

Whom are you Explaining to, and Why?

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Sciences

Disclaimers:

- No ChatGPT/LLM was used (or hurt) during the course of developing this presentation.
- All errors herein are my own.
- Focus on artificial advice givers, and explanations for end-users.

High stakes, poor transparency!

2,75 miljoen euro boete voor Belastingdienst om toeslagenaffaire

De Belastingdienst krijgt een boete van 2,75 miljoen euro voor de toeslagenaffaire. Dat meldt de Autoriteit Persoonsgegevens, de privacywaakhond van de overheid.

19th Oct. 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 op Amsterdamse risicolijst Top 400



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

22nd Nov. 2022, Trouw

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 Oct. 2021, het Parool

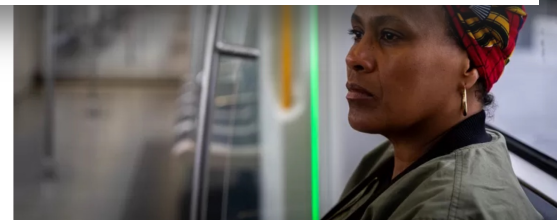
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Top 400-lijst

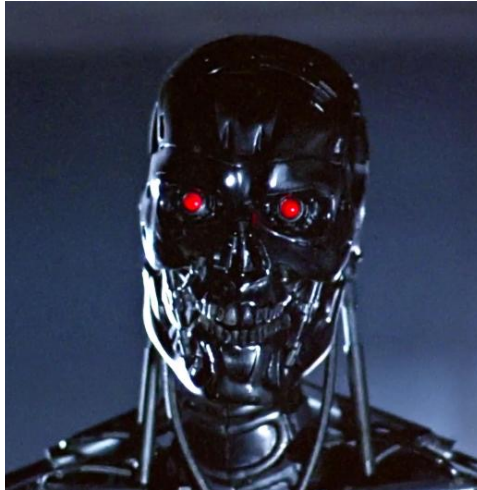
Ook jongeren die niets hebben uitgehaald komen



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22nd Nov. 2022, Trouw

I for one, welcome our AI ~~overlords~~ collaborators



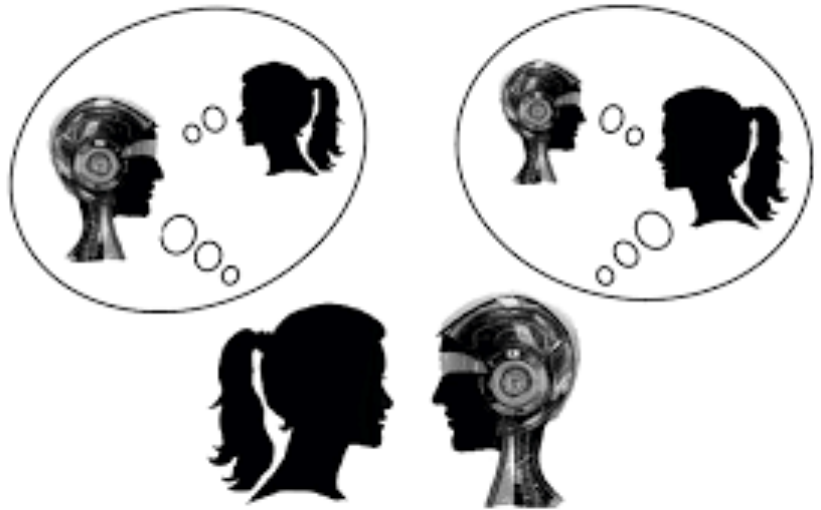
Credit: Alamy

- AI is not evil
- Human-like appearance leads to assumptions.
- AI systems make mistakes.
- AI can be used as a tool.
- Do you know who else makes mistakes....

“Hybrid-intelligence”

