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Department of Artificial Intelligence and Human Interfaces (AIHI)

Keep an eye on the big picture— in recommender systems research and as a scientist

Christine Bauer

Women in RecSys
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Agenda

- motivation
- in recommender systems research
- as a scientist
- context

big picture

where we tend not to see everything
how I contribute

a decathlon
setting weights

my journey

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About me...

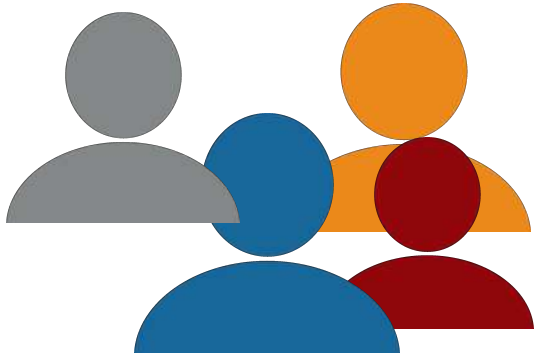
Tourismus Salzburg

Interactive Intelligent Systems

Recommender systems, Context-adaptivity
Fairness
Music and media sector
Multi-method evaluation

Marloes Vredenborg

Anouk van Kasteren



Daniele Pretolesi

Research

Teaching

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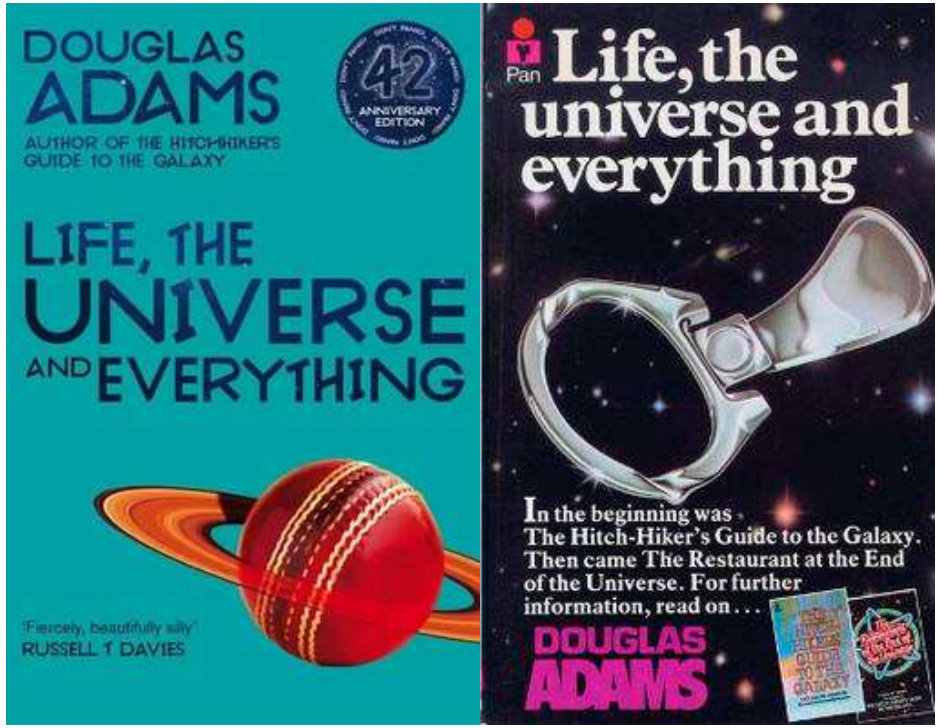
The big picture—Which big picture?

We have often the tendency, trying to solve the “world problem”



We already know that the answer is

42

Then we zoom into what we can do

Then we zoom into what we can do

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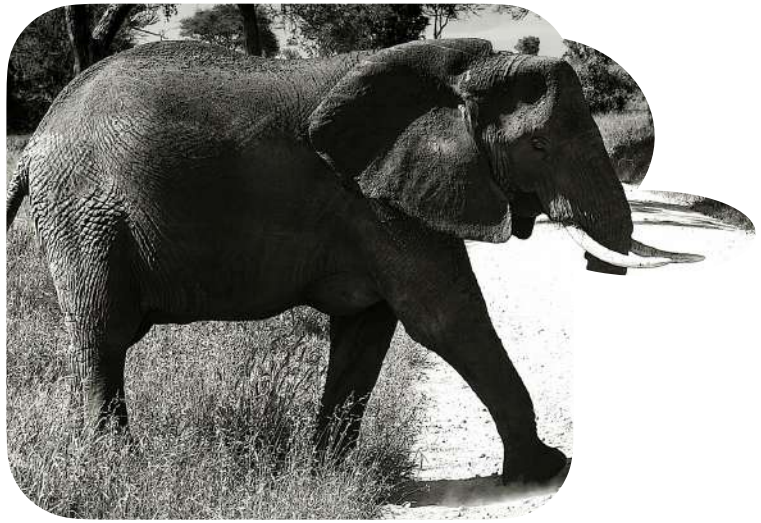
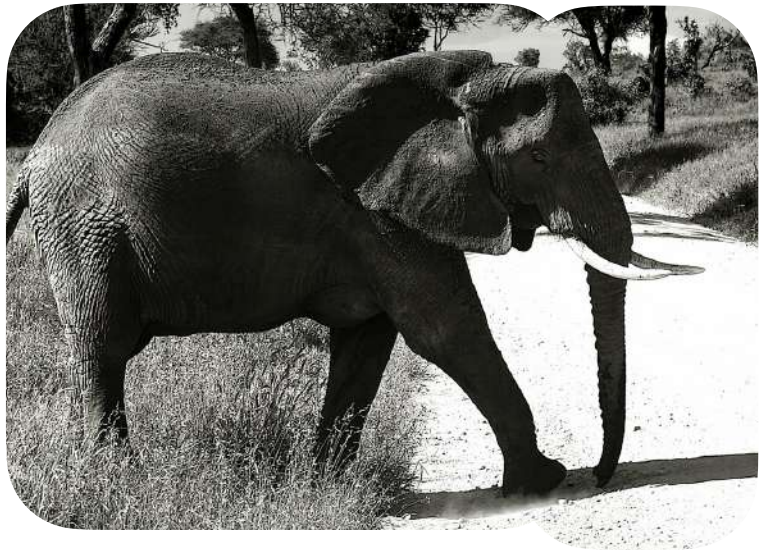
Then we zoom into what we can do



Then we zoom into what we can do



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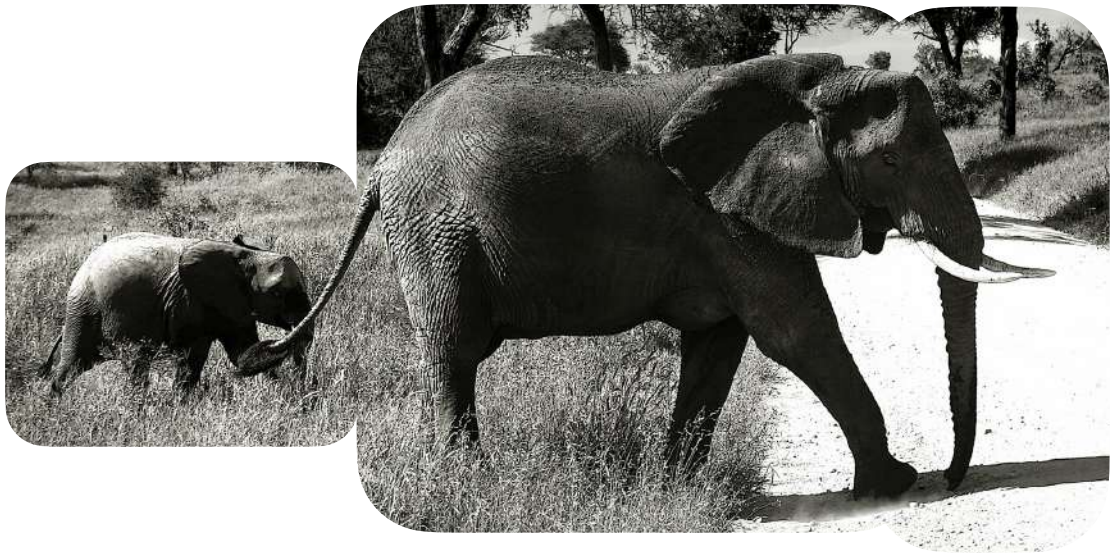

We need to look at the big picture

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But didn't I just say,
"you can't do everything"?

Keep the big picture in mind when zooming in.

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Keep the big picture in mind when zooming in.

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The big picture in recommender systems research

Recommendations to users: Ratings in, rankings out.—It's simple, isn't it?

Input

Explicit ratings

Implicit ratings

Christine Bauer (2020). Ratings in, rankings out. keep it simple, they said. but we need more than that. Proceedings of the Recommendation in Complex Scenarios and the Impact of Recommender Systems 2020 (ComplexRec-ImpactRS 2020). Online, 25 September. URL: http://ceur-ws.org/Vol-2697/invited1.pdf

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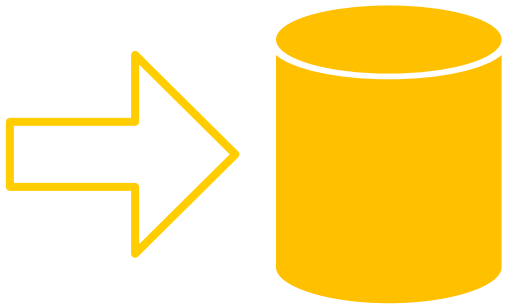

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Recommendations to users: Ratings in, rankings out.—It's simple, isn't it?

