

FIRST KEYNOTE

Interactive and adaptive explanation interfaces for recommender systems

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Maastricht University



WOMEN IN DATA SCIENCE
MAASTRICHT

#WiDSMaastricht2023

Interactive and adaptive explanation interfaces for recommender systems

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WOMEN IN DATA SCIENCE
MAASTRICHT



Maastricht University

High stakes, poor transparency!

2,75 miljoen euro boete

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

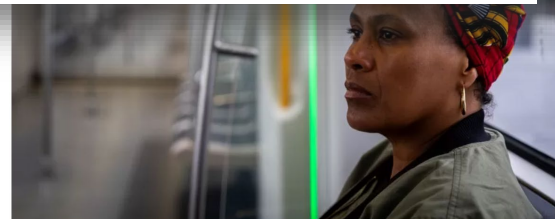
Welfare surveillance system violates human rights, Dutch court rules

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

5th Feb 2020, The Guardian

Top 400-lijst

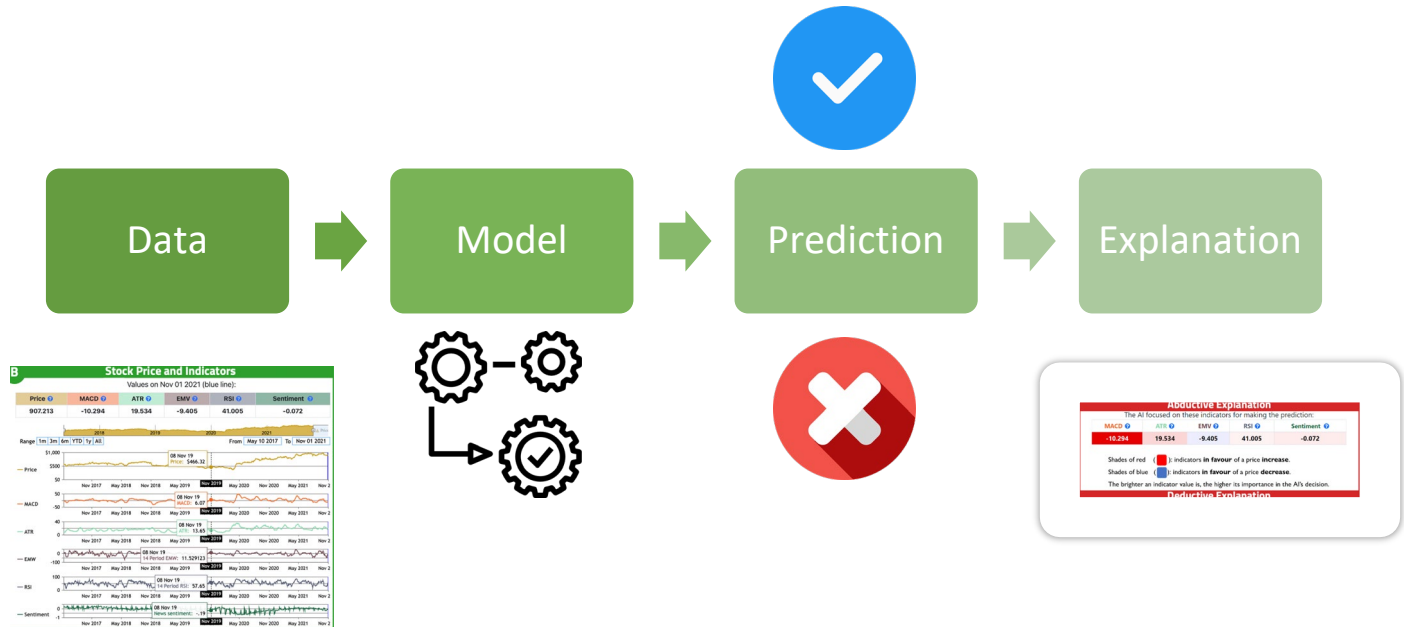
Ook jongeren die niets hebben uitgehaald komen



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

22th November 2022, Trouw

Before we can diagnose the causes



Why should we explain?