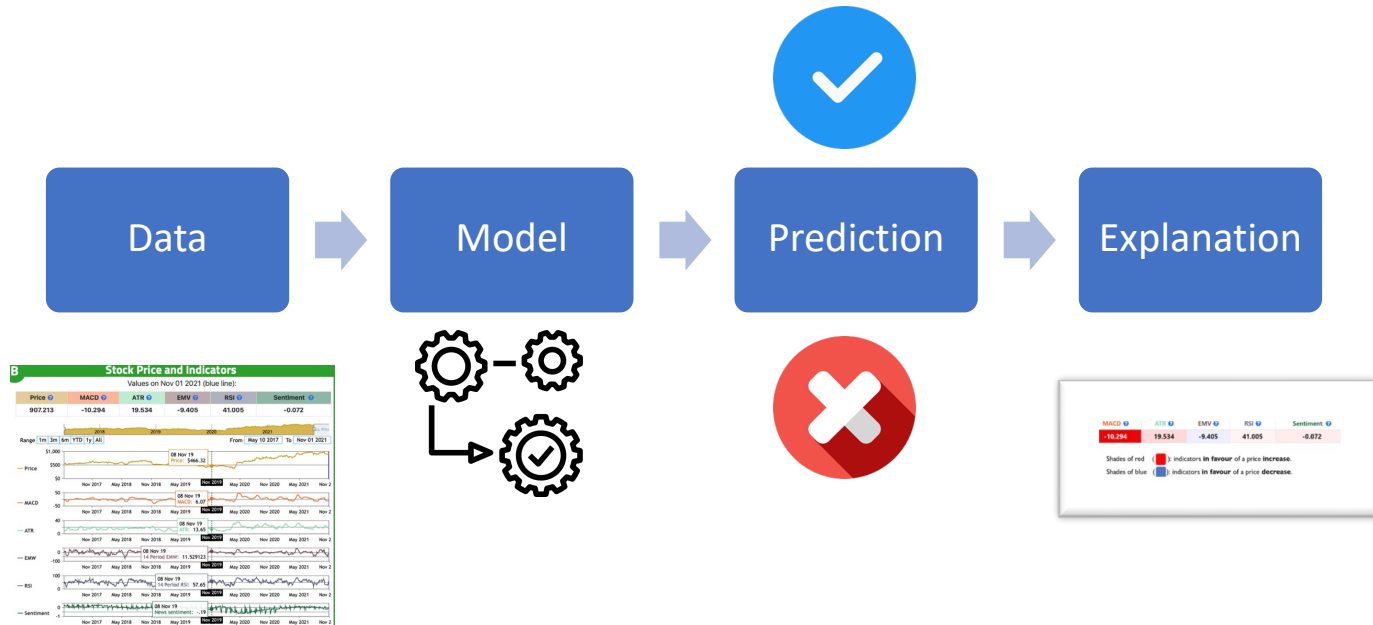


Credit: Web Vectors by Vecteezy



Credit: Hybrid-Intelligence Centre

Before we can diagnose the causes



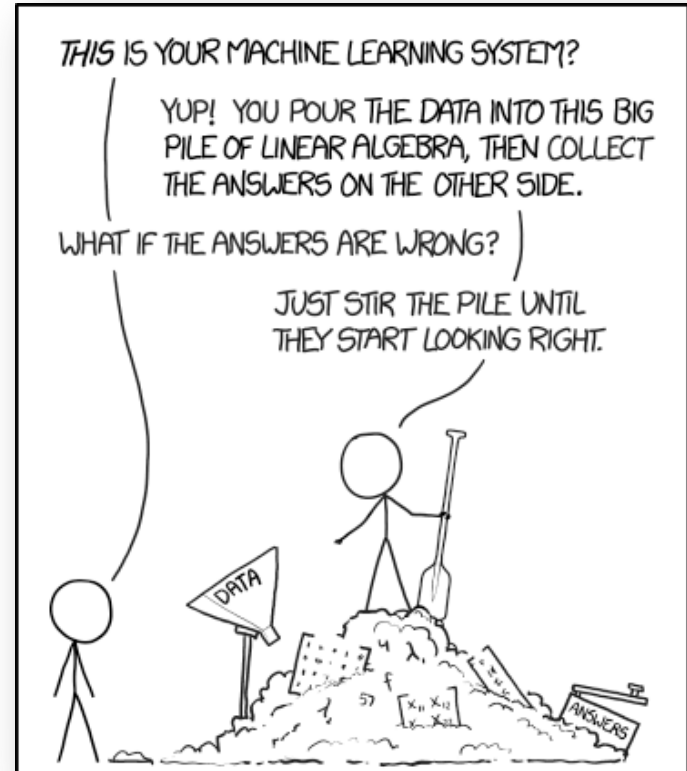
What Prof. Tintarev thinks “went wrong”

Overemphasis on model “performance”

- insufficiently grounded in application and consequences

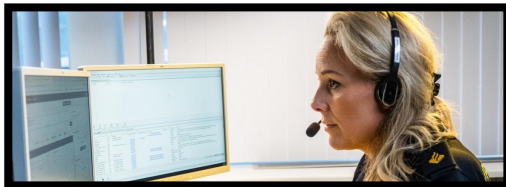
Explanations considered late

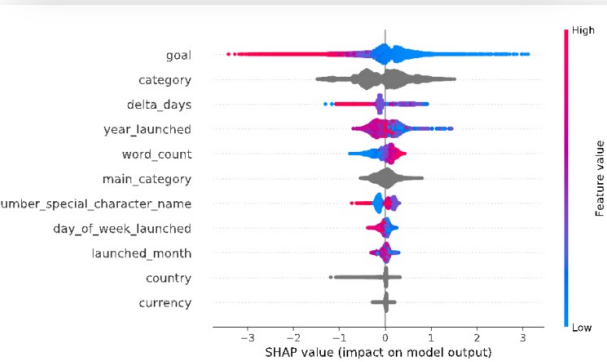
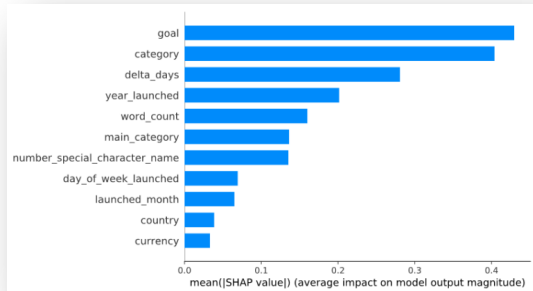
- If at all
- Not human understandable



Credit: [xkcd](#)

- **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.





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

Prediction probabilities

atheism 0.58
christian 0.42

atheism christian

Posting 0.15
Host 0.14
NNTP 0.11
edu 0.04
have 0.01
There 0.01

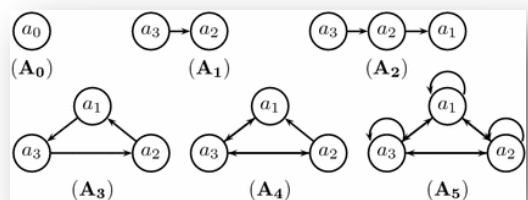
Text with highlighted words

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?



~~Explainability~~

Interpretability is

- the degree to which a human can understand the cause of a decision [Miller 2017; Biran and Cotton]
- 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 2021]



How did I end up here?

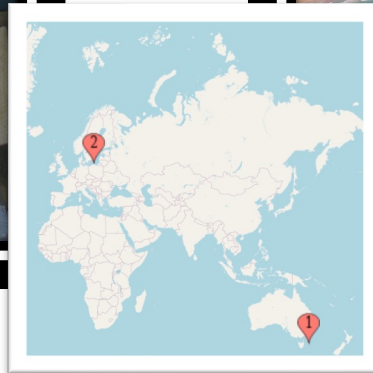
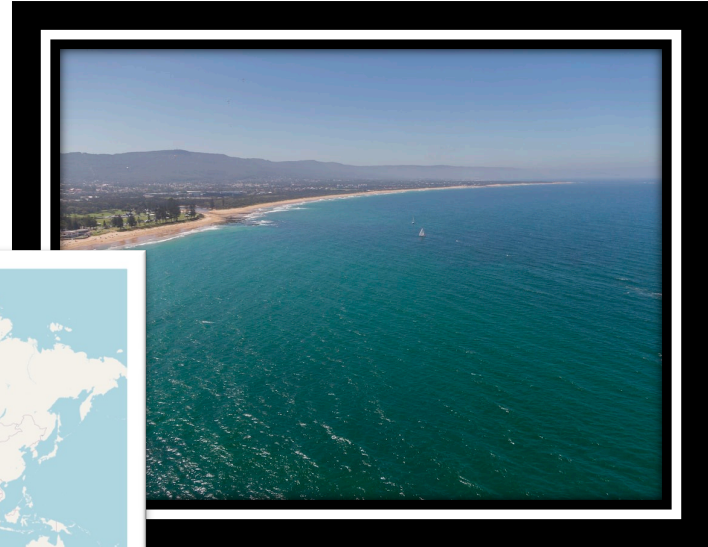
Worlds apart?