Input

Explicit ratings

Implicit ratings

Output

1. …
2. …
3. …

Christine Bauer (2020). Ratings in, rankings out. keep it simple, they said. but we need more than that. Proceedings of the Recommendation in Complex Scenarios and the Impact of Recommender Systems 2020 (ComplexRec-ImpactRS 2020). Online, 25 September. URL: http://ceur-ws.org/Vol-2697/invited1.pdf

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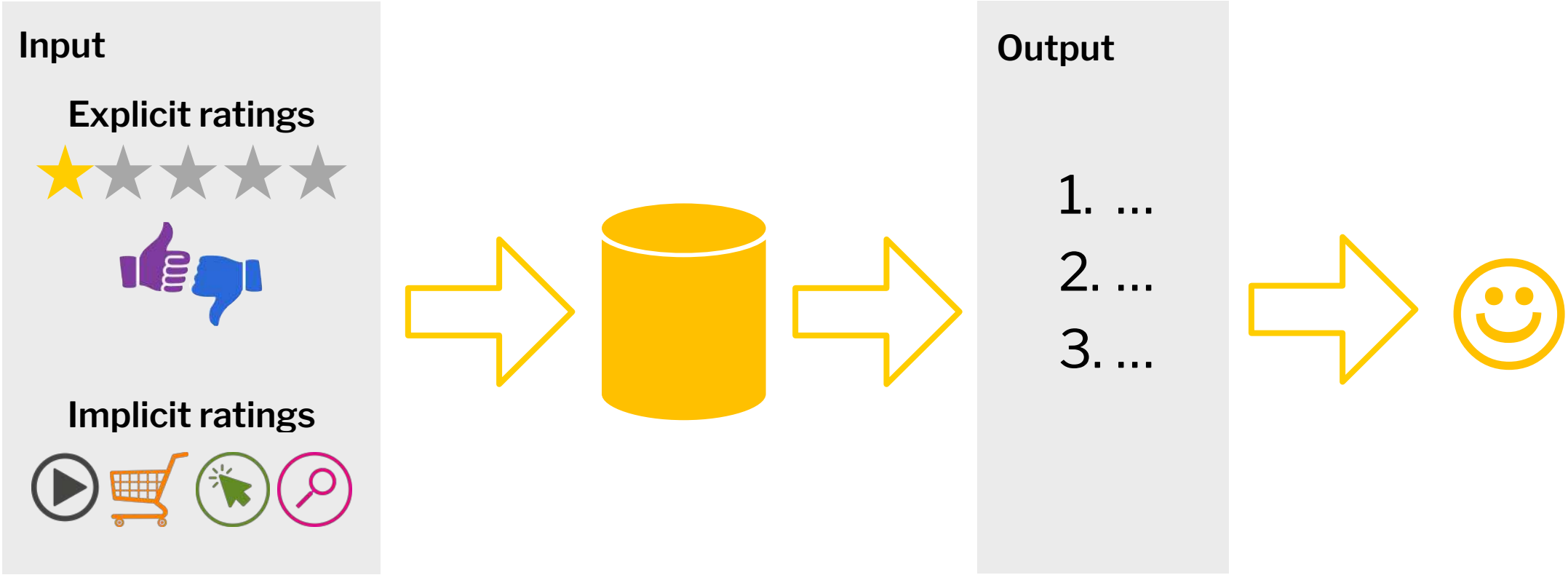

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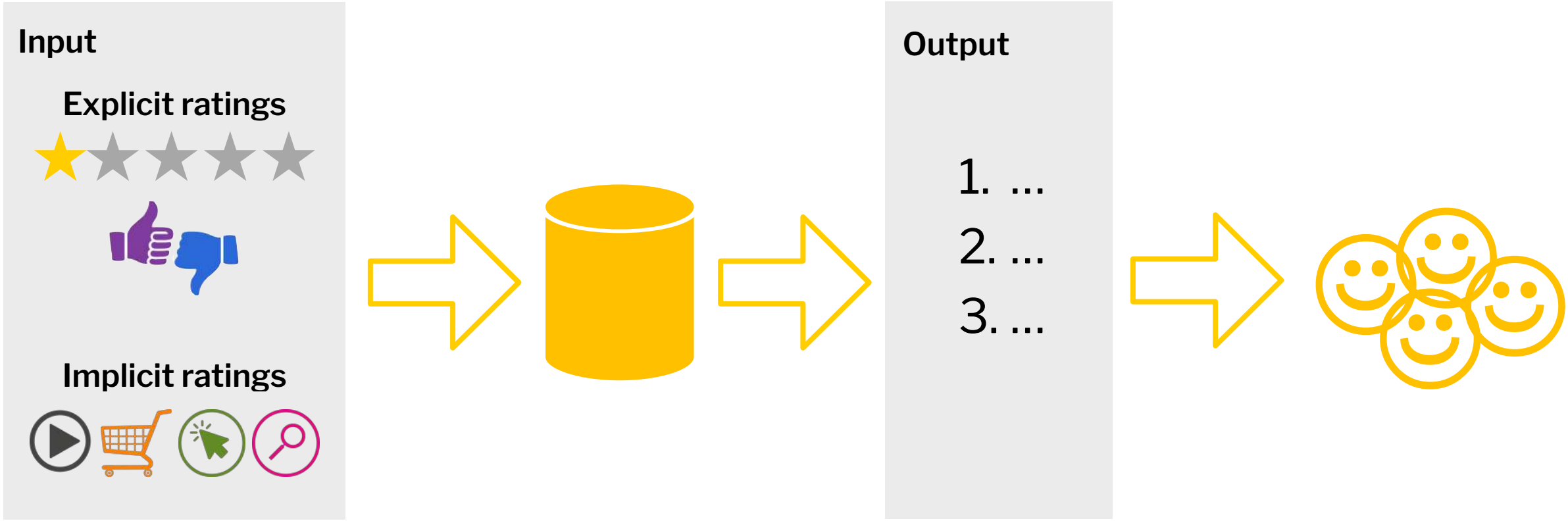

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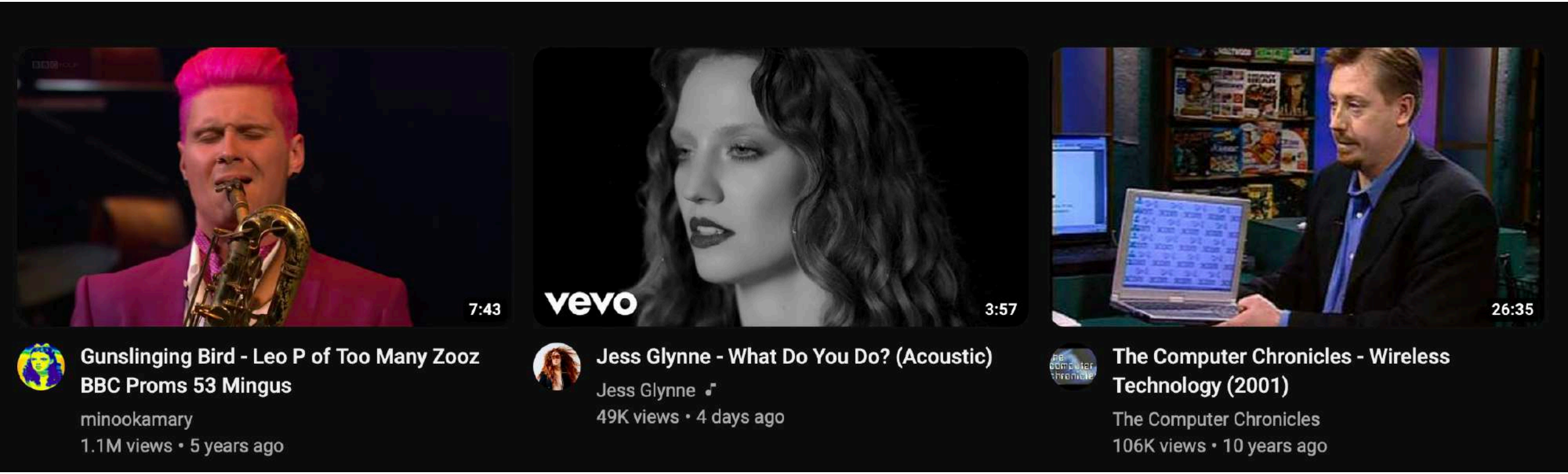
What would you choose?



