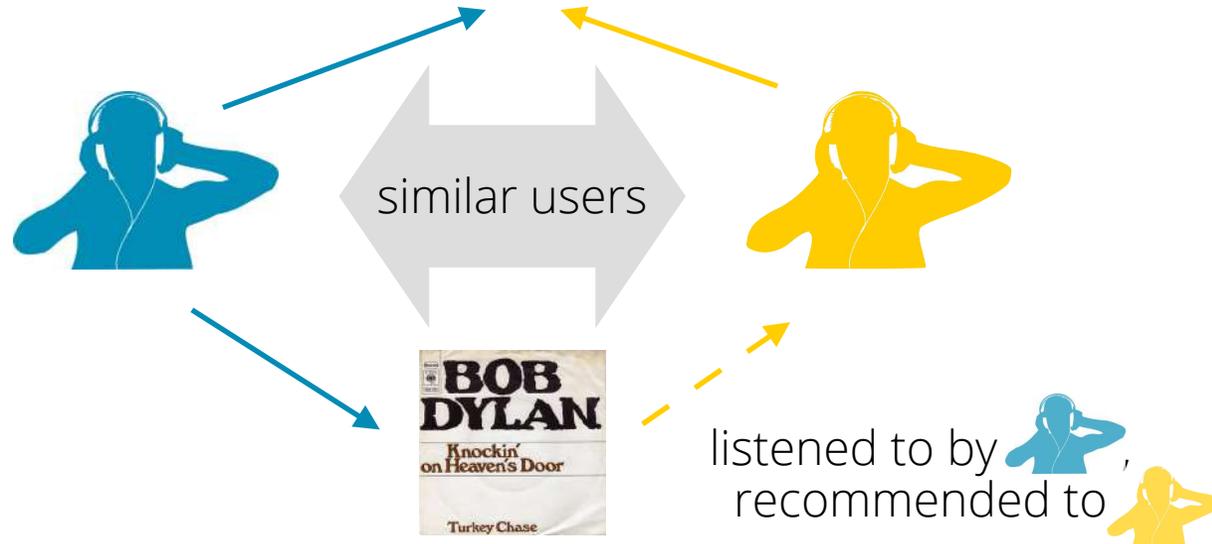
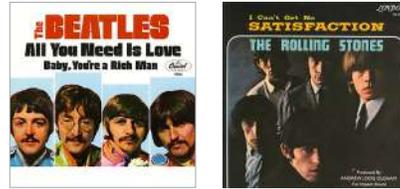
user x item → rating