Sept 2000 – March 2005

Computer science: Uppsala University, Sweden

Feb 2003 – Nov 2003

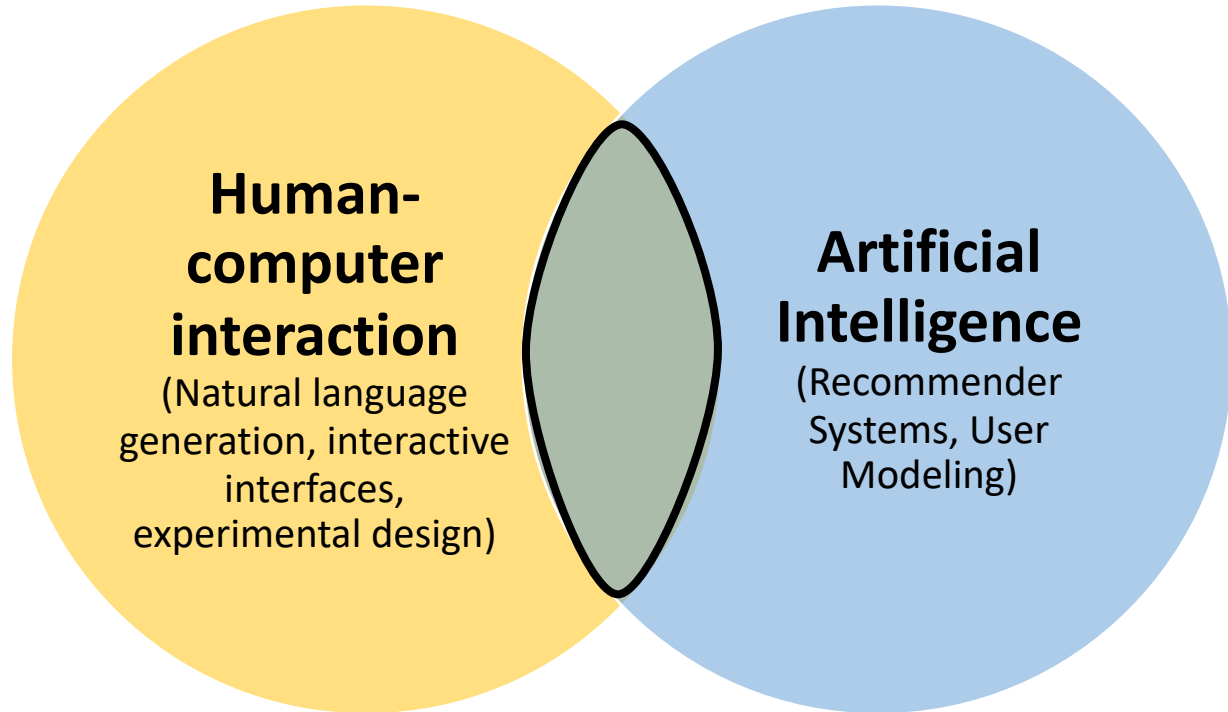
Psychology: Uni. of Wollongong, Australia



Intelligent User Interfaces

Program chair:
UMAP'21, IUI'20

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



PhD: Decision support in Recommender systems

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



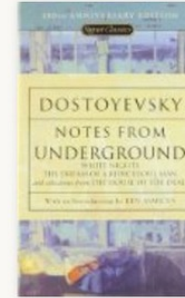
Judith Masthoff



Ehud Reiter

RECOMMENDATIONS

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



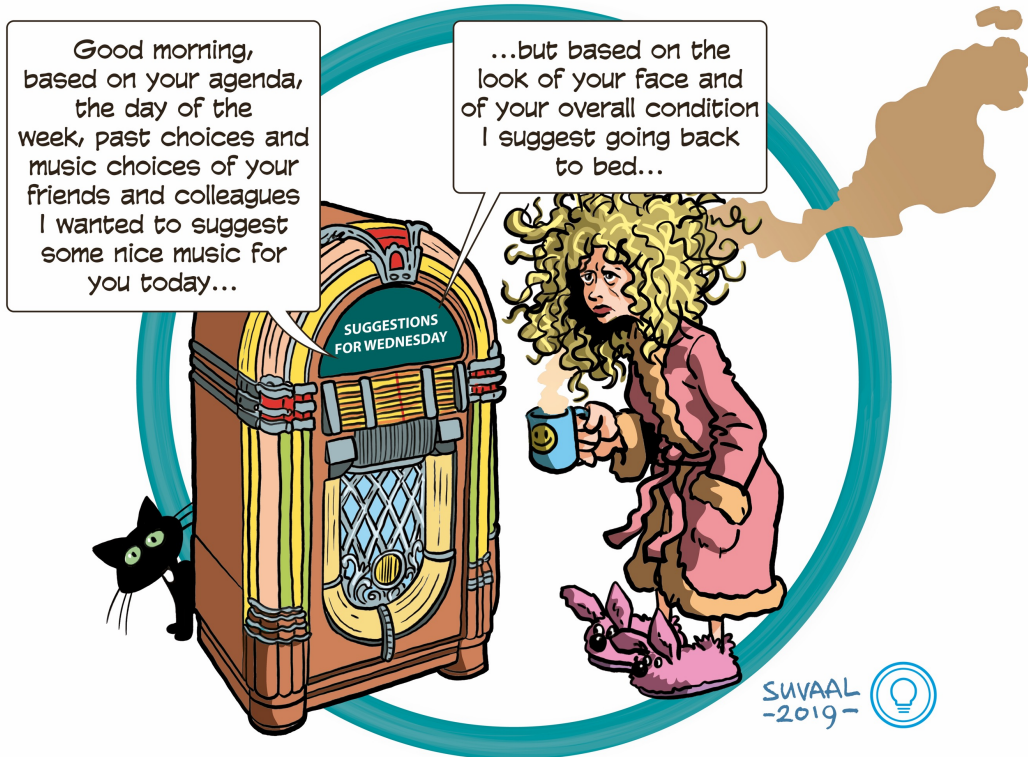
Notes from Underground, White Nights, The Dream of a Ridiculous Man, and Selections from The House of the Dead >

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 \(Harry Potter, #8\)](#)



Credit: Erwin Suvaal from CVIII ontwerpers

- The explanation here is not fully transparent.
- It recommends no music.
- It is rather useful.
- Sometimes this is referred to as Justification.