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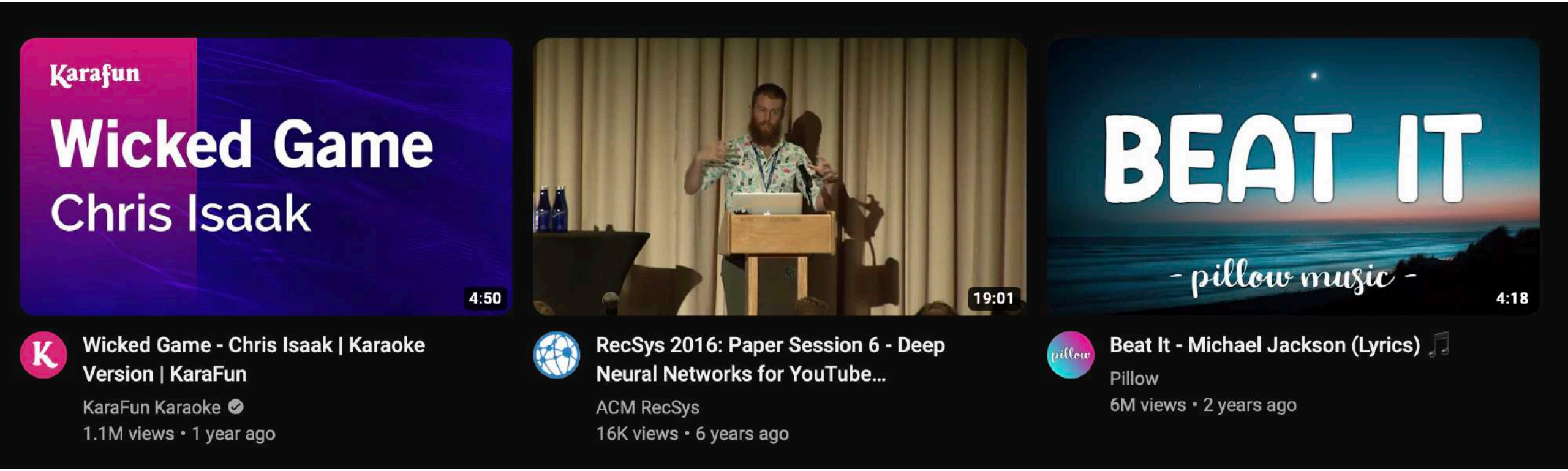
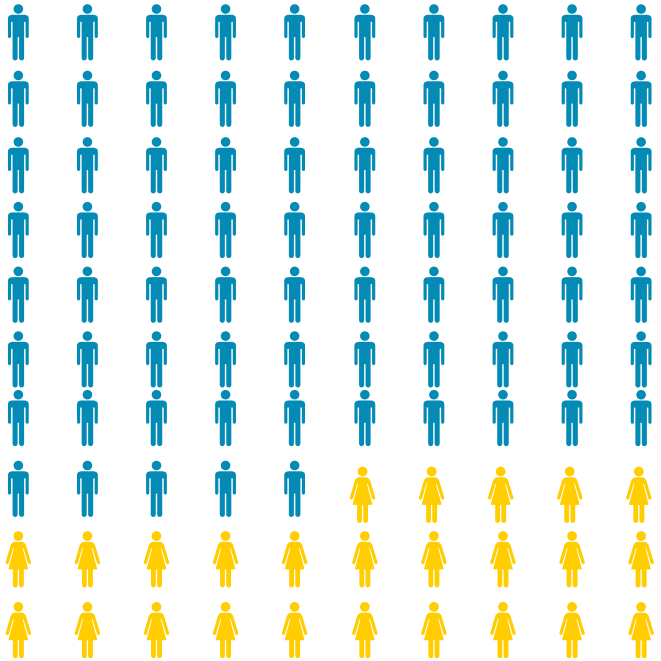


What would you choose?

Gender representation in music recommendations

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

~25% of items recommended are by a woman



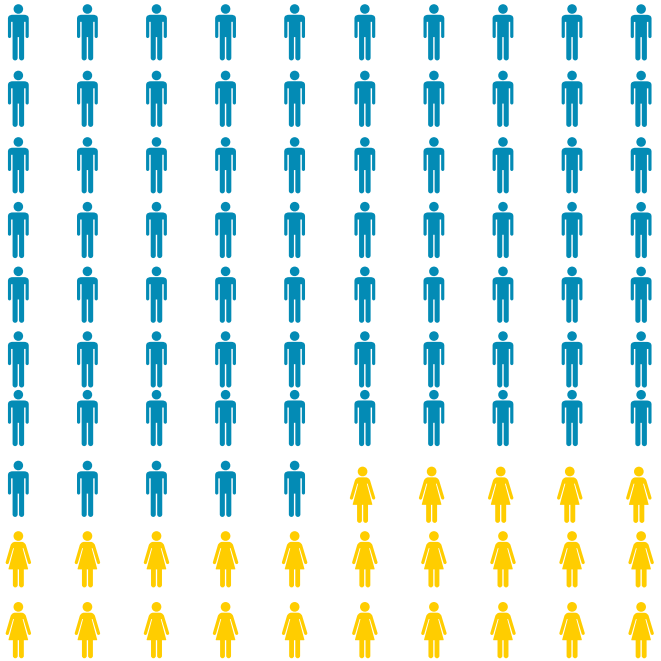
Andrés Ferraro, Xavier Serra, & **Christine Bauer** (2021). Break the Loop: Gender Imbalance in Music Recommenders. Proceedings of the 6th ACM SIGIR Conference on Human Information Interaction and Retrieval (CHIIR '21). Canberra, ACT, Australia, 14-19 March, pp 249-254. DOI: 10.1145/3406522.3446033

Gender representation in music recommendations

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

~25% of items recommended are by a woman

input dataset: ~23% of artists are women



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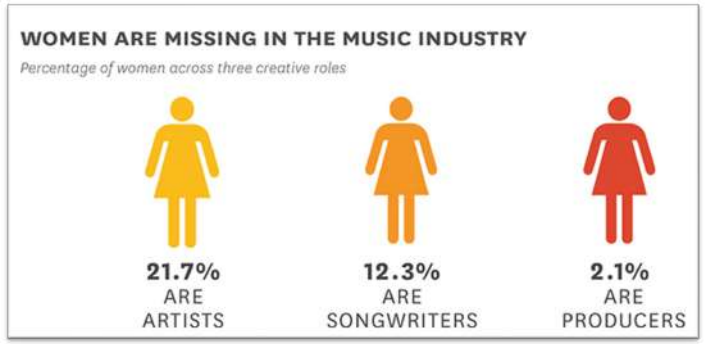
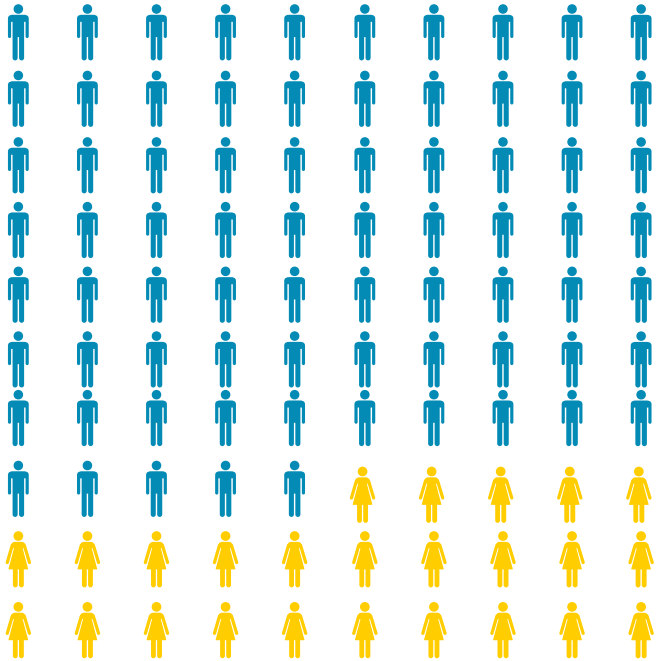


USC Annenberg Inclusion Initiative (2021)



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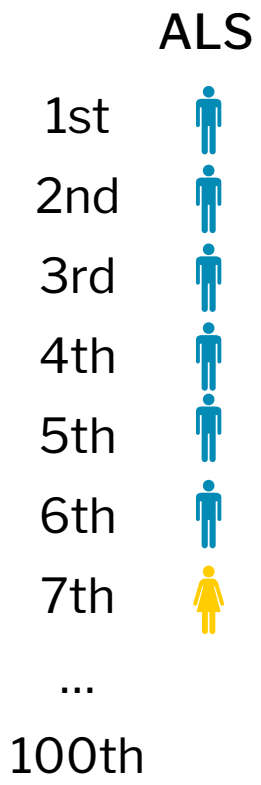
Ranking:
Chances are high that the first track is by a man.



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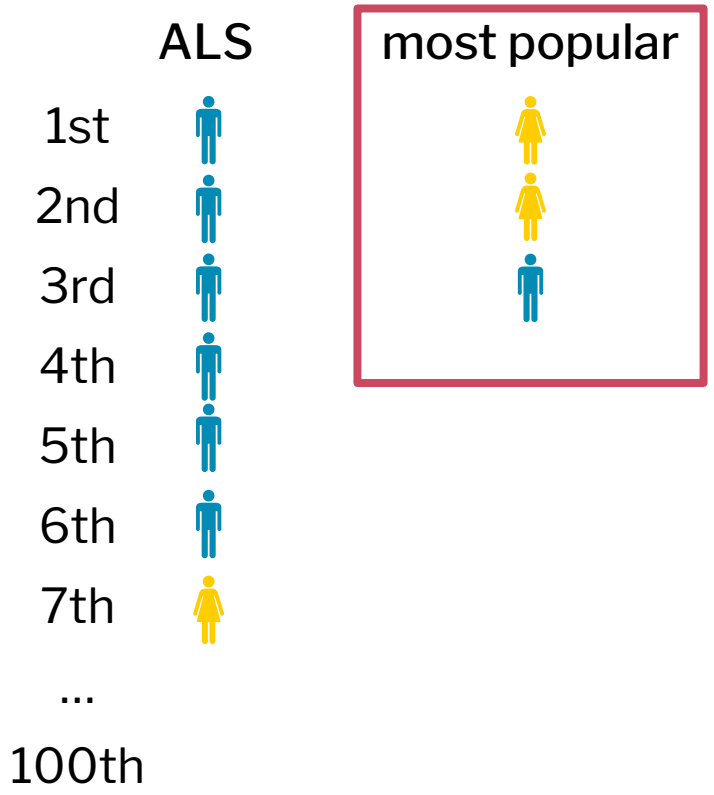

Going for “most popular” flips the results.