Goal: predict what people will like
— based on what they have liked



Collaborative filtering

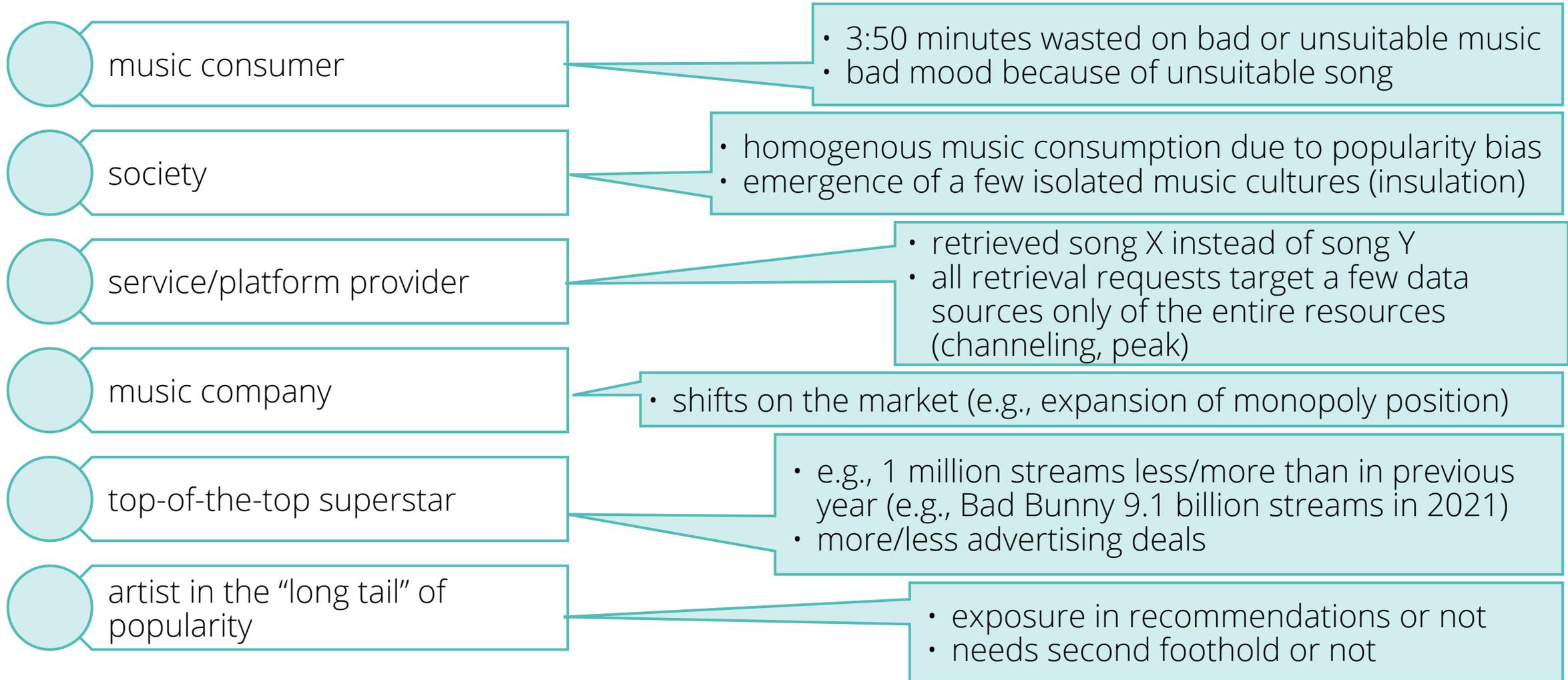
listened to by both users





We've got work to do!

What happens if it's not the best ever recommendation?



In music recommendation, it is all about recommending the **right item** to the **right user** at the right time.



Research is mostly about being highly accurate about what the **user** likes.

Who takes the **artists'** perspective?





Let's put the artist in the loop.

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Recommenders have been built without asking artists.

- Systems make automatic decisions that influence what a user will listen to.— This, in turn, affects artists.
- We want to **understand the impact** of algorithmic decision-making on artists.
- We want to know artists' ideas on how music recommenders should work.

Our goal is
to have music recommenders
that are **fair** for artists.



Karlijn Dinnissen



Andrés Ferraro

No control—Fragmented presentation

“But it is something that I have done 10 years ago. [The platform] puts the most listened tracks. [...] and you have to scroll down to reach the latest album” — P3

In the ‘online radio’ of the band:

*“I see things that I do not like and that **I reject ideologically.**
Why appears [Band X]?” — P3*

Andrés Ferraro, Xavier Serra, & **Christine Bauer** (2021). What is fair? exploring the artists' perspective on the fairness of music streaming platforms. Human-Computer Interaction – INTERACT 2021. Volume 12933, pp 562-584. Cham, Germany: Springer International Publishing. DOI: 10.1007/978-3-030-85616-8_33

New Music

"[...] it is a campaign telling that you released more. To tell the world, 'Hey! There is a new album!' [...] Like saying, 'Hello, I'm here.'" — PR1

*"[...] it is something that I have done 10 years ago. [...] **I don't know if I feel identified** [with it]." — P3*

- Want to be in control of what tracks or albums get promoted
- In general, put more weight on their latest releases

Andrés Ferraro, Xavier Serra, & **Christine Bauer** (2021). What is fair? exploring the artists' perspective on the fairness of music streaming platforms. Human-Computer Interaction – INTERACT 2021. Volume 12933, pp 562-584. Cham, Germany: Springer International Publishing. DOI: 10.1007/978-3-030-85616-8_33

Against influencing users preferences, except for reaching gender balance

“In my opinion you can't impose some [specific] music on the users.” — PF1

Yet, request that platforms promote content by female artists to reach **gender balance**:

“In heavy metal music, I imagine that there aren't many female singers. Maybe we could give them more visibility, otherwise they would never be seen.” — P4

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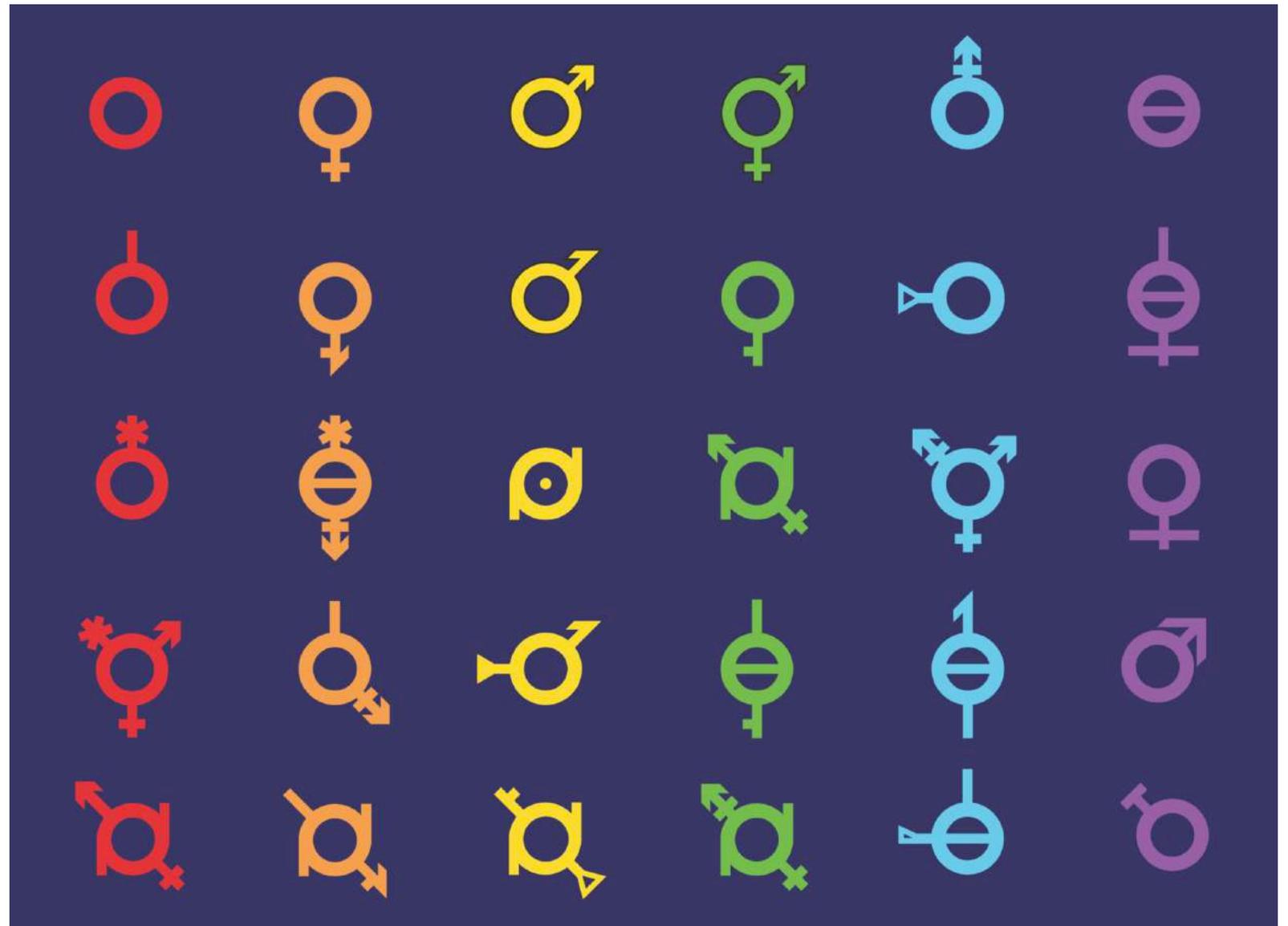
Gender in the music sector—a highly topical subject

