FIRST KEYNOTE

Interactive and adaptive explanation interfaces for recommender systems

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WOMEN IN **DATA SCIENCE**
MAASTRICHT

#WiDSMaastricht2023

Interactive and adaptive explanation interfaces for recommender systems

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High stakes, poor transparency!

2,75 miljoen euro boete

Top 400-lijst
Ook jongeren die niets
hebben uitgehaald komen

THE ALGORITHM ADDICTION

DECEMBER 20, 2022

Mass profiling system SyRI resurfaces in the Netherlands despite ban and landmark court ruling
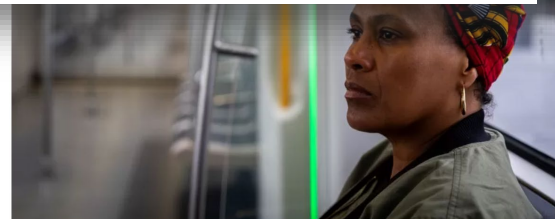
19th of October 2021, het Parool

Welfare surveillance system violates human rights, Dutch court rules

Government told to halt use of AI to detect fraud in decision hailed by privacy campaigners

In de documentaire 'Moeders' komen moeders aan het woord van jongeren die in de Top 400 staan. De vrouw op de foto is een actrice, niet een echte moeder van een Top-400 kind. Beeld VPRO, BALDR Film

5th Feb 2020, The Guardian

22th November 2022, Trouw

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Before we can diagnose the causes
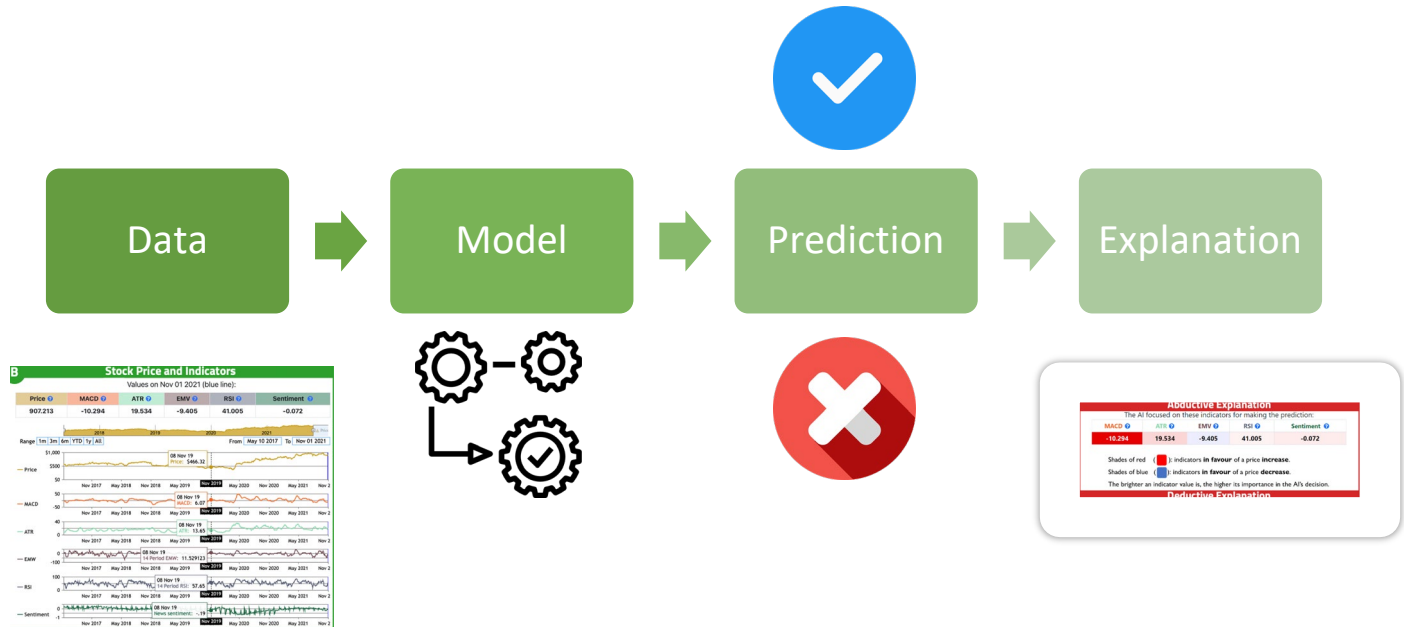
Why should we explain?