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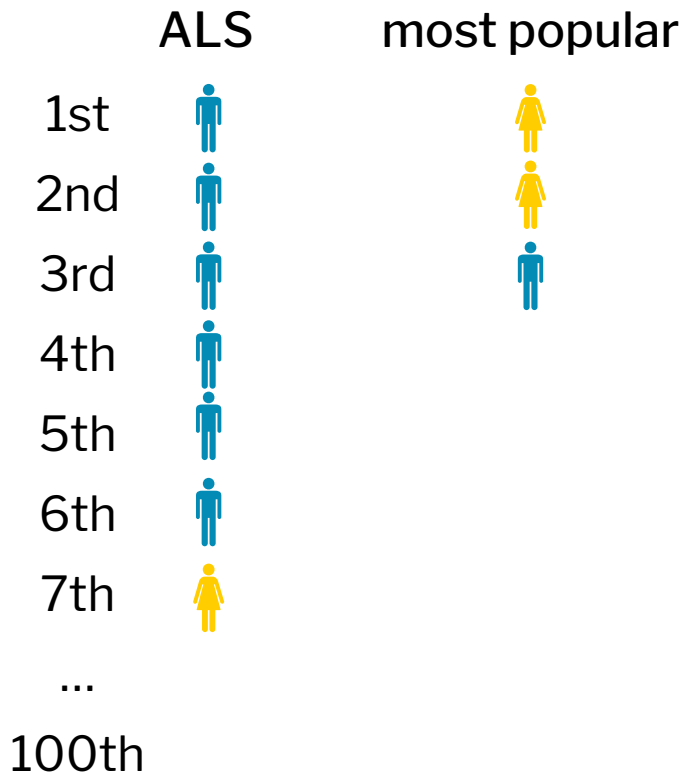

Going for “most popular” flips the results.

ALS		most popular
~19.000 unique tracks by women	vs	**130** unique tracks by women

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Focus and the big picture

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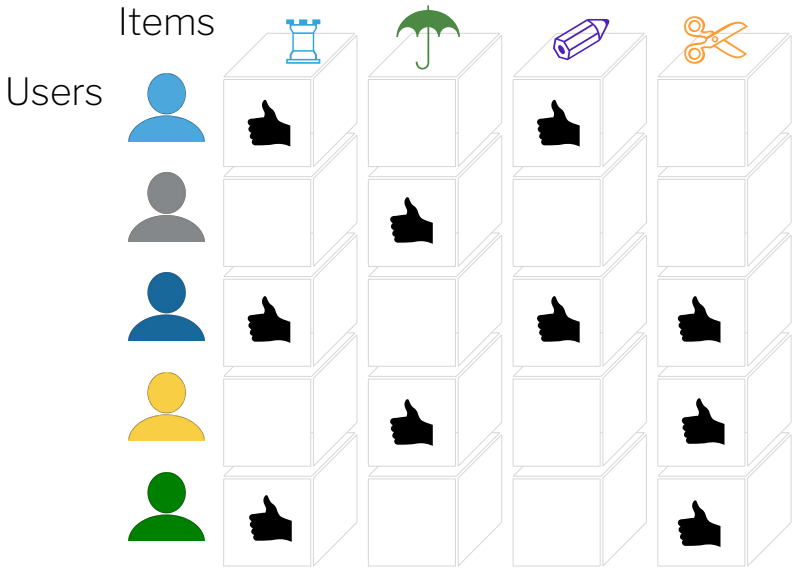
My attempts to contribute to the big picture

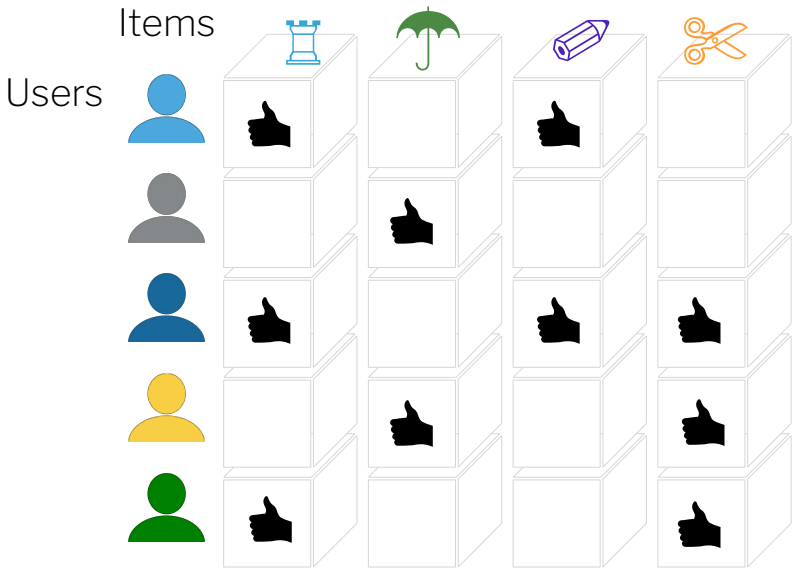
Recommendation as a matrix completion problem



Interactions observed in data.

user x item → rating

Recommendation as a matrix completion problem—context matters!



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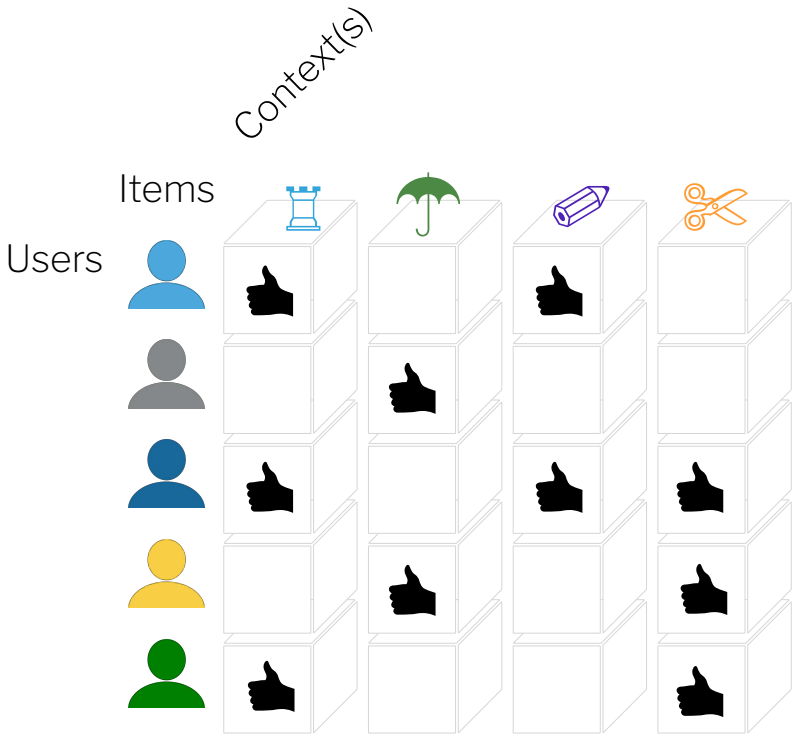

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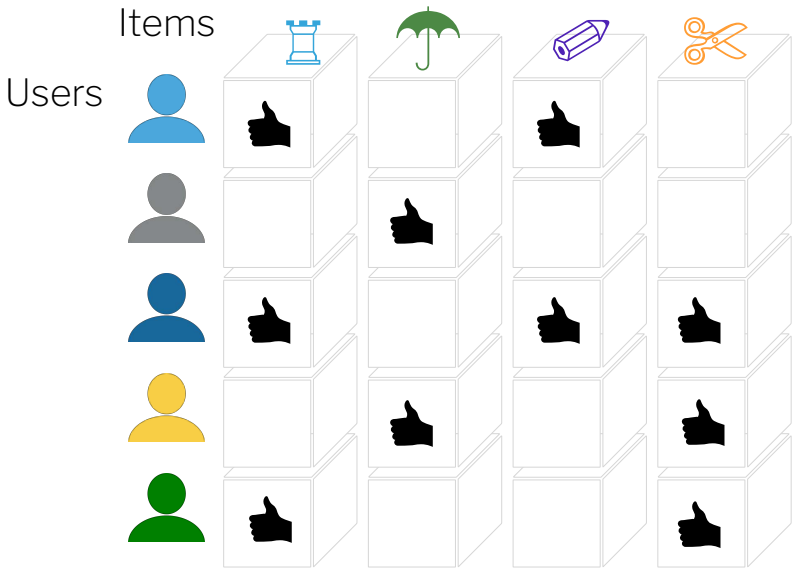

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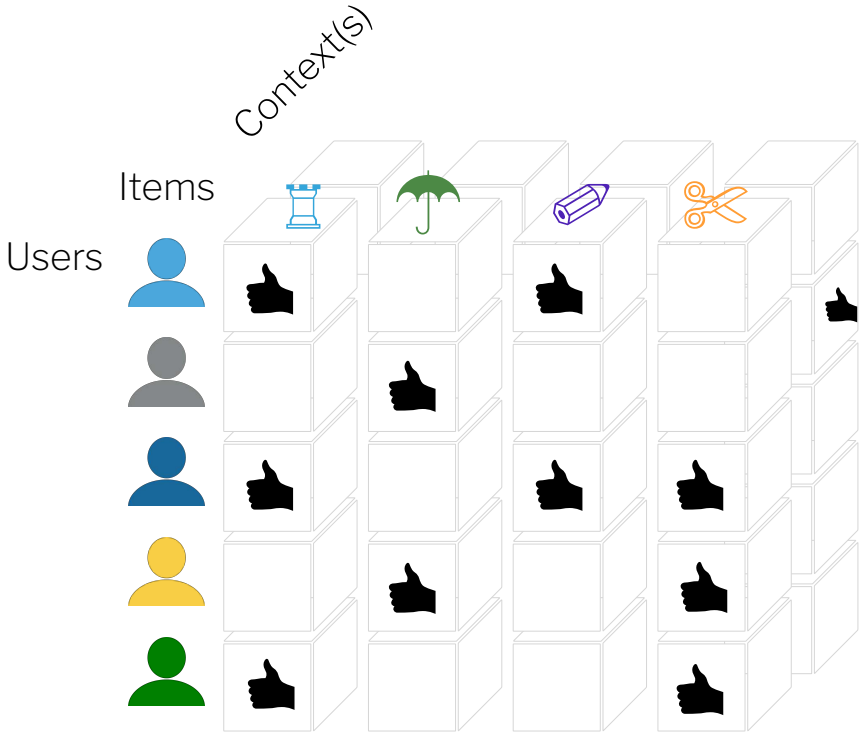