Overemphasis on model “performance”

- insufficiently grounded in application and consequences

Explanations considered late

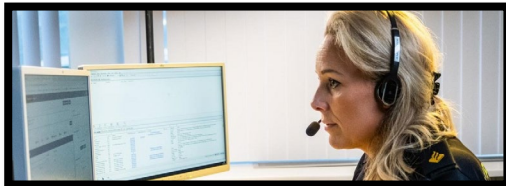
- If at all
- Not human understandable

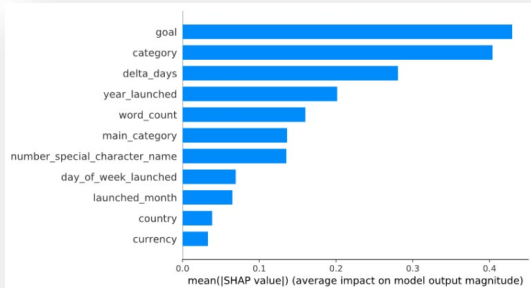


Comic from xkcd:

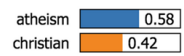
<https://xkcd.com/1838/>

- **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.

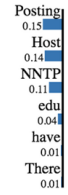




Prediction probabilities



atheism christian

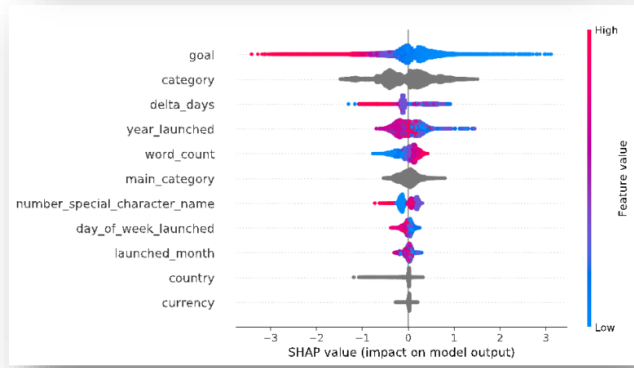


Text with highlighted words

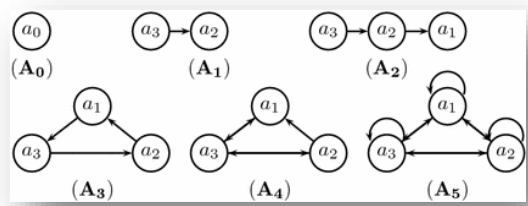
From: johnchad@triton.unm.edu (jchadwic)
 Subject: Another request for Darwin Fish
 Organization: University of New Mexico, Albuquerque
 Lines: 11
 NNTP-Posting-Host: triton.unm.edu

Hello Gang,

There have been some notes recently asking where to obtain the DARWIN fish. This is the same question I have and I have not seen an answer on the net. If anyone has a contact please post on the net or email me.



Progress on generating explanations! How understandable are they?



Tumor is diagnosed as malignant if, $(((\text{smoothness} \geq 0.089) + (\text{standard error of area} \geq 53.78) + (\text{largest radius} \geq 18.225)) \geq 2] + [((98.76 \leq \text{perimeter} < 114.8) + (\text{largest smoothness} \geq 0.136) + (105.95 \leq \text{largest perimeter} < 117.45)) \geq 2] \geq 1$