Overemphasis on model "performance"

- insufficiently grounded in application and consequences
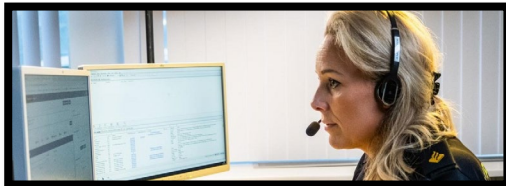
Explanations considered late

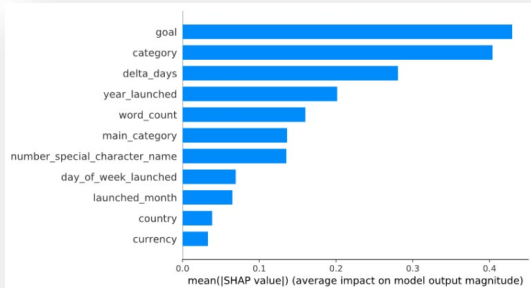- If at all
- Not human understandable
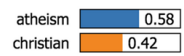

Comic from xkcd:
https://xkcd.com/1838/

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- **Predictive policing by the Dutch police.**
- We discovered that the interpretation and filtering of the AI **outputs was too difficult to leave to the police officers** themselves.
- To solve this problem, the police set up an intelligence unit which translates the AI outputs into what police officers must actually do.
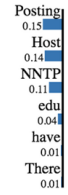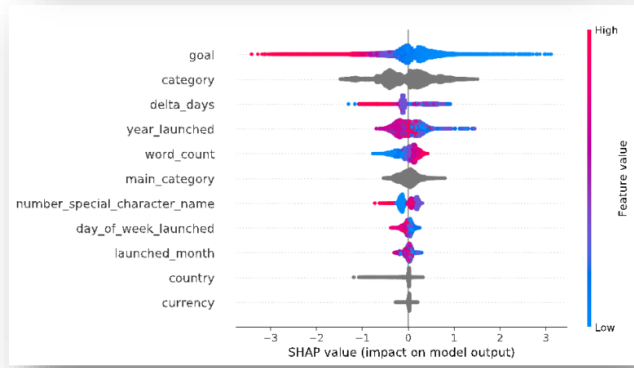
Credit: politie.nl

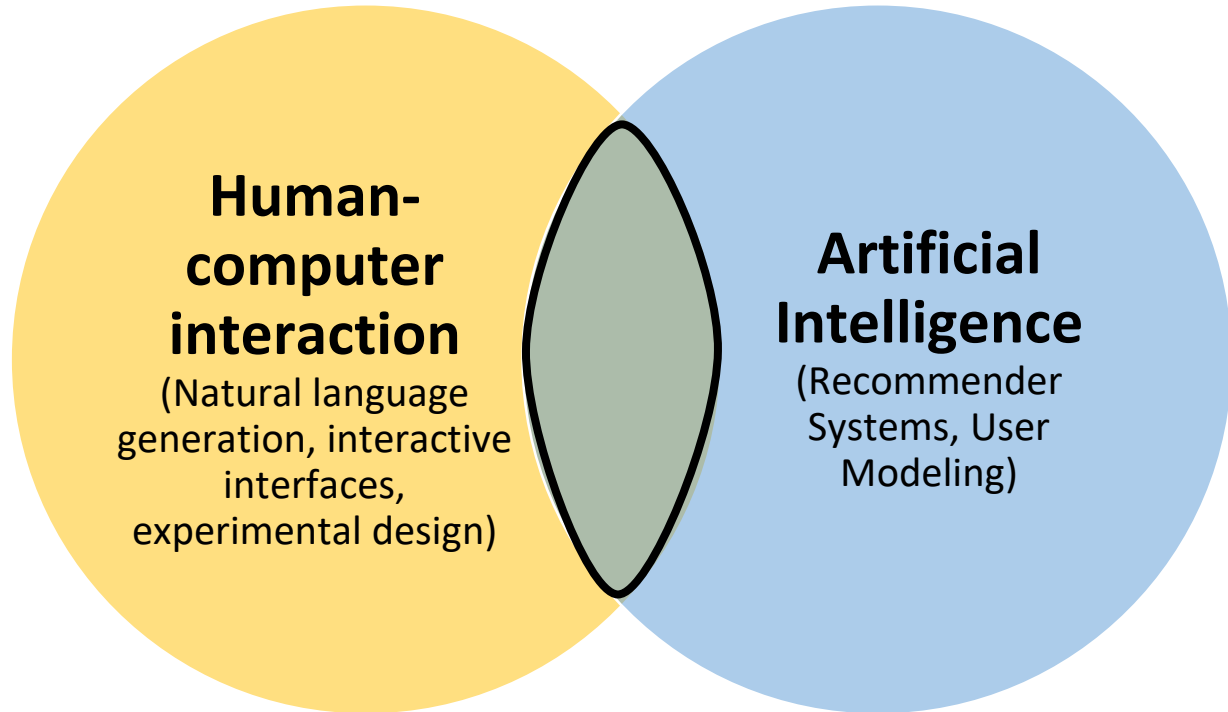**Progress on generating explanations! How understandable are they?**
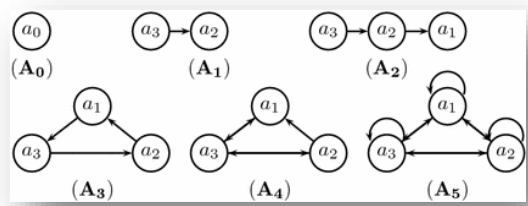
Interpretability is