- 20% artists in the “2020 Billboard 100” were women or gender minorities
- women represent 20% of registered composers and songwriters
- few female-fronted festival headliners
- little representation of black female artists in high-popularity playlists

<https://www.keychange.eu/what-can-i-do/as-a-music-organisation-representative>

Stacy L. Smith, Marc Choueiti, and Katherine Pieper (2018). Inclusion in the Recording Studio?: Gender and Race/Ethnicity of Artists, Songwriters & Producers across 600 Popular Songs from 2012–2017. Report. Annenberg Inclusion Initiative. <http://assets.uscannenberg.org/docs/inclusion-in-the-recording-studio.pdf>

**Let's have a look
what the algorithms do
concerning gender!**



Open dataset and “typical” algorithmic approach

[Alternating Least Square (ALS)
Matrix Factorization
in Collaborative Filtering]

lost.fm  MusicBrainz

LFM-1b enriched with gender information of artists from MusicBrainz

!! only solo artists !! only binary gender classification !!

~65,000 artists

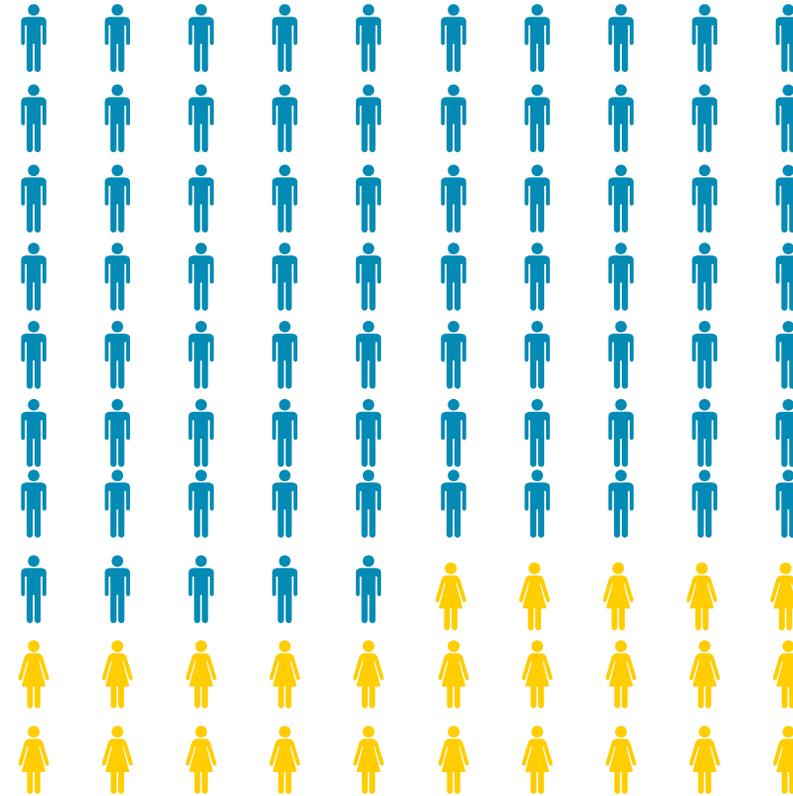
15,000 women + 50,000 men

= 23% women

→ gender imbbalance reflects current reality in the music business

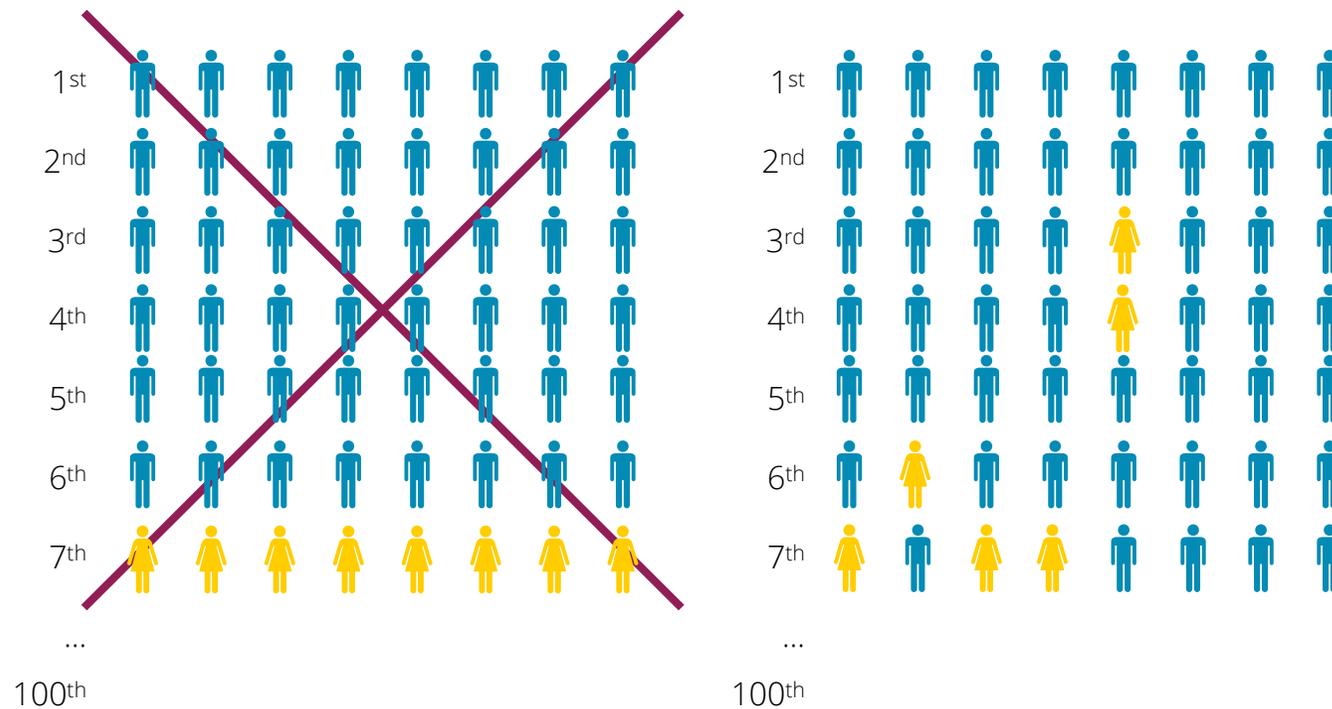
Percentage of recommended women similar to “input”.

~25% of recommendations
women



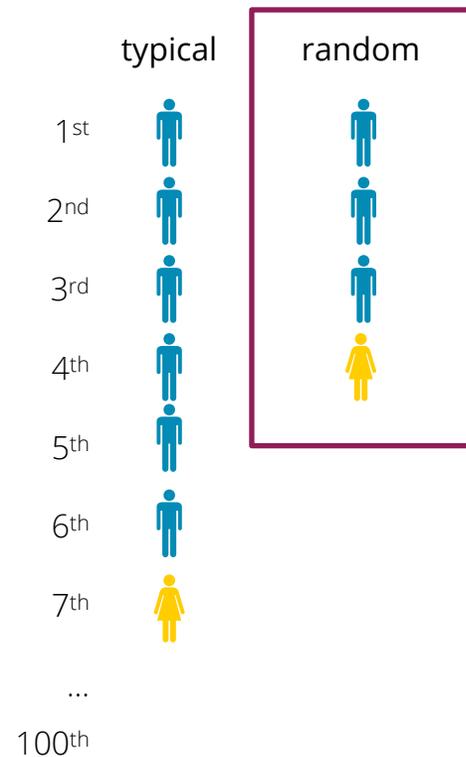
If tracks are recommended—one by one—, chances are high that the first track is by a man.

The first woman appears—on average—on rank 7.