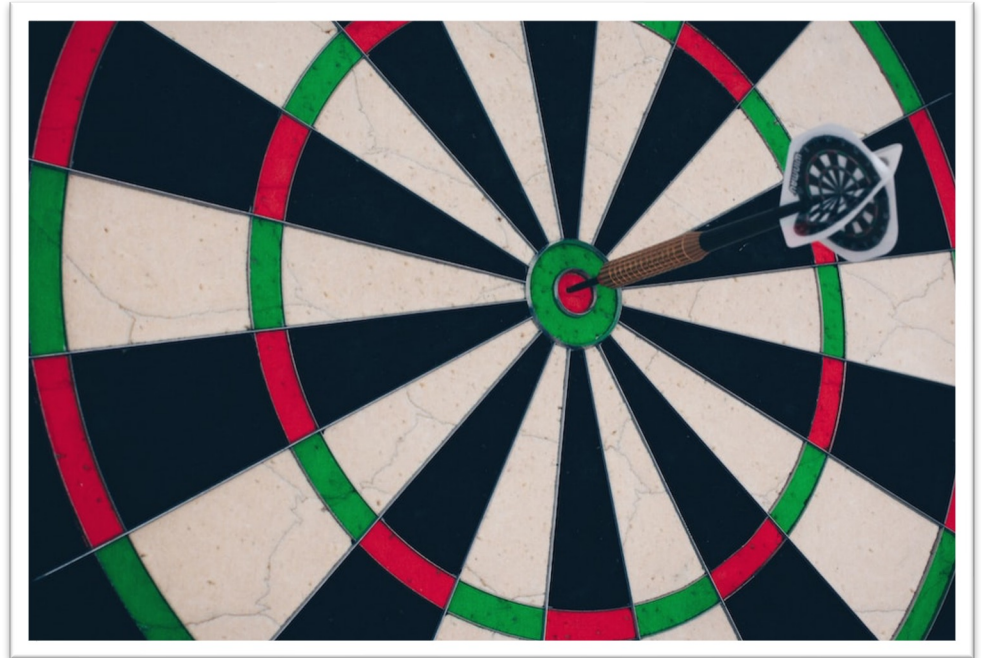


Why are you explaining?

Purpose	Description
Transparency	How was this recommendation made?
Effectiveness	Why (not) this item?
Persuasiveness	Why must you buy this item?
Trust	Increase users' confidence in the system
Scrutability	Allow users to tell the system it is wrong
Satisfaction	Increase the ease of use or enjoyment
Efficiency	Help users make decisions faster

But what is your goal?

- **Transparent, not Scrutable.**
- **Effective, not Transparent.**
- **Satisfying, but not Effective.**



Satisfying, but not Effective

- Benefit of personalized explanations?
- Personalized explanations worse for decisions
- but people were more satisfied! [Tintarev & Masthoff, 2012]
- What you measure matters!

Non-personalized:

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

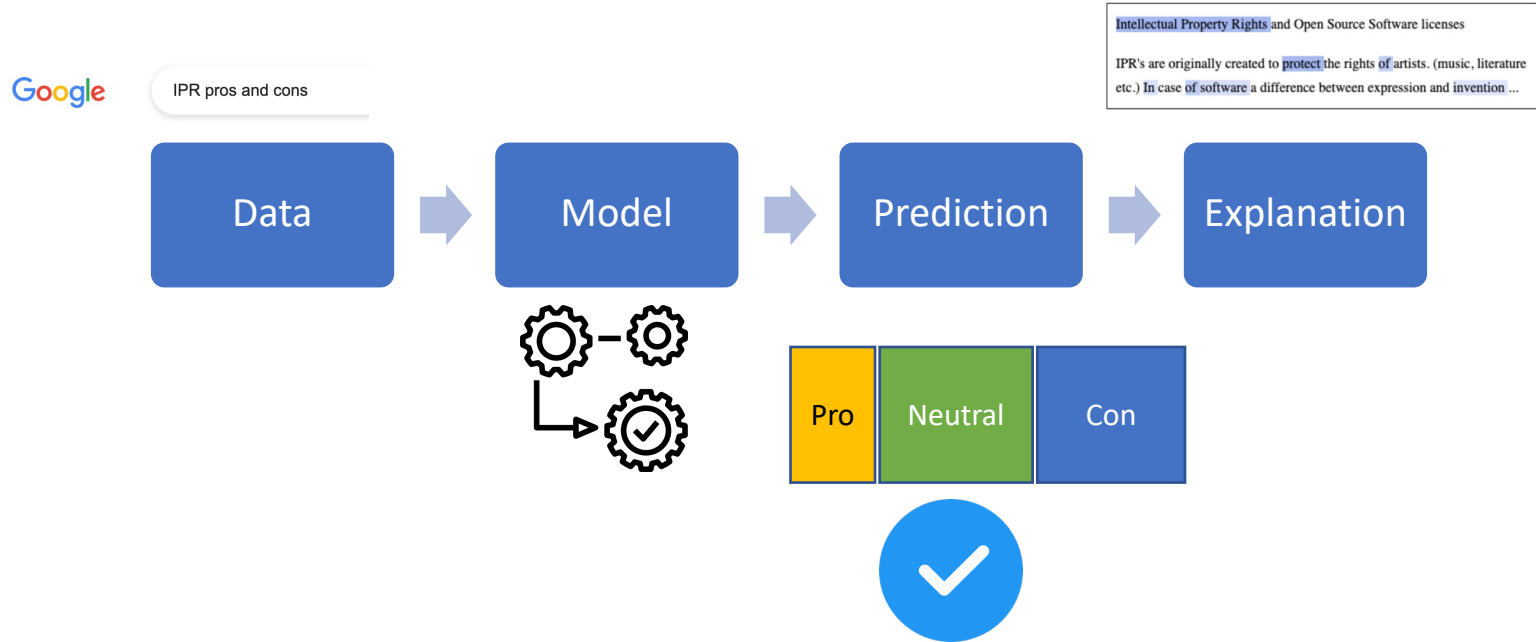
Personalized:

“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).”

Transparency as a purpose: disputed topics



Transparency as a purpose: disputed topics

[Draws et al. CHIIR'23]

- Predict stance for debated topics
- Equally correct and incorrect
- State-of-the-art prediction models and explanation models
- **Task:** "guess" the prediction
 - E.g., what do you think the system predicted this search result as?
NEUTRAL about IPR.

Intellectual Property Rights and Open Source Software licenses

IPR's are originally created to protect the rights of artists. (music, literature etc.) In case of software a difference between expression and invention ...