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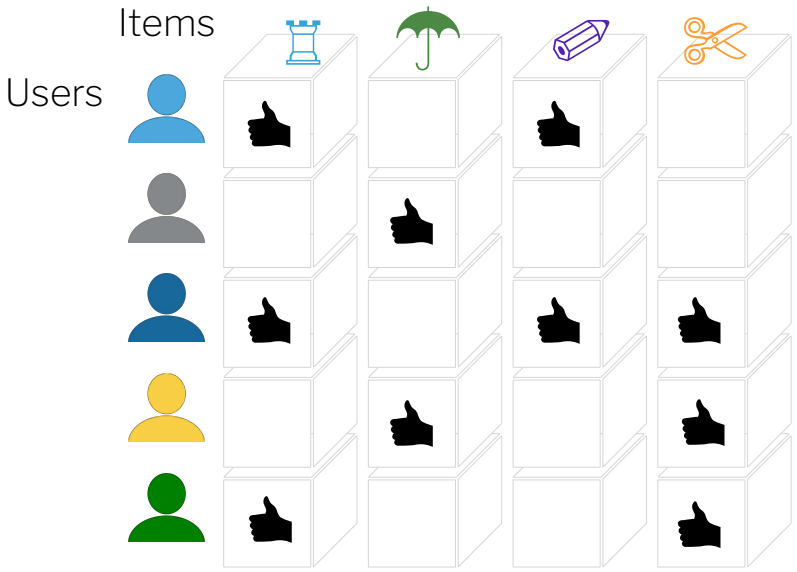

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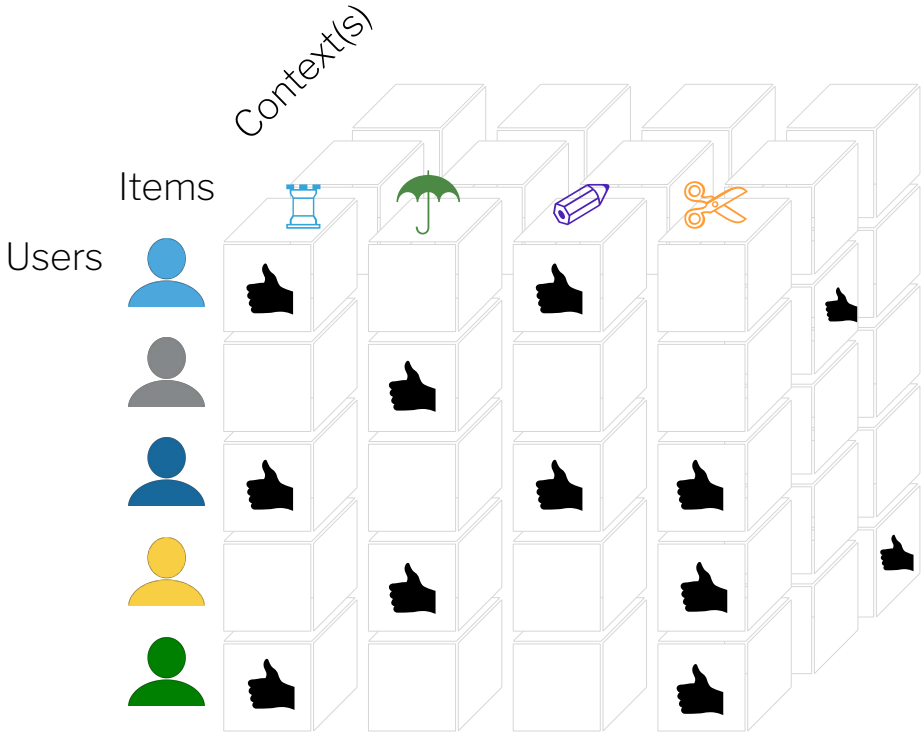

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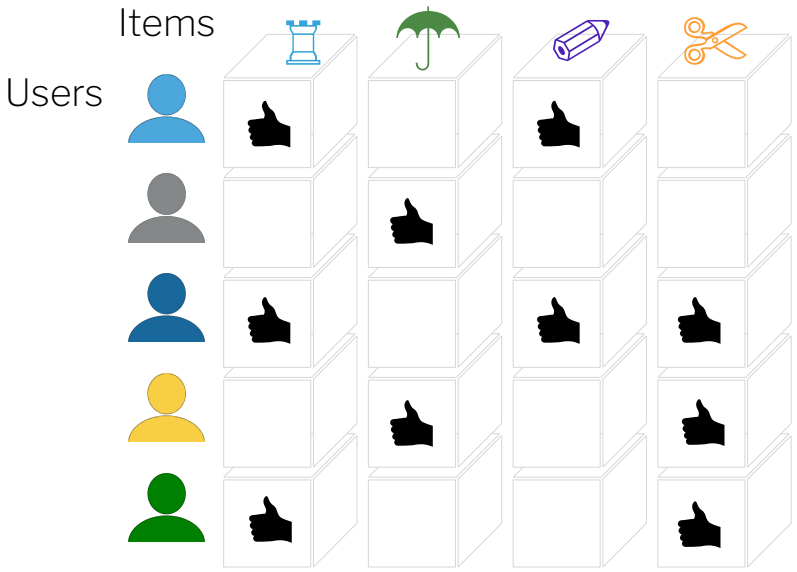

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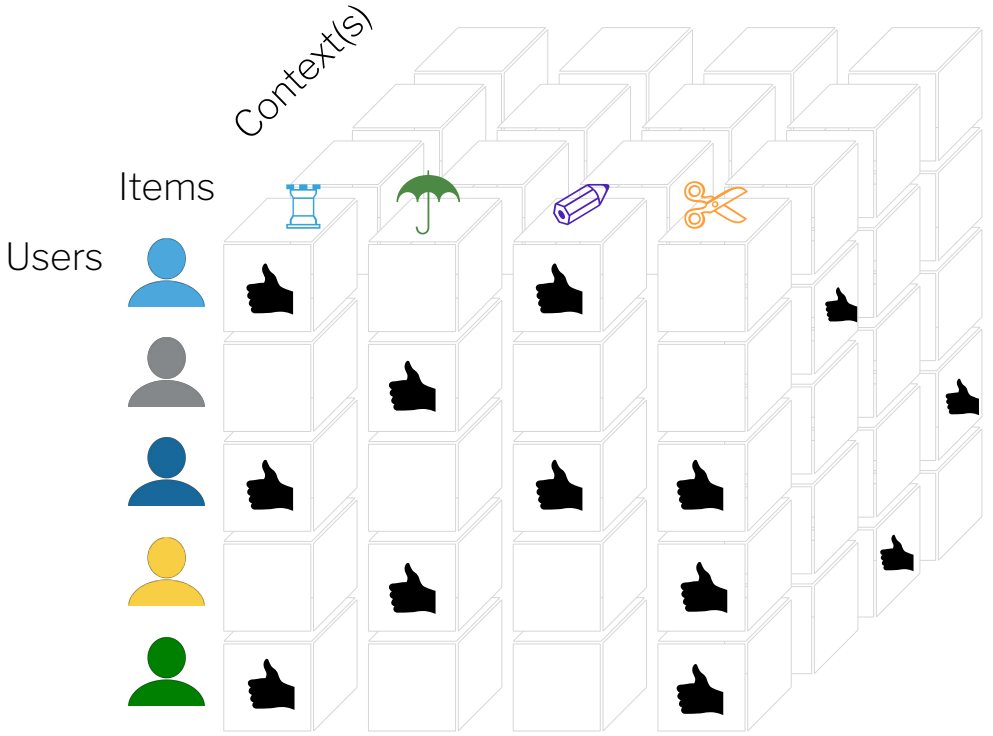


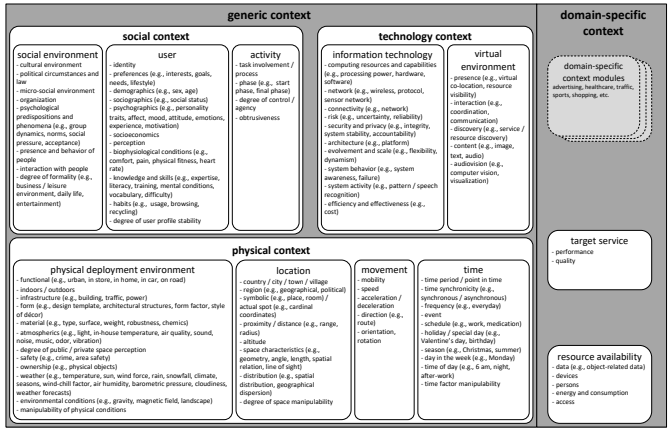
Interactions observed in data.

user x item x context → rating

There is a whole lot of context to consider

A consolidated view of context

Situationalization as an orthogonal strategy to personalization



Christine Bauer & Alexander Novotny (2017). A consolidated view of context for intelligent systems. Journal of Ambient Intelligence and Smart Environments, 9(4), pp 377-393. DOI: 10.3233/ais-170445

The PERSIT Matrix

		Situationalization	
		no	**yes**
Personalization	**no**	(I) no adaptation	(IV) adaptation to a specific situation
	1:1	(II) adaptation to a specific individual	(V) adaptation to a specific individual and to a specific situation
	1:n	(III) adaptation to a group of individuals	(VI) adaptation to a group of individuals and to a specific situation

Christine Bauer & Peter Lasinger (2014). Adaptation strategies to increase advertisement effectiveness in digital media. Management Review Quarterly, 64(2), pp 101-124. DOI: 10.1007/s11301-014-0101-0