- the degree to which a <u>human</u> can understand the cause of a decision (Miller 2017)
- the degree to which a <u>human</u> can consistently predict the model's result (Kim et al 2016)
- To which extent the model and/or the prediction are <u>human-</u>understandable (Guidotti et al 2018, Amparore et al 2020)

Intelligent User Interfaces

Program chair:
UMAP'21, IUI'20

Senior reviewer:
ECAI, IUI, Recsys,
UMAP, TiiS

Human-computer interaction
(Natural language generation, interactive interfaces, experimental design)

**Artificial Intelligence**
(Recommender Systems, User Modeling)

User interface vs algorithm

Keynote: Top 10 Lessons Learned Developing Deploying and Operating Real-world Recommender Systems (Francisco J. Martin, Strands, 2009)

Think about application context; Focus on interface as much as algs; … the UI needs to get the lion's share of the effort (50%) compared to algorithms (5%), knowledge (20%), analytics (25%)
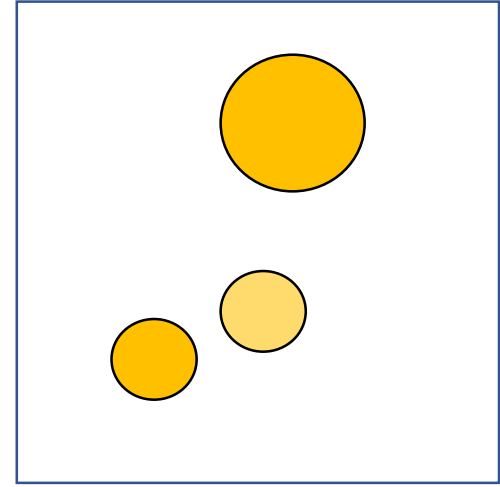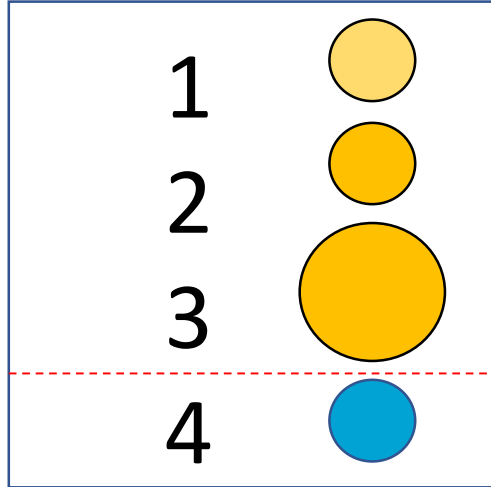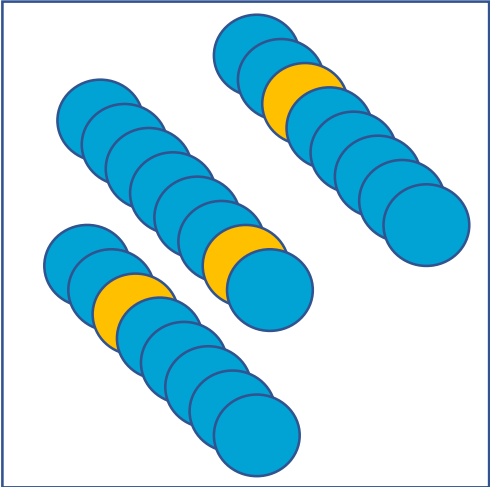
User Interface