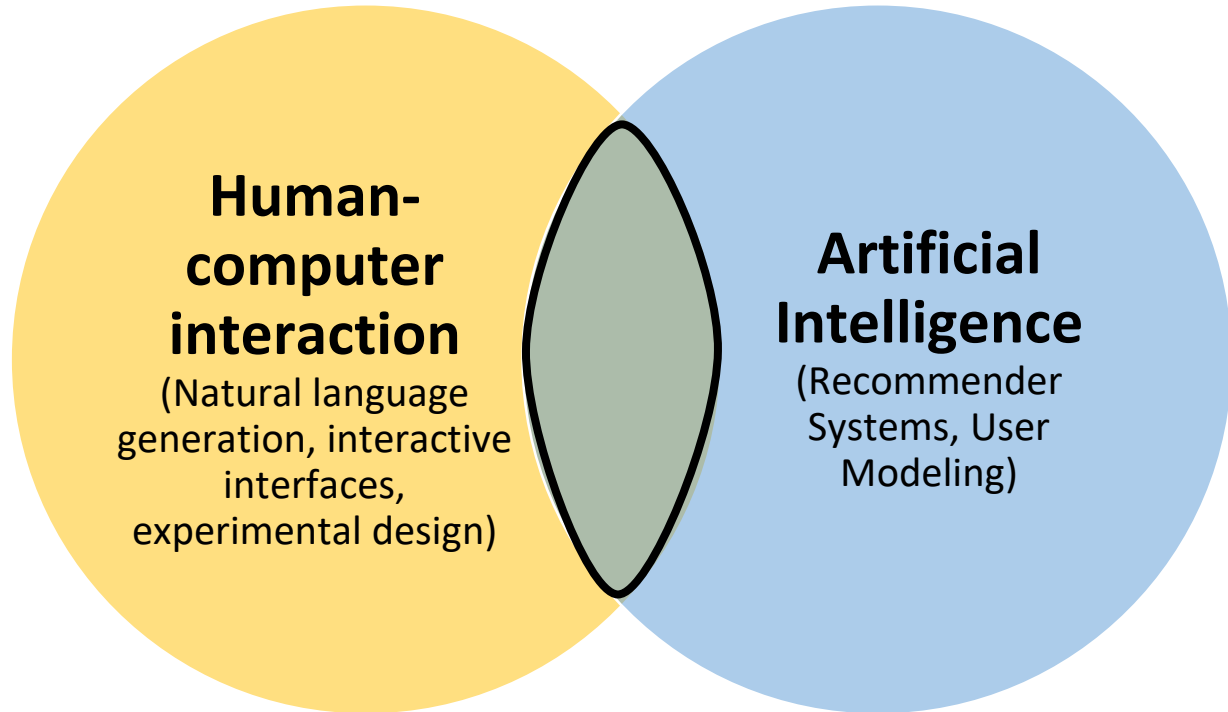
Interpretability is

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

Intelligent User Interfaces

Program chair:
UMAP'21, IUI'20

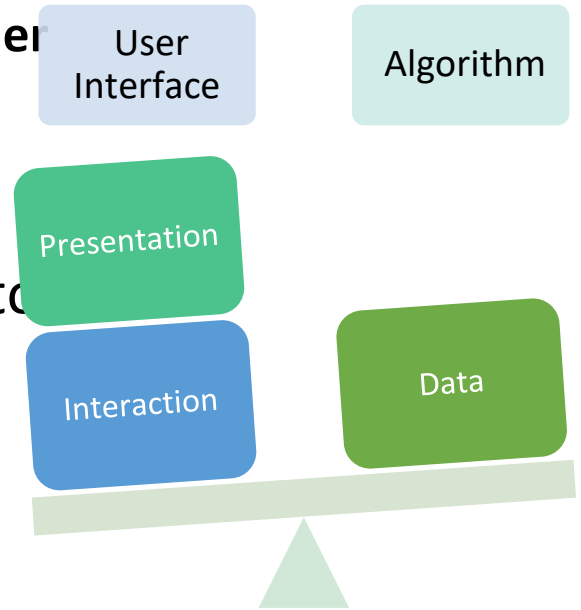
Senior reviewer:
ECAI, IUI, Recsys,
UMAP, TiiS

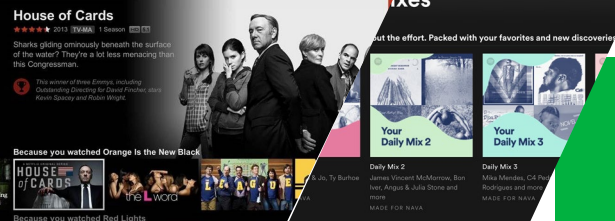


User interface vs algorithm

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%)