There is a whole lot of context to consider

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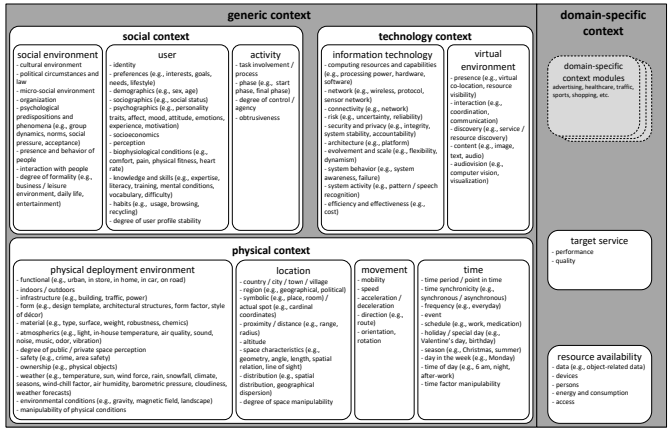
A consolidated view of context

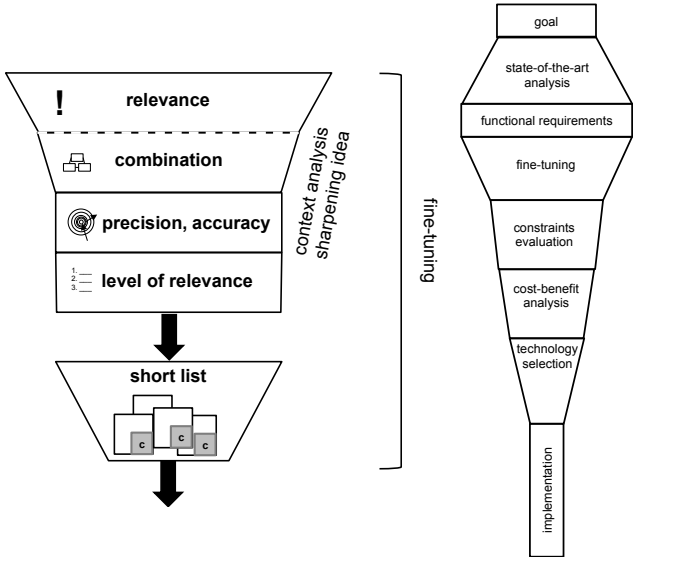
Situationalization as an orthogonal strategy to personalization

Selecting context elements



The PERSIT Matrix

Personalization	Situationalization: no	Situationalization: yes
no	(I) no adaptation	(IV) adaptation to a specific situation
1:1	(II) adaptation to a specific individual	(V) adaptation to a specific individual and to a specific situation
1:n	(III) adaptation to a group of individuals	(VI) adaptation to a group of individuals and to a specific situation



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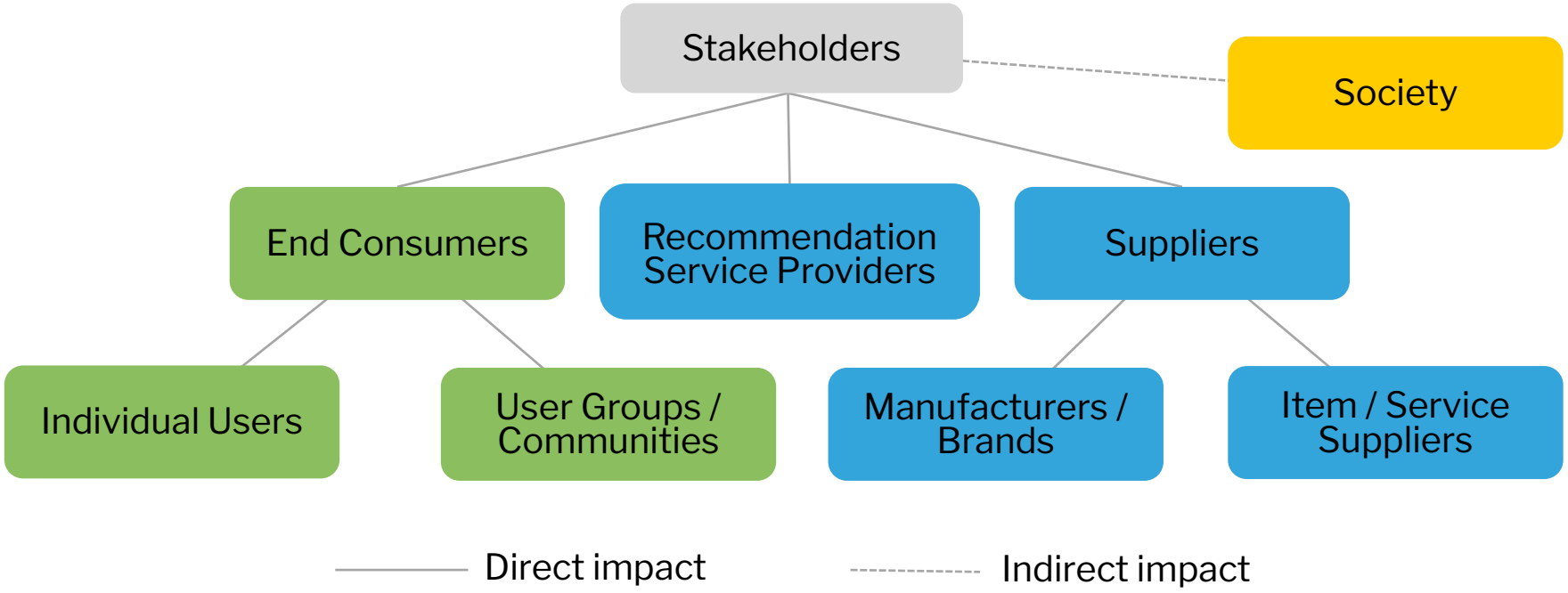
Christine Bauer & Anind K. Dey (2016). Considering context in the design of intelligent systems: current practices and suggestions for improvement. Journal of Systems and Software, 112, pp 26-47. DOI: 10.1016/j.jss.2015.10.041

Multiple stakeholders



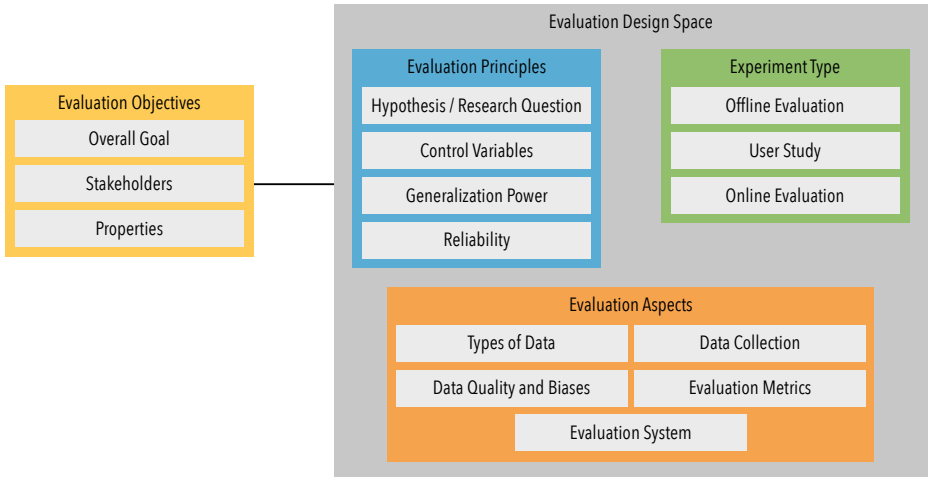
Dietmar Jannach & **Christine Bauer** (2020). Escaping the McNamara Fallacy: Toward more impactful recommender systems research. AI Magazine, 41(4), pp 79-95. DOI: 10.1609/aimag.v41i4.5312

Toward comprehensive evaluation

From system-centric evaluation toward including all stakeholders

Human-centered evaluation (broad spectrum of methods)

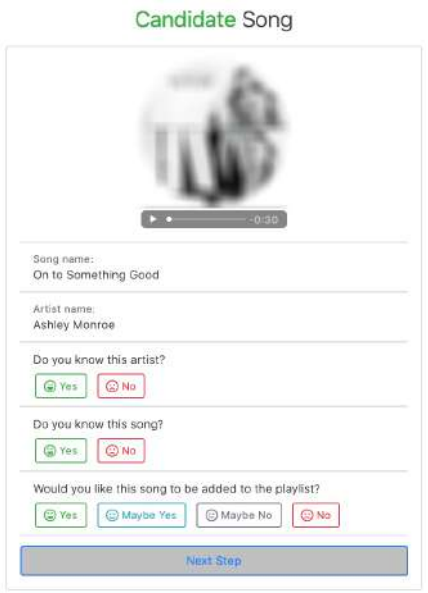
Framework for EValuating Recommender systems (FEVR)



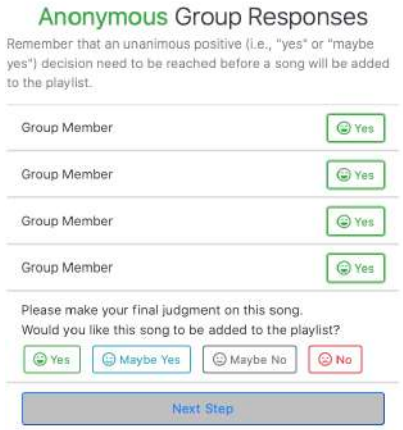
PERSPECTIVES 2021 at RecSys 2021

Eva Zangerle & **Christine Bauer** (2022). Evaluating recommender systems: survey and framework. ACM Computing Surveys, 55(8), Art no. 170, pp 1-38. DOI: 10.1145/3556536

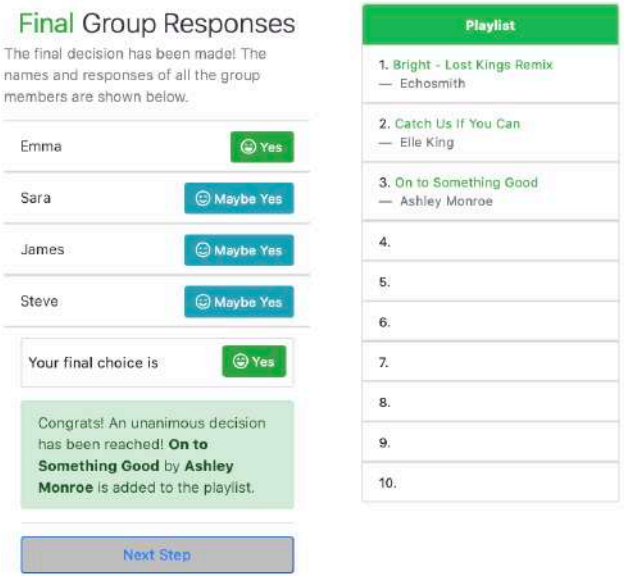
Psychological effects in decision-making



Candidate song to be added to the playlist.