Algorithm

Presentation

Interaction
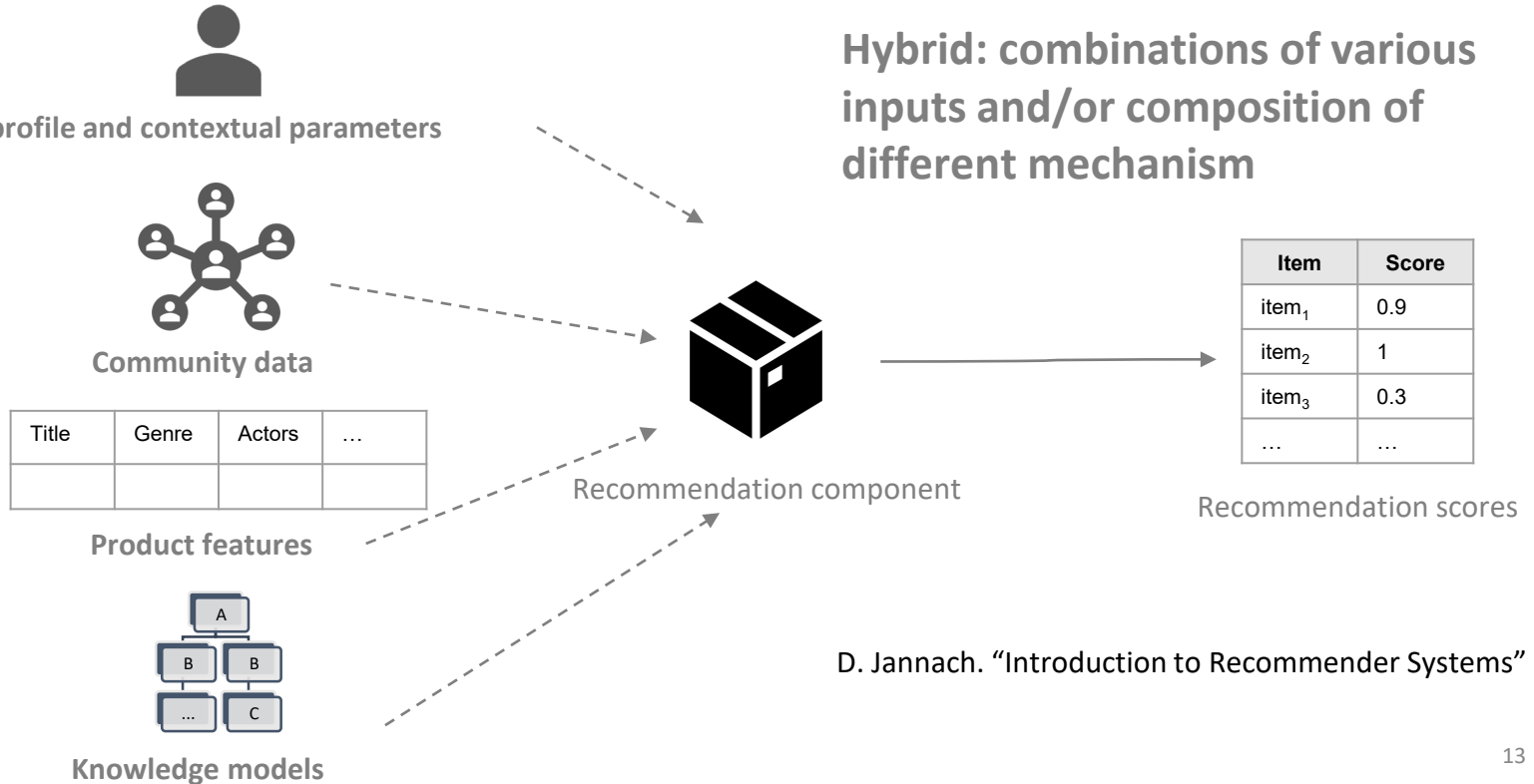
Data
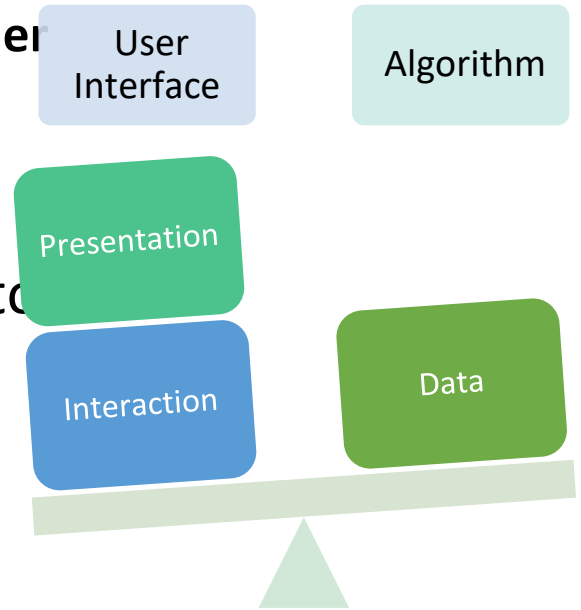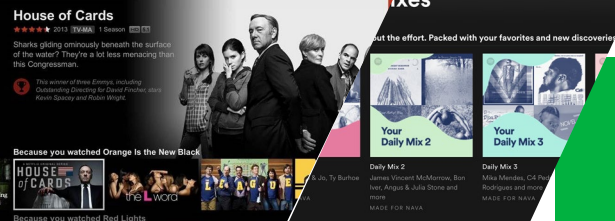
How does a RS work?