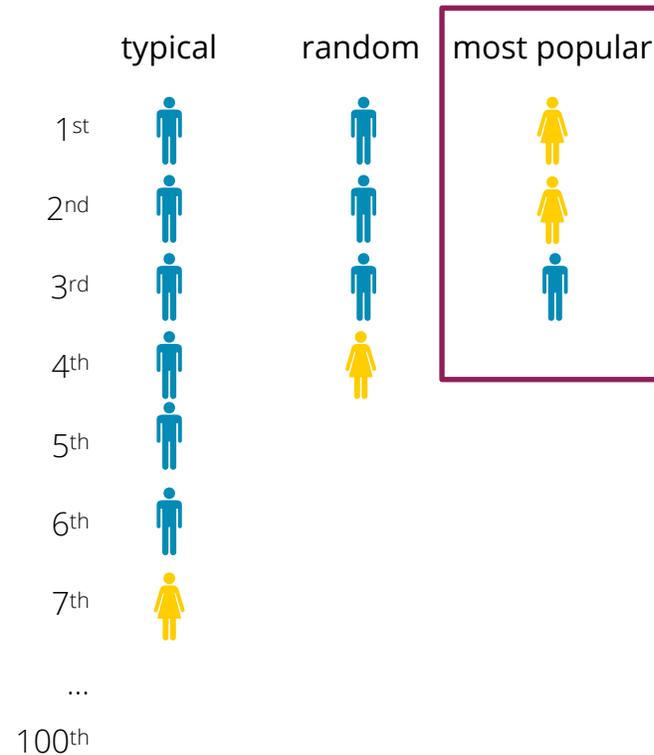


on average,
1st woman appears
on far lower
position

If we would make **random** recommendations, the first women appears—on average—on rank 4.

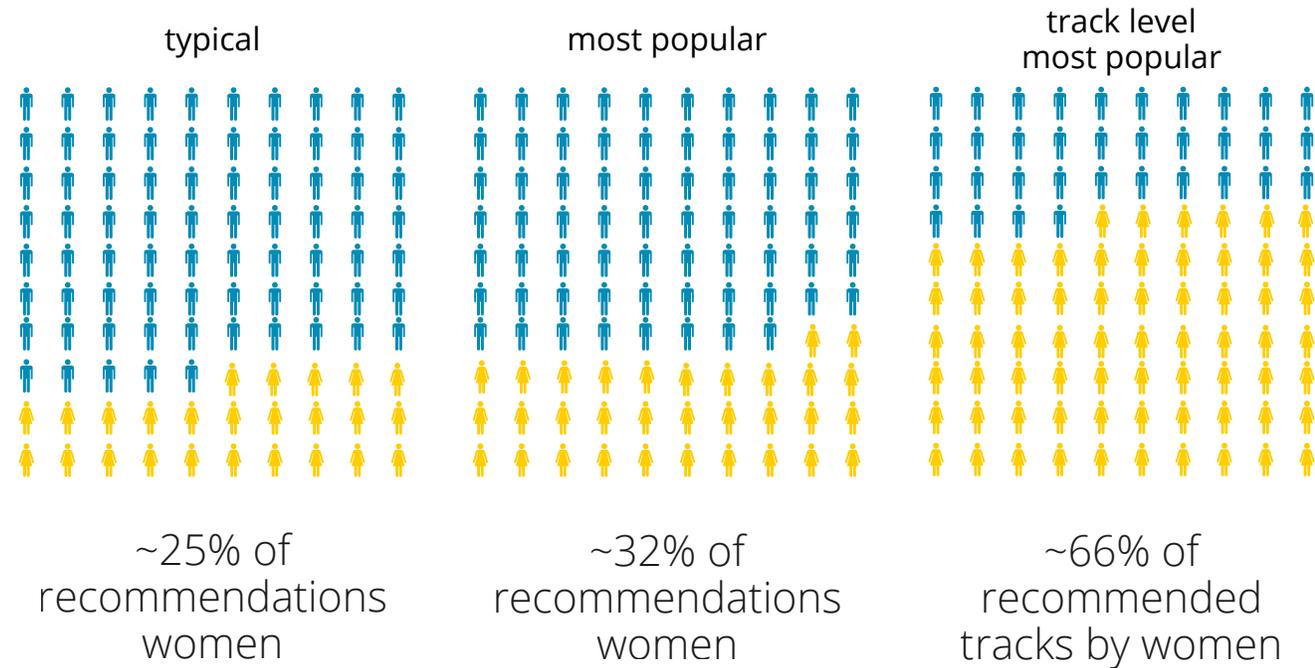


If we recommend **the same most popular items** to everyone, the first women appears—on average—on rank 1.



going for “most popular” flips the results

If we recommend **the same most popular items** to everyone, the percentage of women increases.