The group's votes, allowing the participant to revise their voting.



Song added to a group's playlist after reaching consensus.

Christine Bauer & Bruce Ferwerda (2023). The effect of ingroup identification on conformity behavior in group decision-making: the flipping direction matters. Proceedings of the 56th Hawaii International Conference on System Sciences (HICSS 2023). Maui, HI, USA, 3-6 January, pp 2242-2251. URL: https://hdl.handle.net/10125/102908

Bruce Ferwerda & **Christine Bauer** (2022). To flip or not to flip: conformity effect across cultures. Proceedings of the CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI EA '22). New Orleans, LA, USA, 29 April - 5 May, Art no. 370, 7 pages. DOI: 10.1145/3491101.3519662

Christine Bauer & Bruce Ferwerda (2020). Conformity behavior in group playlist creation. Proceedings of the CHI Conference on Human Factors in Computing Systems (CHI EA '20). Honolulu, HI, USA, 25-30 April, LBW 114, pp 1-10. DOI: 10.1145/3334480.3382942

Critical challenge: Fairness

My approach in addressing this topic—an example

RQs	Methods	Results	
What is fair from the artists' perspective?	Explorative Qualitative approach (interviews, QCA)	Major problem: gender imbalance	*"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

Andrés Ferraro, Xavier Serra, & **Christine Bauer** (2021). What is fair? Exploring the artists' perspective on the fairness of music streaming platforms, INTERACT 2021. DOI: 10.1007/978-3-030-85616-8_33

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My approach in addressing this topic—an example

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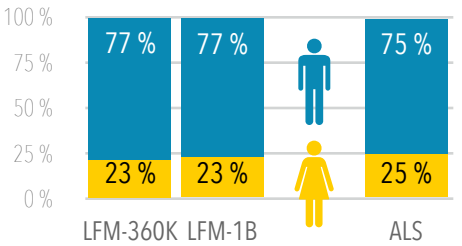
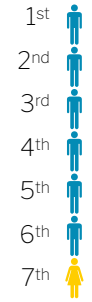
▸ How are datasets distributed regarding artists' gender? ▸ How do algorithms perform regarding gender fairness?	last.fm MusicBrainz Data enrichment Data analysis Offline evaluation	Statistical parity  Avg. 1st position of women: 7th 

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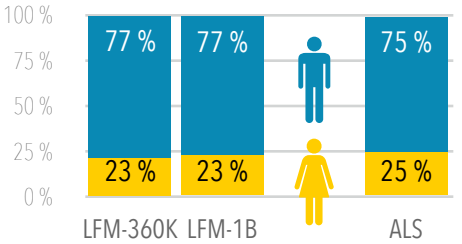
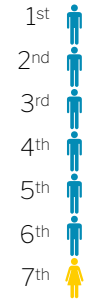
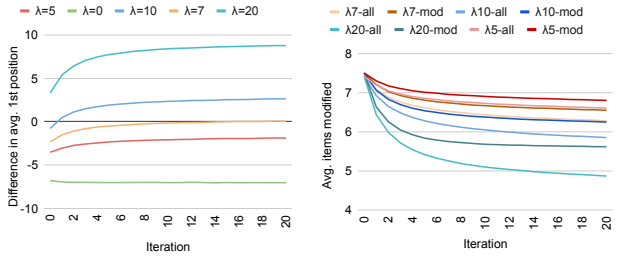
▸ How are datasets distributed regarding artists' gender? ▸ How do algorithms perform regarding gender fairness?	last.fm MusicBrainz Data enrichment Data analysis Offline evaluation	Statistical parity  Avg. 1st position of women: 7th 
▸ Intervention: Progressive re-ranking ▸ What are the longitudinal effects of this intervention?	Simulation of feedback loops	Break the loop 

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We might not solve everything
→ but we can do better!

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The big picture as a scientist

Also here:
Focus and the big picture

We need to build a portfolio.
Somehow it is similar to a decathlon

Wikimedia

Getty Images

Peter Rinderer/APA/AFP

Steph Chambers/Getty Images

Andy Lyons/Getty Images

Simon Bruty/SI

AP Photo/David J. Phillip

https://indiasportshub.com/feature-event-400m/

dpa/Jens Büttner

Erik van Leeuwen

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The 3 pillars of an academic researcher

Research

Teaching

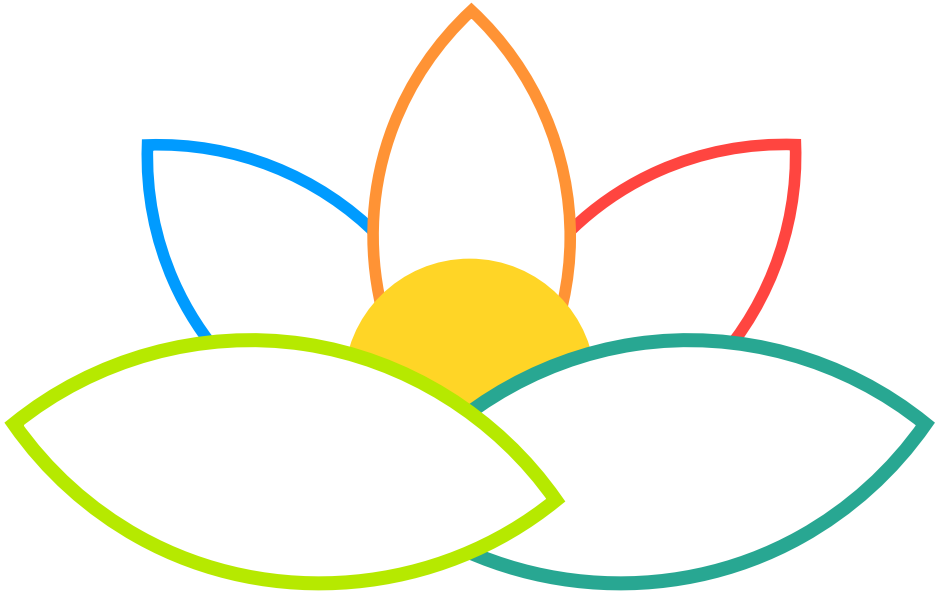
Administration

The 10 disciplines of a scientist (Mertens 2010)

Research and communication within science	Research and transfer to industry	Teaching	Writing textbooks	Communication to the public
Publications	talks at industry-related organizations, MBA courses, cooperative research, patents	including supervision of students, creation of research internships		transfer to politics and society, media presence
Third-party funding=Money	University self-organization tasks	Service to the community	Furthering young academic talent	Advancement of local facilities
				attracting students, education of students, support for spin-offs

Peter Mertens (2010). Der Zehnkampf des Hochschullehrers – Setzen wir falsche Anreize? https://www.if-blog.de/wp-content/uploads/downloads/2010/03/Zehnkampf-Arbeitsbericht_2Aufl.pdf

TRIPLE model of Utrecht University



- TEAM
- RESEARCH
- IMPACT
- PROFESSIONAL PERFORMANCE
- LEADERSHIP
- EDUCATION

TRIPLE MODEL

https://www.uu.nl/sites/default/files/UU-Recognition-and-Rewards-Vision.pdf

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What *I* take as *my* pillars

- Research and publications
- Third-Party Funding=Money
- Teaching
- Service to the Community
- Communication to the Public

What *I* take as *my* pillars

- Research and publications
- Third-Party Funding=Money
- Teaching
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What we need to keep in mind

What does my current employer expect?

What does my future employer want?

What is my community and what does my community expect?

What do I want?

Scientific integrity

current situation — future situation

short-term wins — long-term impact (and image!)