Systems that make personalized recommendations of goods, services, and people (Kautz)

- User identifies one or more objects as being of interest
- The recommender system suggests other objects that are similar (infers liking)
- Ranking and filtering algorithm
  - Ranks the options, filters out lower ranking options

What could be "similar"?

User profile and contextual parameters

Community data

Title	Genre	Actors	…

Product features

Knowledge models

Hybrid: combinations of various inputs and/or composition of different mechanism

Recommendation component

Item	Score
item$_1$	0.9
item$_2$	1
item$_3$	0.3
…	…

Recommendation scores

D. Jannach. "Introduction to Recommender Systems"

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PhD: Decision support in Recommender systems

Users wonder why this book.
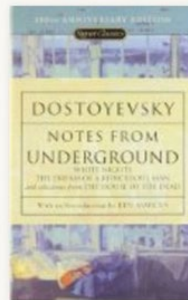What makes for a **good** explanation?

Judith Masthoff

Ehud Reiter

RECOMMENDATIONS

Because you enjoyed Harry Potter and the Cursed Child - Parts One and Two (Harry Potter, #8):

Notes from Underground, White Nights, The Dream of a Ridiculous Man, and Selections from The House of the Dead
by Fyodor Dostoyevsky
★★★★½ 4.17 avg. rating

Want to Read

A collection of powerful stories by one of the masters of Russian literature, illustrating the author's thoughts on political philosophy, religion and above all, humanity: No... Continue reading

View all books similar to Harry Potter and the Cursed Child - Parts One and Two (Harry Potter, #8)

Why explain (recsys)

Purpose	Description
Transparency	Explain how the system works
Effectiveness	Help users make good decisions
Trust	Increase users' confidence in the system
Persuasiveness	Convince users to try or buy
Satisfaction	Increase the ease of use or enjoyment
Scrutability	Allow users to tell the system it is wrong
Efficiency	Help users make decisions faster

Trade-offs?

Recommender Systems Handbook Chapter (3rd Ed), Tintarev and Masthoff 2022

Trade-offs between goals

- Benefit of personalized text?
- It matters what you measure!
    - Personalized explanations worse for decisions
    - but people were more satisfied!
- People had a hard time having an opinion for "baseline" explanations

Non-personalized:
"This movie belongs to the genre(s): Action & Adventure and Comedy. On average other users rated this movie 4/5.0"

Personalized:
"Unfortunately, this movie belongs to at least one genre you do not want to see: Action & Adventure. It also belongs to the genre(s): Comedy. This movie stars Jo Marr and Robert Redford."