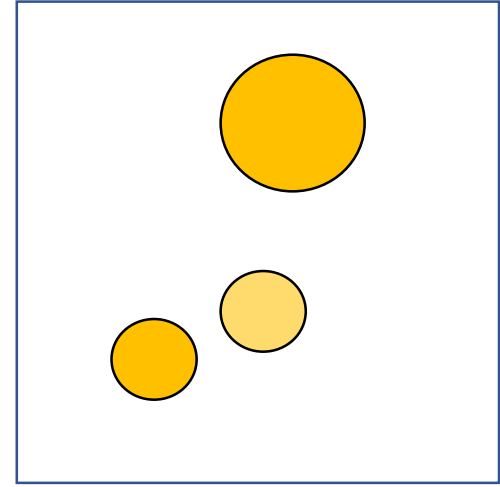
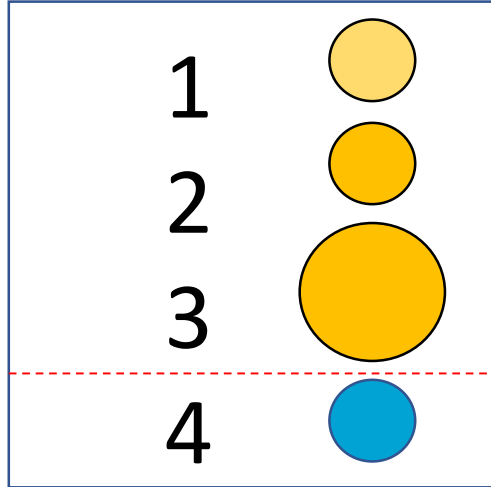
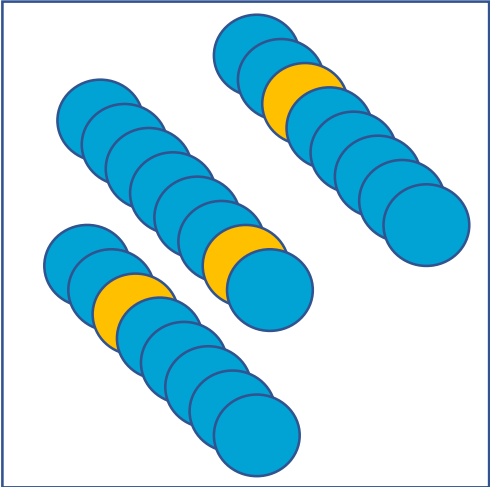


How does a RS work?