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My journey

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Interactive Intelligent Systems

Recommender systems, Context-adaptivity
Fairness
Music and media sector
Multi-method evaluation

Research

Teaching

Business

Department of Artificial Intelligence and Human Interfaces

christine.bauer@plus.ac.at
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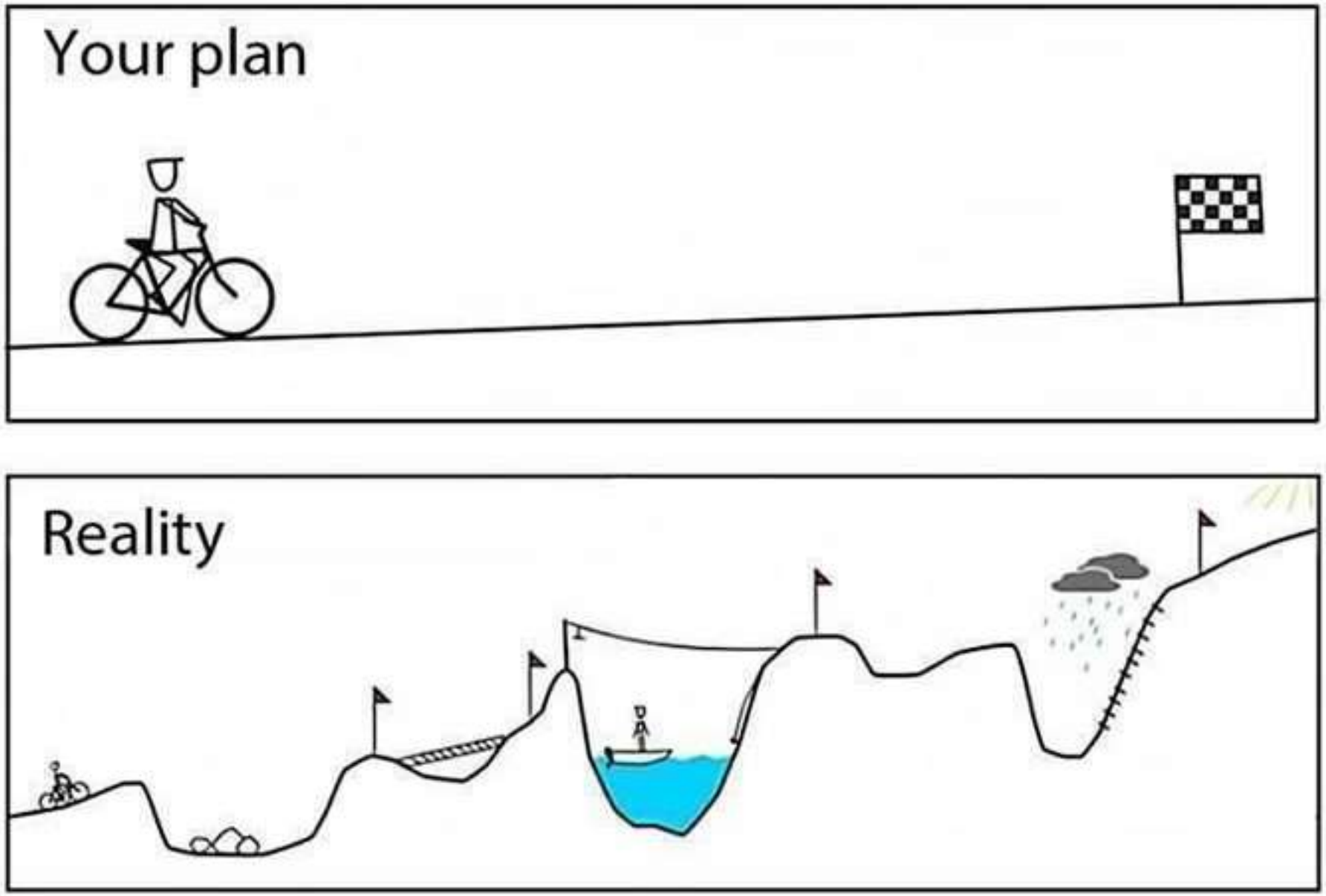
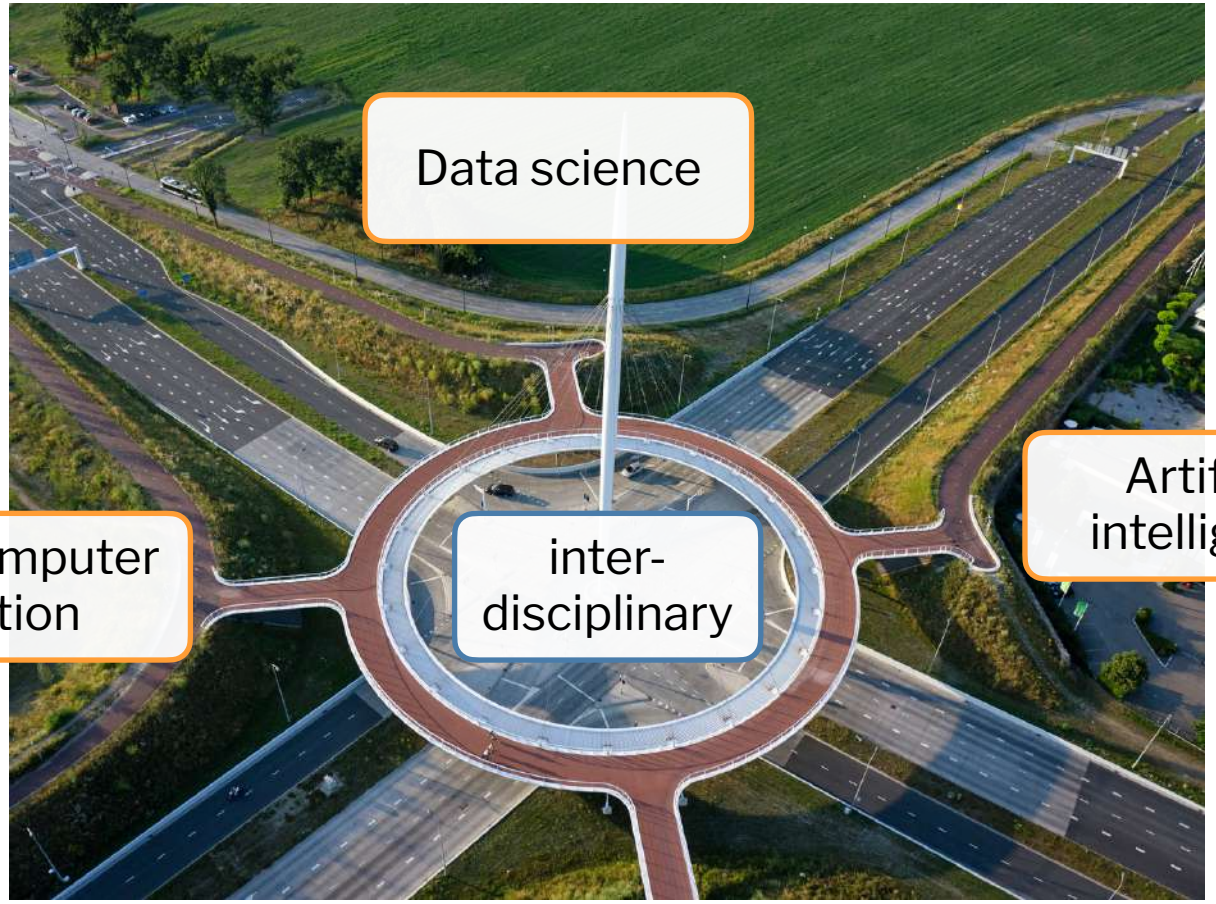
@christine_bauer


Your plan
Reality

My educational background

universität wien	International Business Administration Diploma	Swansea University Prifysgol Abertawe
TU WIEN	Business Informatics MSc	
universität wien	Social and Economic Sciences (Business Informatics) Doctorate	
	Jazz Saxophone Study program	MUK MUSIC AND ARTS UNIVERSITY OF THE CITY OF VIENNA

Building bridges



I am an interdisciplinary researcher.

Methodology

- Algorithmic experimentation
- Analytical research
- Quantitative methods
- Qualitative methods
- Modeling

Perspectives Home Call for Papers Important Dates Committee Perspectives 2021 Perspectives 2022

Alan Said

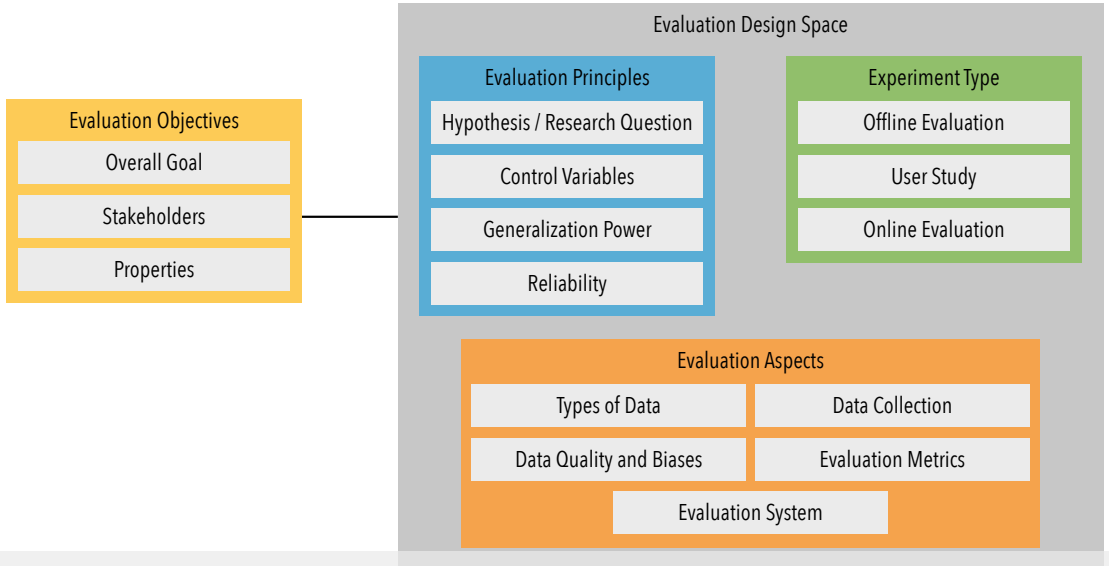
Eva Zangerle

Christine Bauer

19 September 2023, @RecSys 2023
https://perspectives-ws.github.io

Women In RecSys Session @RecSys 2023

Framework for EValuating Recommender systems (FEVR)



Women in RecSys: Journal Paper of the Year Award 2023, Senior category

Eva Zangerle & **Christine Bauer** (2022). Evaluating recommender systems: survey and framework. ACM Computing Surveys, 55(8), Art no. 170, pp 1-38. DOI: 10.1145/3556536

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Christine Bauer
EXDIGIT Professor of Interactive Intelligent Systems
Department of Artificial Intelligence and Human Interfaces (AIHI)

Keep an eye on the big picture— in recommender systems research and as a scientist

Christine Bauer

Women in RecSys
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