Pro

Neutral

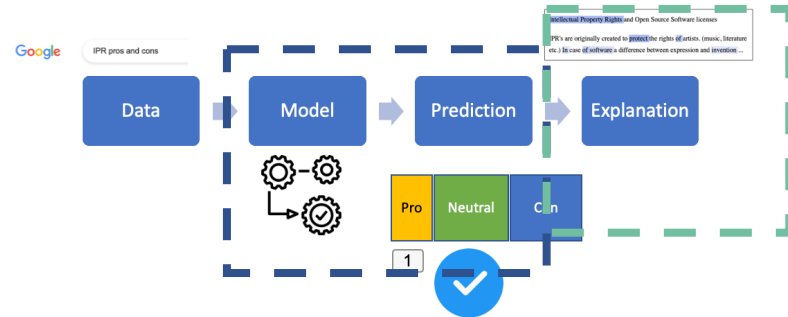
Con



Tim Draws, PhD, TU Delft



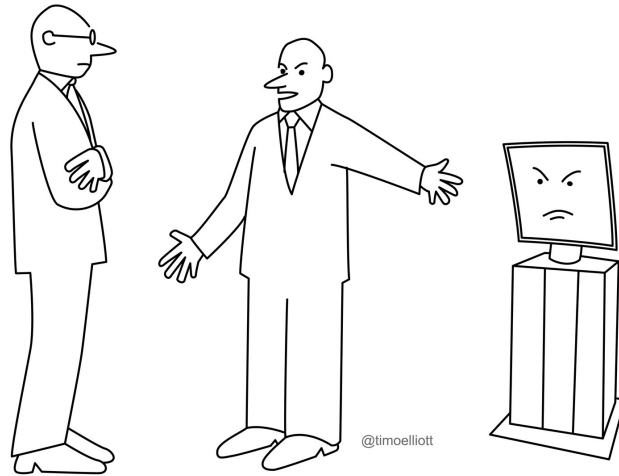
Transparency as a purpose: disputed topics



Depending on the classification models:

- We influenced how correct predictions are
 - **Combinations** of model and explanation worked better.
 - I.e., how understandable the explanation is – for a person
-
- Focus on transparency – but no scrutability.

Trust as a purpose



*His decisions aren't any better than yours
— but they're WAY faster...*

Credit: Timo Elliott

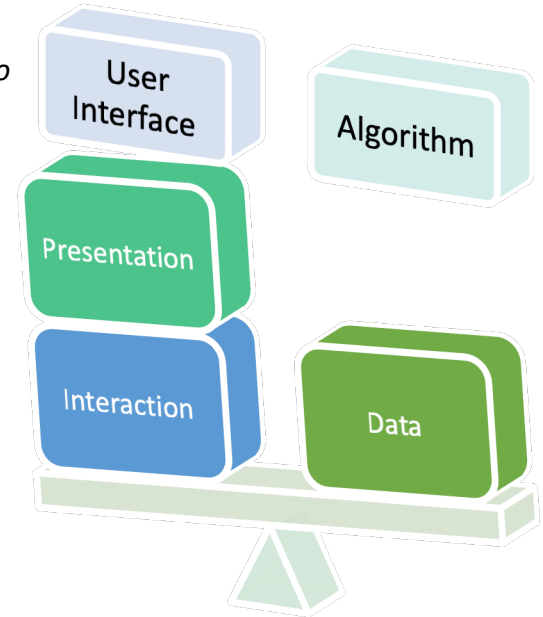
Trust as a purpose

- Is there such a thing as “too much” trust?
- What is “appropriate trust”?
- Is there a difference b/w explanation styles?

How you explain matters

Top 10 Lessons Learned Developing Deploying and Operating Real-world Recommender Systems - *Francisco J. Martin, Strands (Recsys'10)*

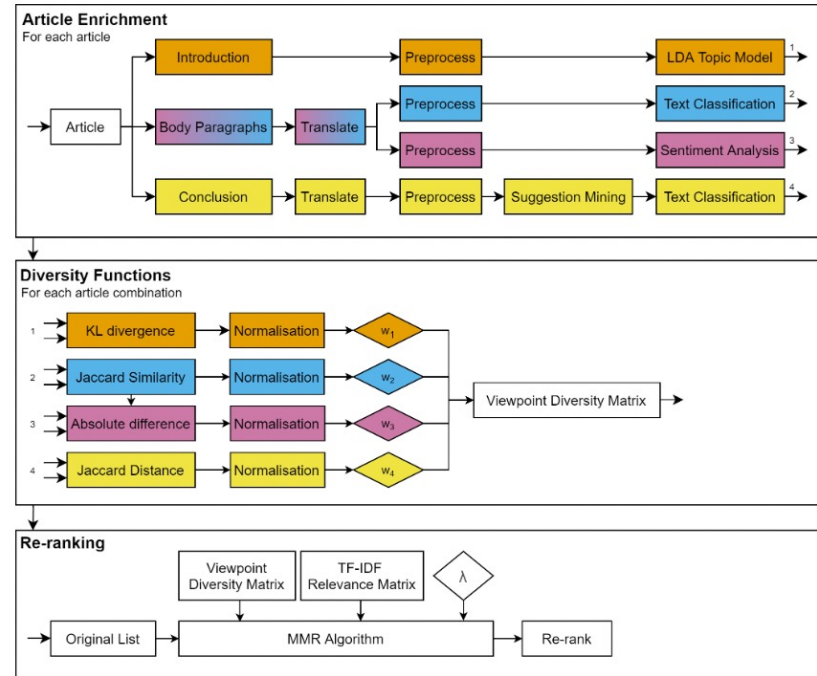
Focus on interface as much as algs; ... the User Interface needs to get the lion's share of the effort (50%) compared to algorithms (5%), knowledge (20%), analytics (25%)



Presenting diverse articles (Blendle)



The screenshot shows the Blendle website interface. At the top, there are navigation links: Blendle, Vandaag, Eerder, Magazines, Kranten, Leeslijst, and Audio. Below this is a section titled "Van de redactie" with the subtitle "Het beste uit de kranten en tijdschriften staat hieronder voor je klaar". A sub-section "Het beste voor de zaterdag" features several article thumbnails with headlines such as "Hij is er: de corona-app. Dit zijn de gevaren volgens een Harvard-expert", "Duizenden arrestanten in Wit-Rusland zijn onmenselijk behandeld: Irina was één van hen. 'Alleen onze dierlijke angst reesteerde'", "Een nazi-mime of Baudet aan de galg: in appgroepen komt het ware gezicht van politieke jongeren naar voren, van CDA tot FvD", "Met de GOD's gaat het al jaren niet lekker, maar door corona worden ze omvergeblazen. 'Ze zijn niet kwetsbaar, maar kansloos'", and "Hoe de eisen voor 'diversiteit' musea de nek omdraaien: 'de subsidiegever luistert mee'". A large blue arrow points from the right side of the page towards the article grid.