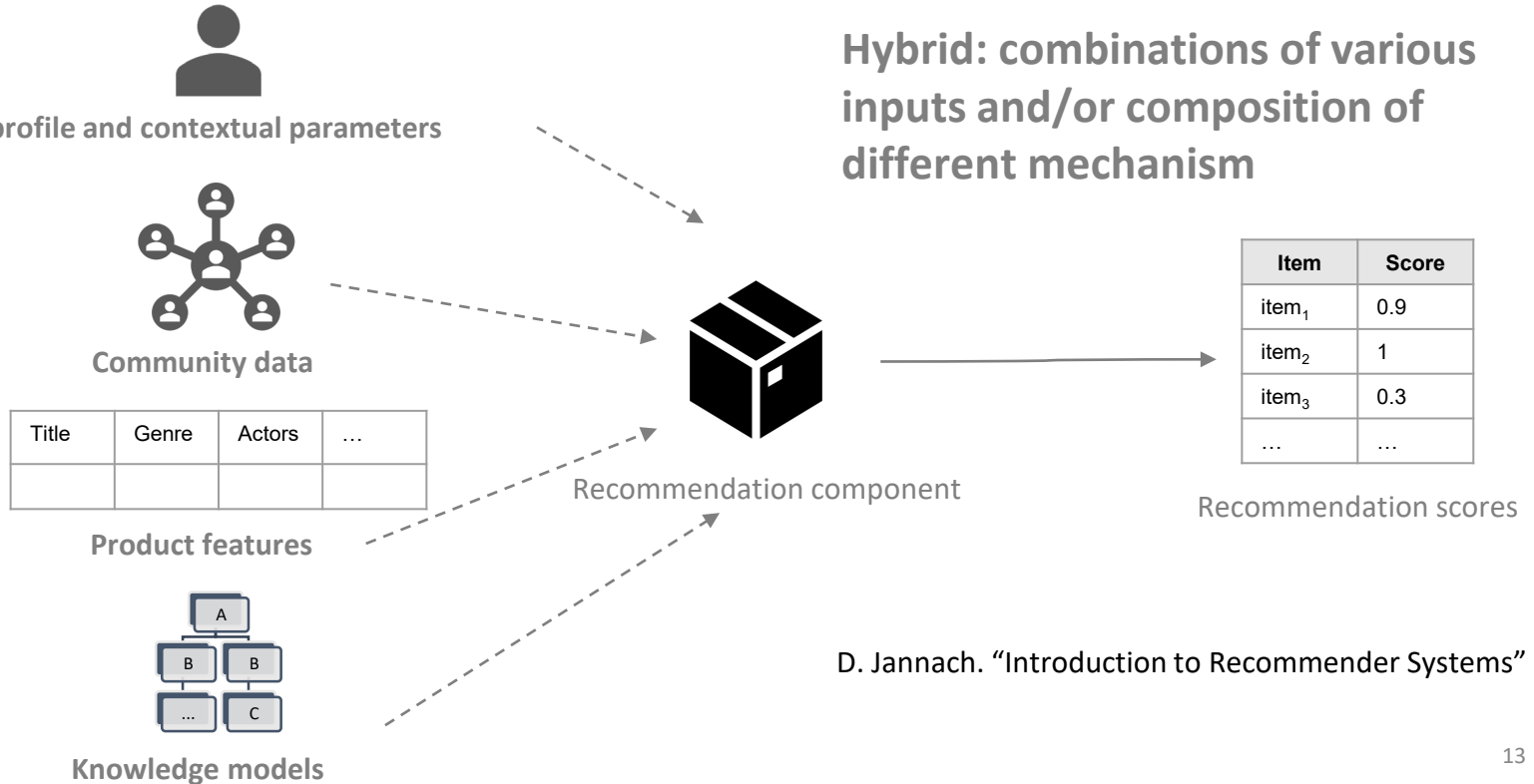


Systems that make personalized recommendations of goods, services, and people (Kautz)

- 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”?



PhD: Decision support in Recommender systems

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



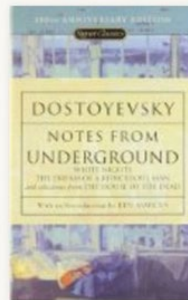
Judith Masthoff



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
★★★★★ 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 \(Harry Potter, #8\)](#)

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?

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:

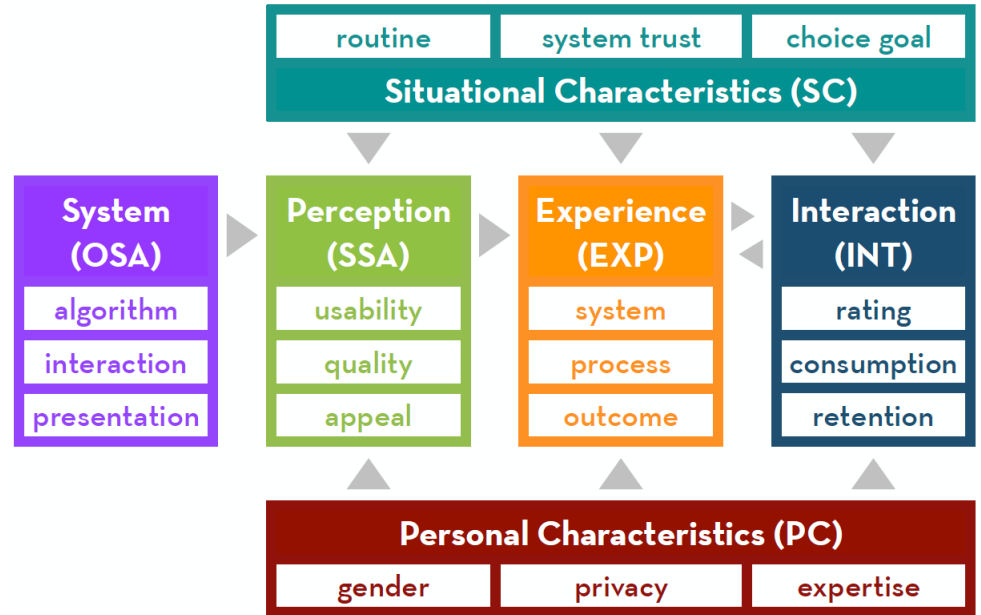
"Unfortunately, this movie belongs to at least one genre you do not want to see: Action & Adventure. It also belongs to the genre(s): Comedy. This movie stars Jo Marr and Robert Redford."

Baseline:

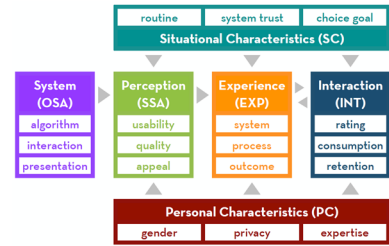
"This movie is not one of the top 250 movies in the Internet Movie Database (IMDB)."