But ...the very same tracks by a few women.

typical

~19,000
unique tracks
by women

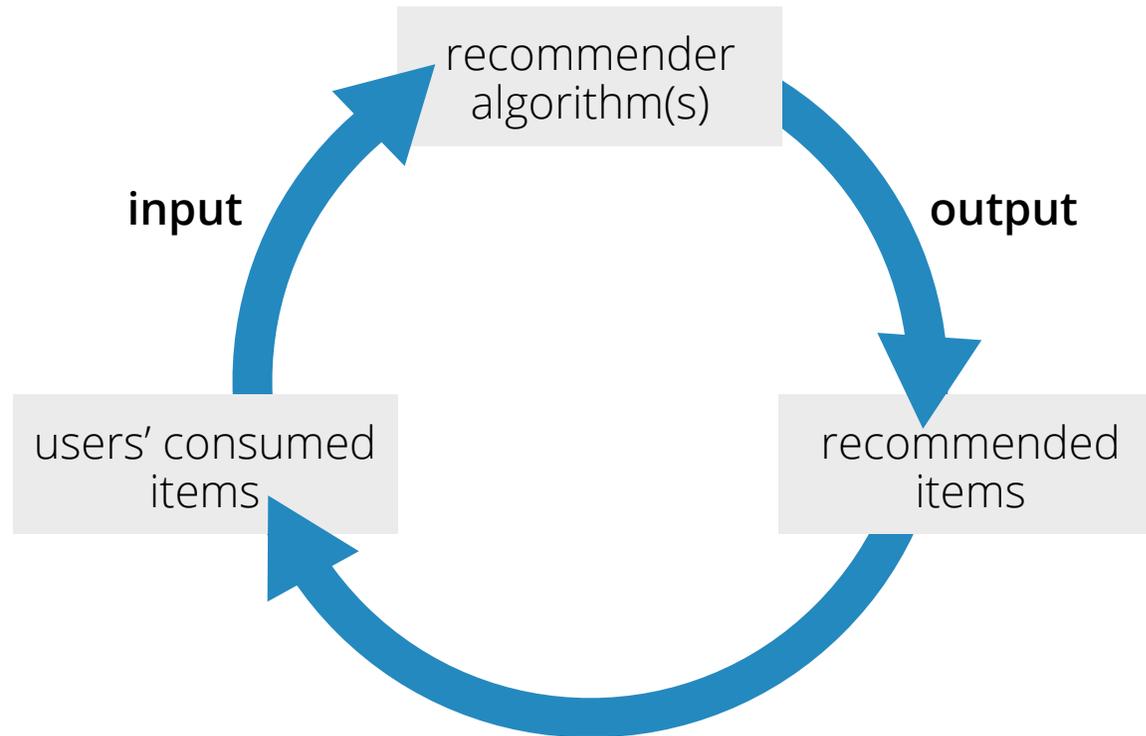
random

~100,000
unique tracks
by women

most popular

130
unique tracks
by women

Feedback loop



users consume what is recommended

Artists see the algorithms as **a possible solution** to address the long-standing problem of gender imbalance.

"I think there should be actions to correct some biases. The question is in which cases it should be corrected and in which not. In heavy metal music, I imagine that there aren't many female singers. Maybe we could give them more visibility, otherwise they would never be seen." — P4