Baseline:
"This movie is not one of the top 250 movies in the Internet Movie Database (IMDB). "

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Factors influencing explanation effectiveness

[Knijnenburg2012]
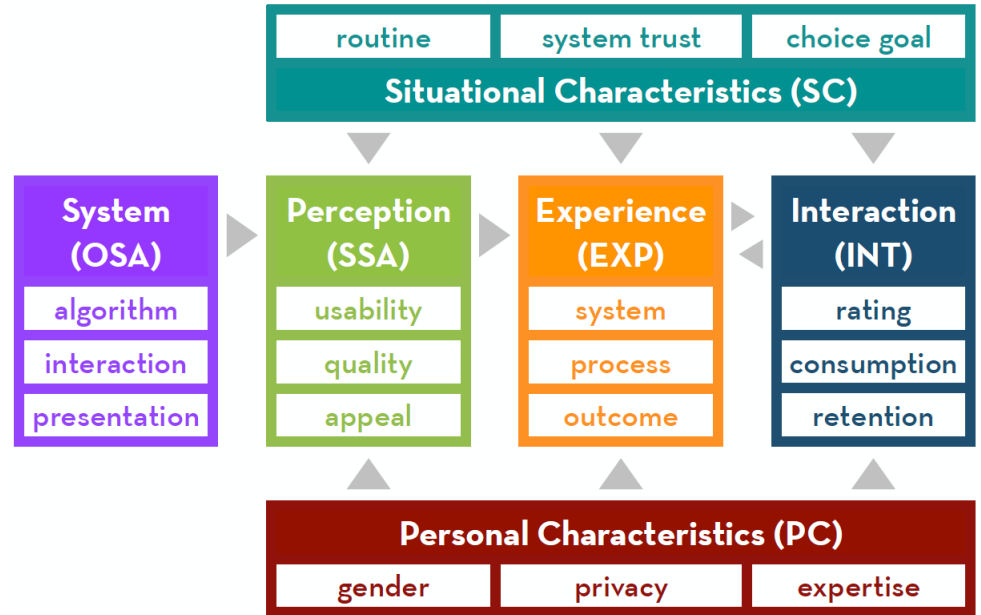
Explanation effectiveness
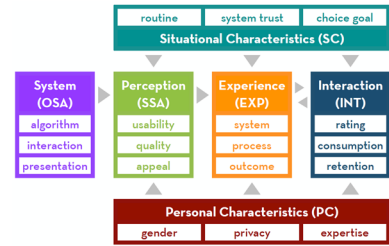
Situational Characteristics?

- Explaining the ``Unexpected" [Rieger2021, Draws2020, Draws2022, Draws2023]
- Group explanations [Najafian2023, Barile2021]
- Multi-stakeholder explanations e.g., jobs [Schellingerhout'22]

Personal Characteristics?

Working memory & Expertise [Jin et al 2018: UMAP and Recsys, UMUAI 2019]

Need for Cognition [Rieger et al. *ACM HyperText'2021* 🏆]

Katrien Verbert
Professor, KU Leuven

Jin et al 2018: UMAP and Recsys, UMUAI 2019

Yucheng Jin
Assistant Professor, HKBU

User profile (PRO)   Algorithm parameters (PAR)   Recommendations (REC)

+Visualization

Influence of expertise and cognition?

- **User control:** Expertise influenced <u>the acceptance</u> of recommendations

- **Visualization:**
  - Expertise influenced <u>perceived diversity</u>
  - Cognition interacted with visualizations for <u>perceived diversity</u>