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, UMUI 2019]

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



Katrien Verbert
Professor, KU
Leuven

Jin et al 2018: UMAP and
Recsys, UMUI 2019



Yucheng Jin
Assistant Professor, HKBU

User profile (PRO)

Algorithm parameters (PAR)

Recommendations (REC)

The image shows a screenshot of Spotify's algorithm interface, divided into three main sections: User Profile (PRO), Algorithm Parameters (PAR), and Recommendations (REC).

a) User Profile (PRO): This section displays the user's top artists, tracks, and genres. The top artists are Owl City, Imagine Dragons, Armin van Buuren, Capital Cities, and Calvin Harris. The top tracks are Yutopia, Youtopia - Micha..., Safe And Sound, Get Lucky (feat. P...), and Radioactive. The top genres are acoustic, afrobeat, alt-rock, alternative, and ambient.

b) Algorithm Parameters (PAR): This section allows users to adjust the weight of selected artists, tracks, and genres. The current artist is Owl City, with a popularity of 4 stars and 147,581 followers. The current track is Yutopia. The current genre is acoustic. A yellow box highlights the slider for the weight of selected genres, with an arrow pointing to it and the text "grayed out slider".

c) Recommendations (REC): This section displays the top 20 songs recommended for the user. The songs are: Under My Skin - Original Mix (Ilan Bluestone, Jerome Isma-Ae), Grade 8 (Ed Sheeran), Only Girl (In the World) (Boyce Avenue), Thank You (Dido), Somebody To Love (Justin Bieber), Telescope (Nashville Cast), Find a Way - Listenbee Radio... (Ferry Corsten), Freefalling - Cold Blue Mix (Dennis Sheperd), and Let Go - Going Deeper Remix. A yellow box highlights the "play" button for the song Telescope, with an arrow pointing to it and the text "removing and sorting".

+Visualization

Your task is to: find a good playlist which contains faster and louder music for a sleepless night. ?

Recommendations source

The top artists you have

- Owl City
- Imagine Dragons
- Armin van Buuren
- Capital Cities
- Calvin Harris

The top tracks you have

- Youtopia
- Youtopia - Michael Woo...
- Safe And Sound
- Get Lucky (feat. Pharrell...
- Radioactive

The top genres you have

- acoustic
- afrobeat
- alt-rock
- alternative
- ambient

Recommendations Processor

Weight of selected artists: 50

Weight of selected tracks: 50

Weight of selected genres: 50

A playlist containing **acoustic**

Acoustic Covers Acoust... Spotify

- Stay... 2:54 Ang...
- Can... 3:18 Ed S...
- Ho... 2:53 Gar...
- Blan... 5:03 Ima...
- Stol... 3:55 Twin...
- Sen... 3:45 I'm ...
- I'm ... 3:15 Dua ...

Recommendations

Popularity

- 100
- 80
- 60
- 40
- 20

Music genres

- chamber pop
- metropolis
- alternative pop rock
- canadian punk
- big room
- progressive house
- disco house
- emo
- edm
- dance pop
- neo mellow
- canadian pop
- folk-pop
- acoustic pop

Labels in visualization: Hey, Sou, Out Of, Frozen, Muto, Babel, Hearti, Say You, Hear, Galaxie, Life Of, Stoned, Siren, Neba, The Sa, World, Rock, Like We, Carry On, Last On.

Recommendations

- Frozen Gro...
Ilan Bluestone
- Heartless
Kris Allen
- Babel
Mumford & Sons
- Out Of To...
Justin Bieber
- Hear Me N...
Boyce Avenue
- Hey, Soul S...
Train
- Siren [ANR...

Influence of expertise and cognition?

- **User control:** Expertise influenced the acceptance of recommendations
- **Visualization:**
 - Expertise influenced perceived diversity
 - Cognition interacted with visualizations for perceived diversity

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 sophistication (MS)	Acceptance (+) Diversity (no) Cognitive load (no)	Acceptance (no) Diversity (+)	Acceptance (+) Diversity (+)