What do people click on? Blendle



Interface matters?

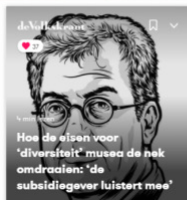
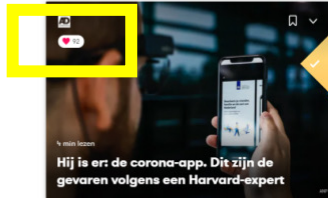
Number of hearts

Van de redactie

Het beste uit de kranten en tijdschriften staat hieronder voor je klaar

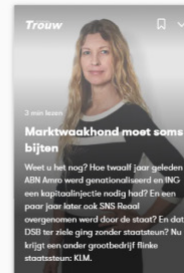
Het beste voor de zaterdag

Uitbundende ontwerfged, interviews en reportages

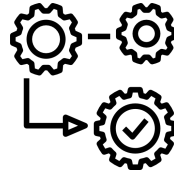
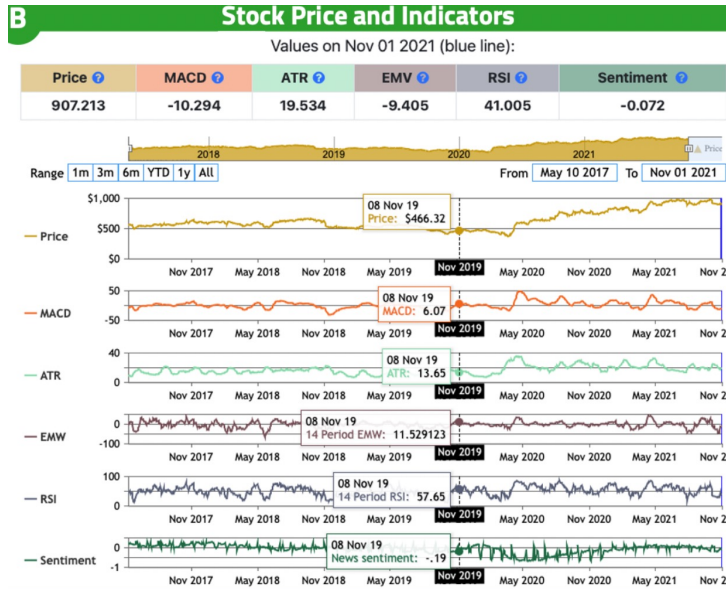


Thumbnail 3.1% more

Lees de nieuwste artikelen



Back to Trust as a purpose



SELL



HOLD

You can explain in many different ways!

Cau et al. IUI'23; TiiS'23

Inductive Explanation

The AI generated this prediction learning from these examples:

Example	Date	Price	MACD	ATR	EMV	RSI	Sentiment	Next week price
1	2018-06-07	539.507	-11.286	17.761	-7.281	42.927	-0.164	increase
2	2018-10-29	625.385	-8.183	18.369	-8.525	43.288	0.009	decrease
3	2019-10-14	438.583	-13.277	17.910	-8.187	44.041	-0.201	increase

Abductive Explanation

The AI focused on these indicators for making the prediction:

MACD	ATR	EMV	RSI	Sentiment
-10.294	19.534	-9.405	41.005	-0.072

Shades of red (■): indicators **in favour** of a price **increase**.
Shades of blue (■): indicators **in favour** of a price **decrease**.
The brighter an indicator value is, the higher its importance in the AI's decision.

Deductive Explanation

The AI generated this prediction following this rule learned from the data:

	Indicator	Value	Check	Threshold value	Contrast	Decision
if	RSI	41.005	>	32.392	22.3%	increase
and	MACD	-10.294	<=	-0.655	17.8%	
and	ATR	19.534	>	3.459	5.9%	



Federico Cau (UM)



Davide Spano (Cagliari)

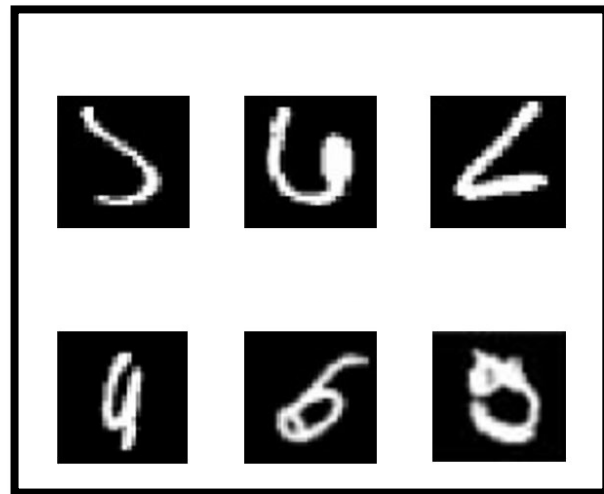


Hanna Hauptmann (Utrecht)

“Too much” trust

Agree more with the system

- System right - human right 94%.
- System wrong - human wrong 75%.
- Also agree when system is wrong
→ more mistakes for the person!



Inductive Explanation

The AI generated this prediction learning from these examples:

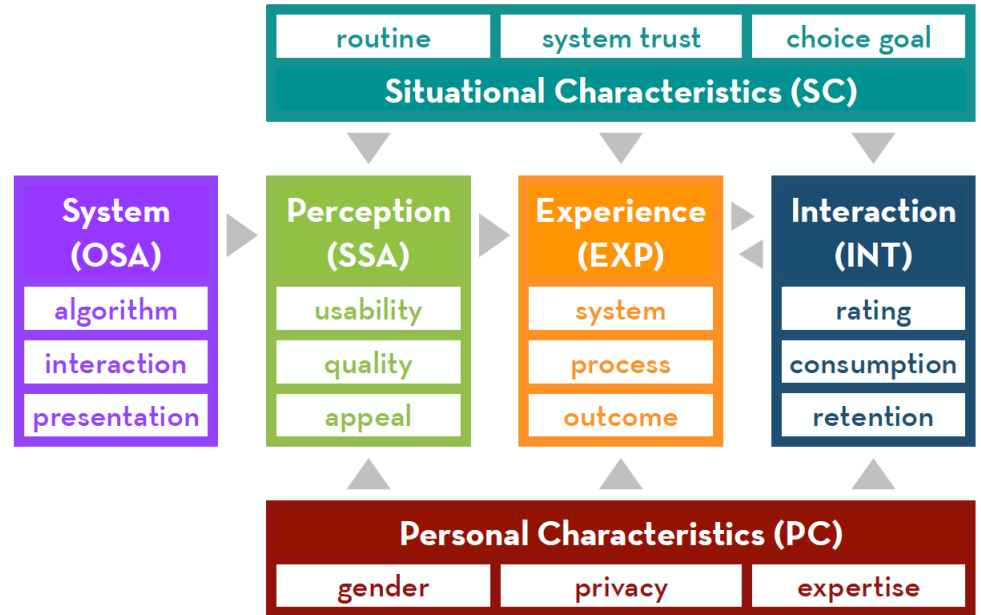
Example	Date	Price ?	MACD ?	ATR ?	EMV ?	RSI ?	Sentiment ?	Next week price ?
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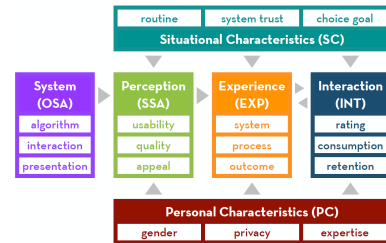
Explaining, to whom?

Factors influencing explanation effectiveness

[Knijnenburg2012]



Situational Characteristics?



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



Dr Shabnam Najafian



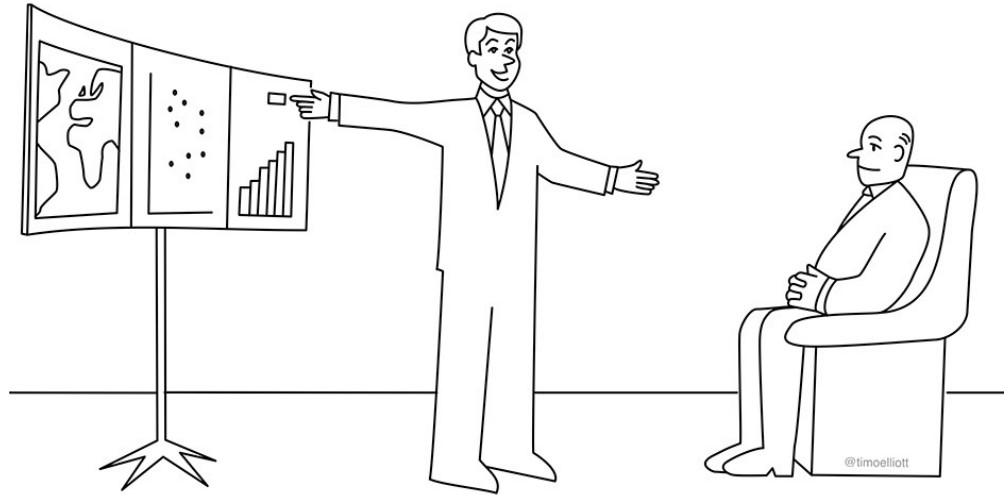
Francesco Barile, Assistant Professor, University of Maastricht



Roan Schellingerhout, PhD, University of Maastricht



Explaining the “unexpected”

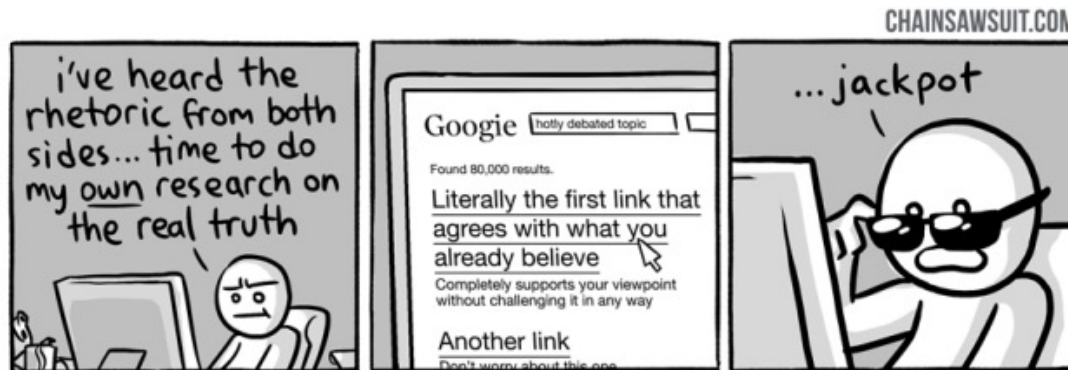


“And our unique JustifyIt™ feature uses deep learning to find data that agrees with your point of view!”

Credit: Timo Elliott

Explanations for "unexpected" content

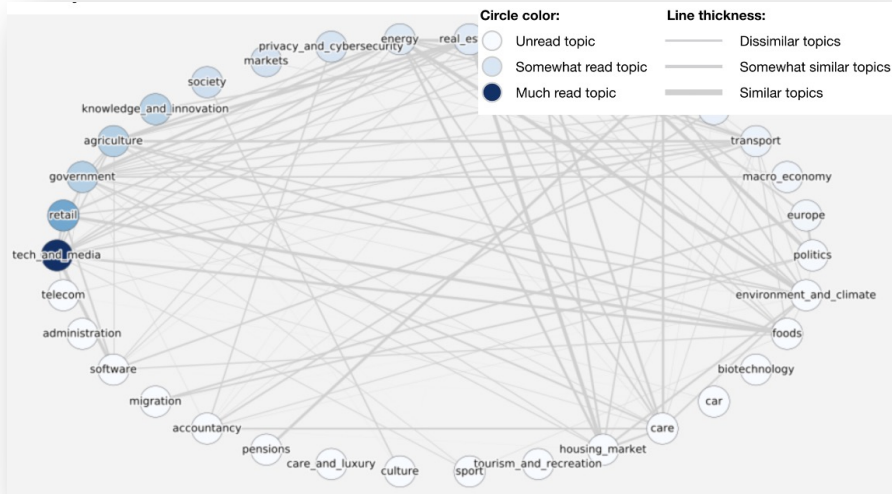
- Humans also make mistakes!
- During online information search, users tend to select search results that confirm pre-existing beliefs or values and ignore competing possibilities
(Confirmation bias) [Azzopardi2021]
- **Results representing alternative viewpoints are in that sense "unexpected"**