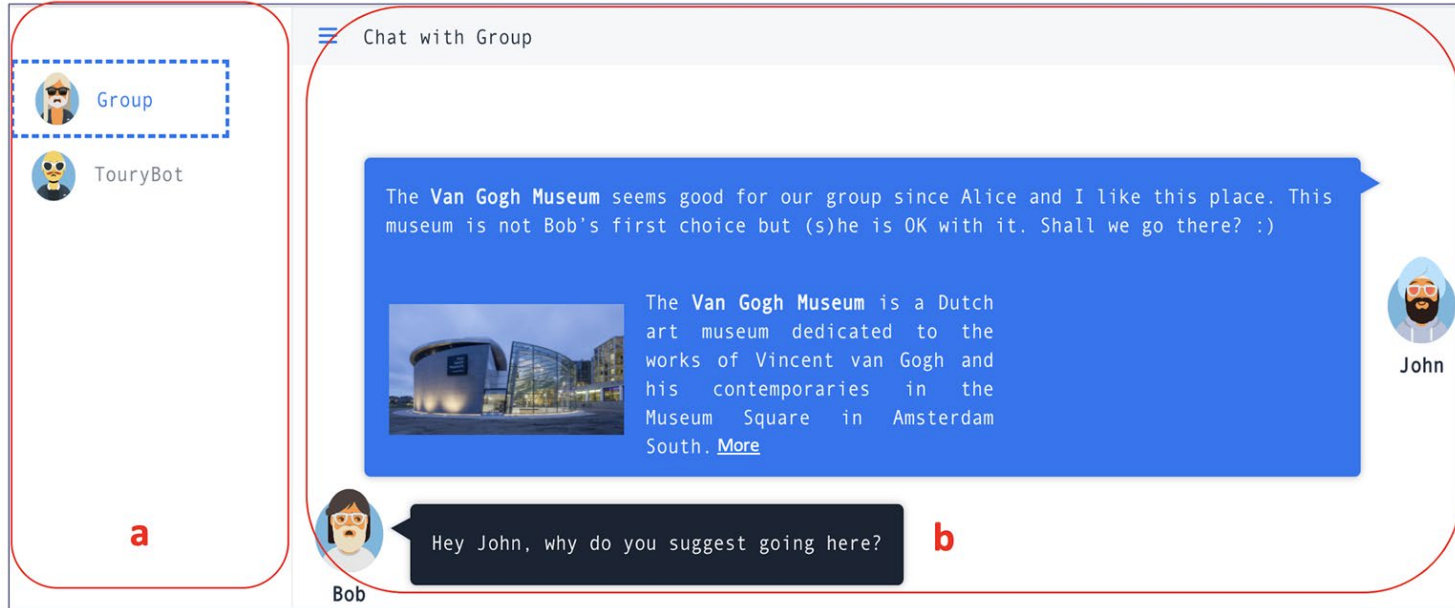| PCs	Exp. 1 User controls	Exp. 2 Visualizations	Exp. 3 Controls+Vis.
Visual memory (VM)	Acceptance (no) Diversity (no) Cognitive load (no)	Acceptance (no) Diversity (+)	Acceptance (no) Diversity (+)
Musical sophis- tication (MS)	Acceptance (+) Diversity (no) Cognitive load (no)	Acceptance (no) Diversity (+)	Acceptance (+) Diversity (+)

Hoptopics

Kang et al 2016
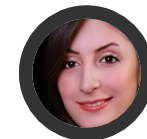

Person to person (CF)
Also content-based

Two "hops"