Hoptopics

Kang et al 2016

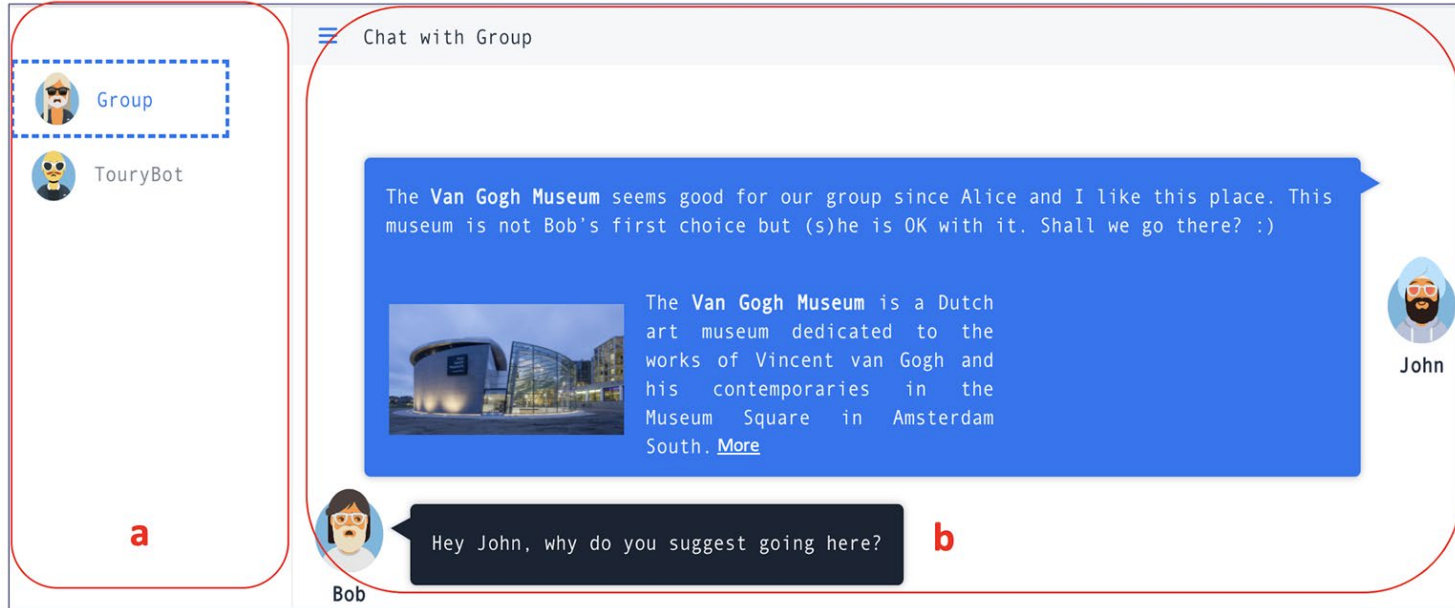
The screenshot shows the Hoptopics interface. At the top, the logo and title "Hoptopics" are displayed. Below it, a search bar contains "ScreenName: DIS2016" and a "Go" button. The main content area is divided into two columns: "I Follow..." (left, blue) and "They Follow..." (right, yellow). Each column has a "My Hashtags" and "Their Hashtags" section. Below these is a "Tweets recommended for @DIS2016" section showing three tweets. Annotations include: "Your Friends (People you follow)" pointing to the "I Follow..." section; "dashboard can be hidden for readability" pointing to the "Dashboard On" button; "Your Friends' Friends (People your friends follow)" pointing to the "They Follow..." section; "filter buttons" pointing to the filter icons and "RESET" button; and "Star icons. Saved tweets have yellow star" pointing to a star icon on a tweet. A "Source of tweet" section at the bottom identifies the user as either "your friend" or "your friends' friend".

Person to person
(CF)
Also content-
based

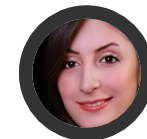
Two
"hops"