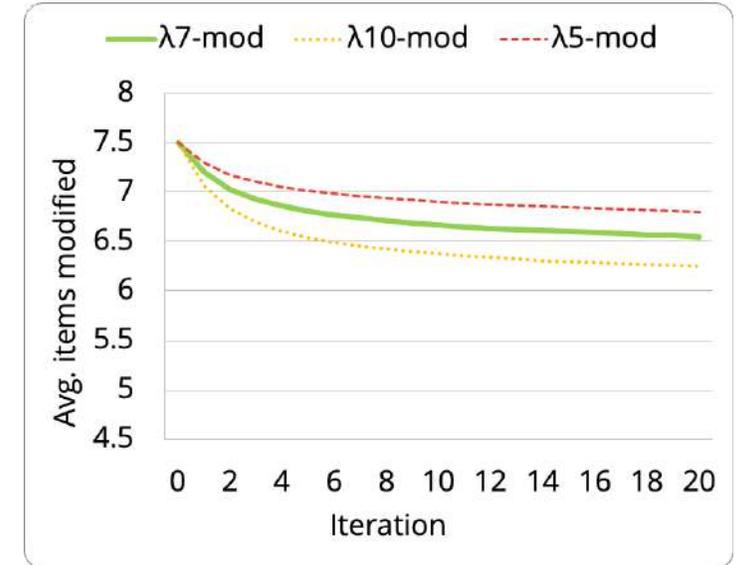
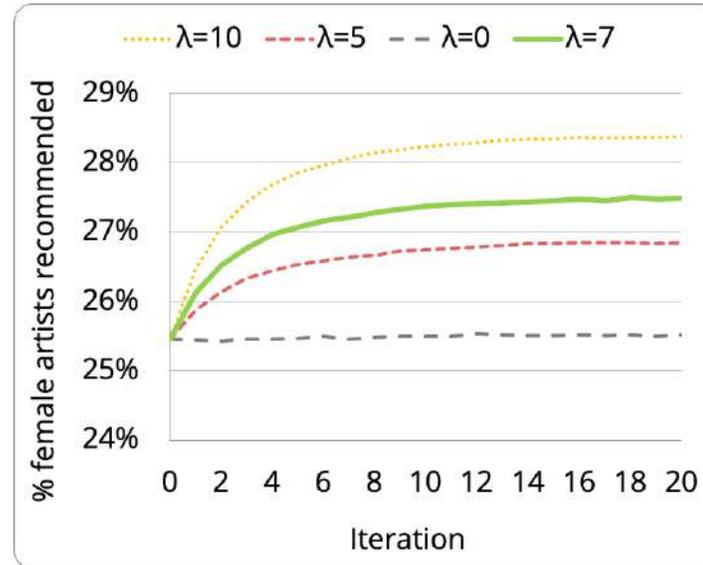
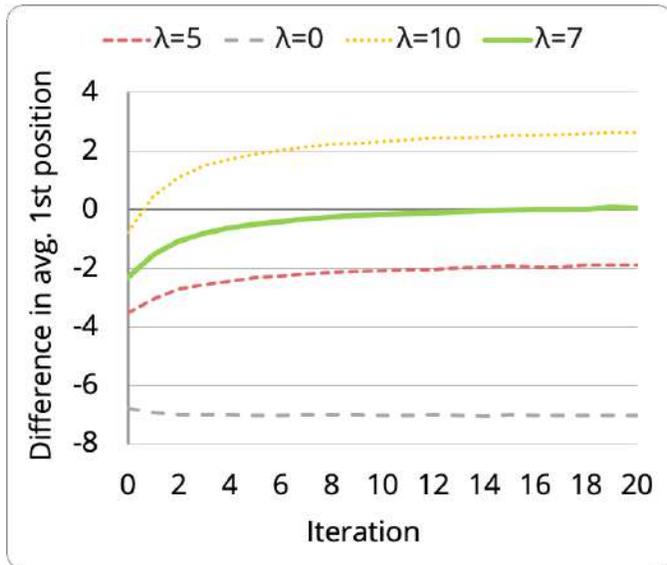
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Artists suggest a **progressive change** towards **50% gender balance**.

“otherwise the users could perceive it as something bad and leave the platform.” — PN1

Andrés Ferraro, Xavier Serra, & **Christine Bauer** (2021). Break the Loop: Gender Imbalance in Music Recommenders. Proceedings of the 6th ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR '21). Canberra, ACT, Australia, 14-19 March, pp 249-254. DOI: 10.1145/3406522.3446033

Break the loop



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Gender is only one of many aspects of unfairness, creating unequal opportunities

- →develop a deep understanding of the biases and inequalities
- investigate the various facets that hinder equal opportunity in music recommendation
- essential basis for designing music recommenders that provide reasonable opportunities for all kind of artists alike
- what about other domains?



Algorithms may amplify biases...

*We can also use algorithms as a chance to
change the world.*



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