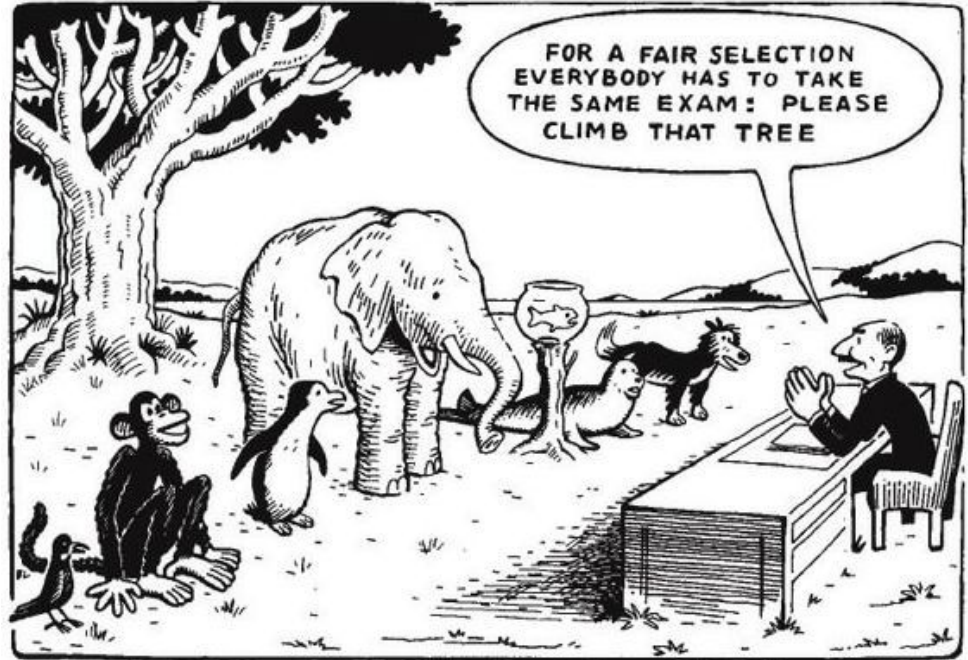Can set 1 or two hops, or content-based

WHEN DO PEOPLE SHARE PERSONAL INFORMATION FOR PERSONALIZATION?

Dr Shabnam Najafian

Take home messages

- Interfaces are important
- Interactions allow for "conversational" systems
- One size does not fit all!

Long Term Program (10Y)
ROBUST: Trustworthy AI-based Systems for Sustainable Growth.
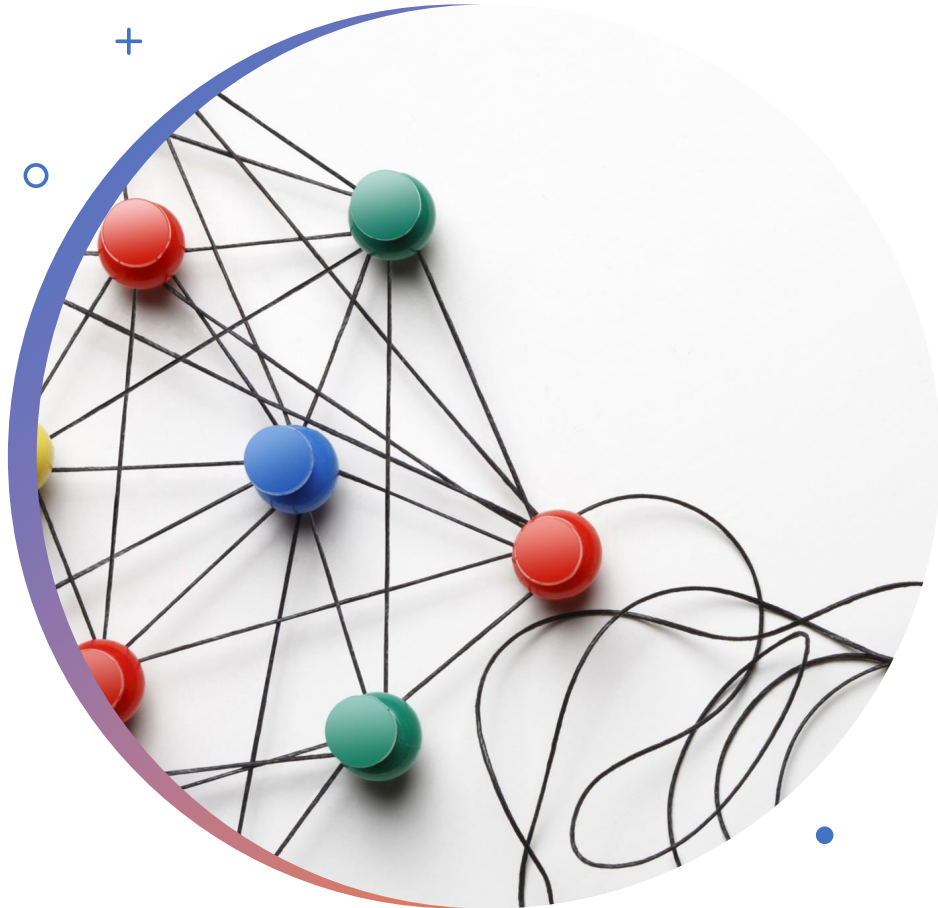17 new labs, 85 PhD positions
https://icai.ai/icai-labs/

Thank you!

Whom

- These are complex interfaces
- More benefit for people who are more expert
- BUT! More acceptance and equal cognitive load even for high complexity
  - Increases interaction
  - And accuracy