Can set 1
or two
hops, or
content-
based





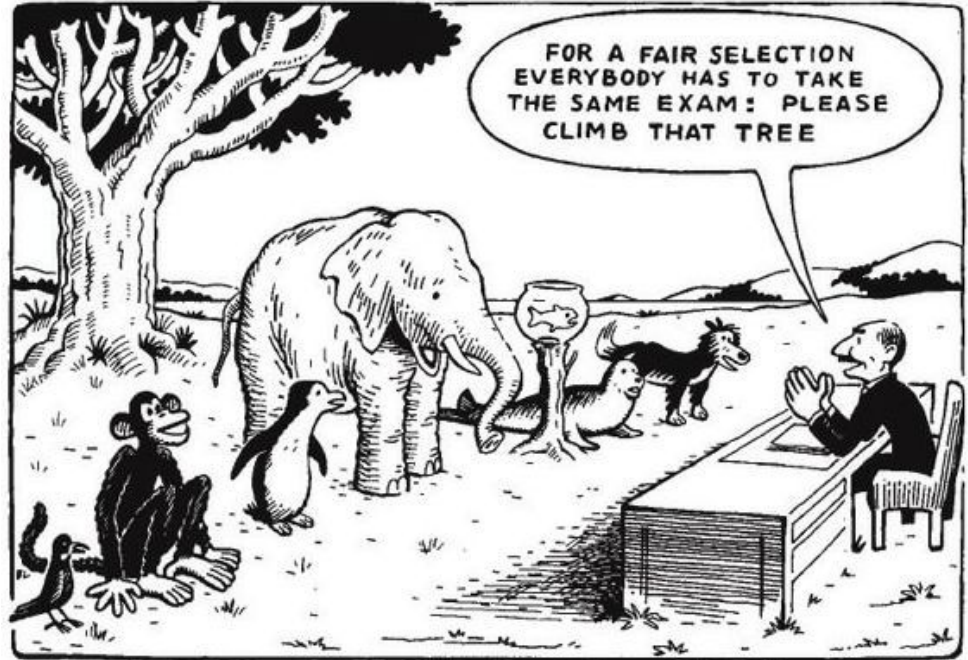
WHEN DO PEOPLE SHARE PERSONAL INFORMATION FOR PERSONALIZATION?



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!



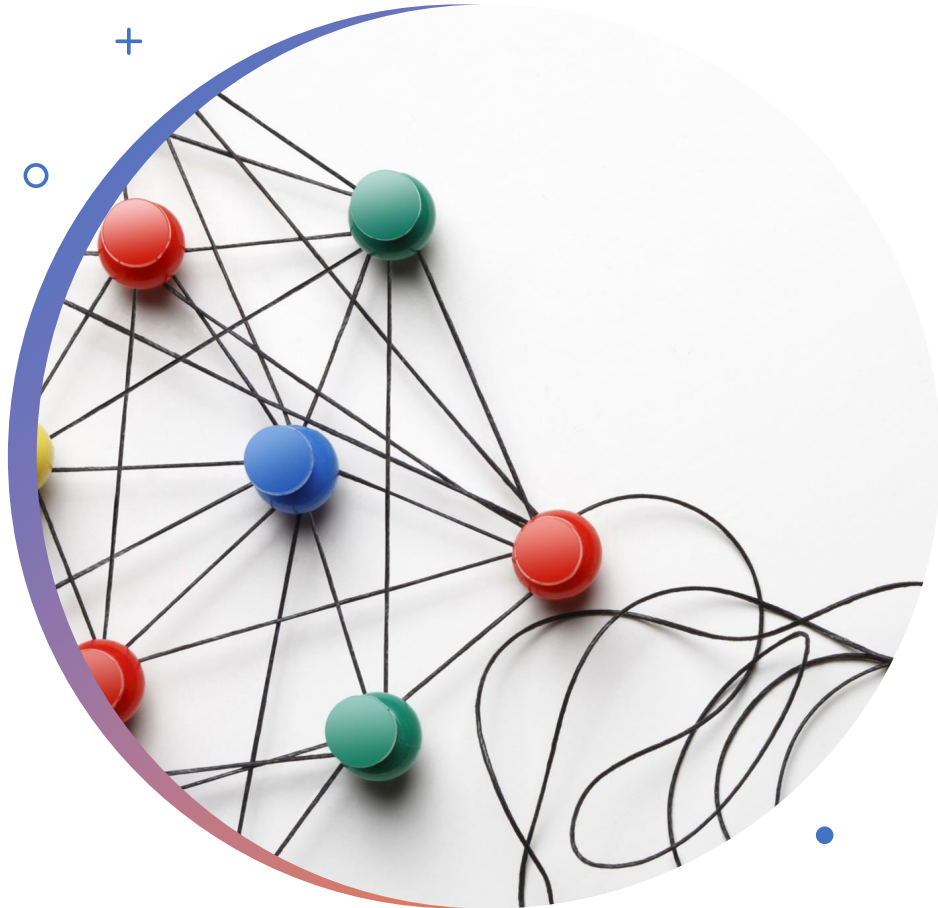
**Innovation Center for
Artificial Intelligence**



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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