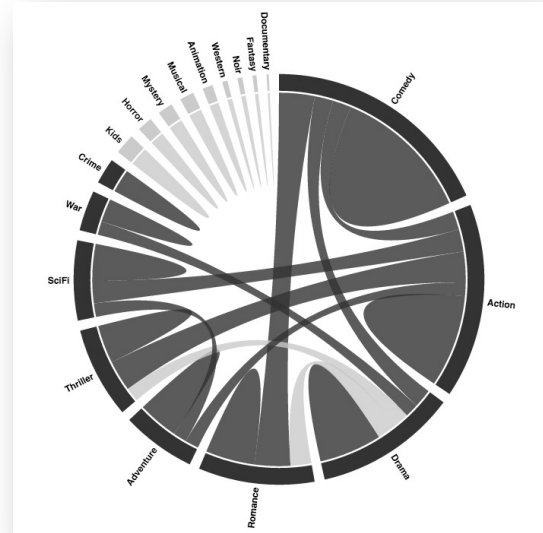
Credit: Chainsawsuit

Explanations for "unexpected" content

Sullivan et al. Collaboration with FD Media @ICTwIndustry, ExUm Workshop, UMAP, 2019



Tintarev et al. ACM Symposium On Applied Computing, 2018





Alisa Rieger,
PhD, TU Delft

Cognitive bias mitigation in search

Caution!

This search result might reinforce your opinion, select another search result if you want to minimize the risk of [confirmation bias](#)

Rieger et al. *ACM HyperText'2021* 🏆

- Aim reduce clicks on results that confirm user's held opinion
- **Targeted warning:** effective
- **Extra step to view:** reduces clicks, but...
- Works well on random search results.
- Potential of misuse...
- **Boosting!** Preserve user autonomy, and enduring effects. [Lorenz-Spreen et al., 2021]

Interactions in search interface

SEPP

You can explore search results on your assigned topic as long as you want to. Once you feel that you are done, please close this tab and continue with the study.

Pro atheism <https://www.closetotruth.com/series/atheisms-best-arguments-part-1>
atheism's best arguments? (part 1) | closer to truth
atheism's best arguments? (part 1) | closer to truth
atheism fields two kinds of arguments denying the existence of god: if you watch or read atheist - theist debates, you'll quickly note that the cosmos consciousness meaning atheism fields two kinds of arguments denying the...

Pro atheism <https://www.atheistrev.com/2009/04/what-is-atheism.html>
what is atheism ? - atheist revolution
what is atheism ? - atheist revolution
I am willing to cut theists particularly evangelical christians, considerable slack in misunderstanding atheism . I know all too well what they have been taught about atheism (and atheism) and why . to my atheist colleagues, this is...

Pro atheism <https://www.atheists.org/activism/resources/about-atheism/>
what is atheism? - american atheists
what is atheism? - american atheists
this, again, does not mean that atheism is a religious belief. some groups will use words like agnostic, humanist, secular, bright, freethinker, or any number simply a rejection of the assertion that there are gods. atheism is too often defined incorrectly as a belief system. to be clear atheism is not a disbelief in gods or a denial of gods it is a lack of belief

Pro atheism <https://www.theguardian.com/news/2018/aug/27/religion-why-is-faith-growing-and-what-happens-next>
religion: why faith is becoming more and more popular - the
religion: why faith is becoming more and more popular - the 27 aug. 2018 -- faith is on the rise and 84% of the global population identifies with a religious group. what does it mean for the future? think religion belongs to the past and we live in a new age of reason you need to check out the facts 84 of the worlds population identifies with a religious group. members of this demographic are generally younger and produce...

Neutral <https://www.psychologytoday.com/us/blog/the-secular-life/201406/why-americans-hate-atheists>
why americans hate atheists - psychology today
why americans hate atheists - psychology today
why americans hate atheists americans have a lack of religiosity in general -- or atheism specifically -- with being unatheists lack faith in god, and thus theists are or not. verified by psychology today posted june 23 2014 reviewed by euka hagan last week. pew research center released results of a new survey concerning...

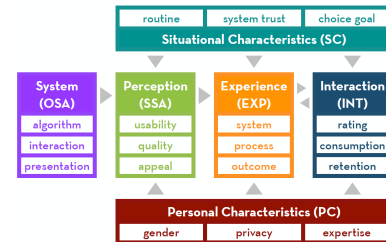
Con atheism <https://biblereasons.com/atheism-vs-theism/>
atheism vs theism debate: (10 important things to know)
atheism vs theism debate: (10 important things to know)
atheism automatically presupposes that 1) there is no rational, holy, and sovereign creator and 2) that their conclusions are totally and rationally justified. both of these cannot be correct. if a belief exists without reason, then anything drawn from that belief will also be without reason. can we understand the differences? how can...

Pro <https://www.wikiwand.com/en/Atheism>

Stance Overview of Search Results Appearing in this Page:

Pro atheism
Pro atheism
Pro atheism
Pro atheism
Neutral towards atheism
Con atheism
Pro atheism
Neutral towards atheism
Con atheism
Pro atheism

Personal Characteristics?



Working memory & Expertise [Jin et al 2018: UMAP and Recsys, UMUI 2019] Need for Cognition [Rieger et al. ACM HyperText'2021 🏆]

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

- One 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
- afrobeats
- all-rock
- alternative
- ambient

Recommendations Processor

Weight of selected artists: 50

Weight of selected tracks: 50

Weight of selected genres: 50

A playlist containing acoustic

- Stay... 2:54
- Can... 3:18
- Ho... 2:53
- Blan... 6:03
- Sto... 3:55
- Sen... 3:45
- I'm ... 3:15

Recommendations

Popularity

Music genres

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

Hey, Soul Train

Frozen Gro...
Ilan Bluestone

Heartless
Kris Allen

Babel
Mumford & Sons

Out Of To...
Justin Bieber

Hear Me N...
Boyce Avenue

Hey, Soul S...
Train



Katrien Verbert
Professor, KU Leuven



Yucheng Jin
Assistant Professor,
HKBU

Expertise

- These are complex interfaces
- More effective for people who are more expert
- Still! Higher acceptance and equal cognitive load even for high complexity [Jin et al UМУАІ'18]
 - Increases interaction
 - And accuracy

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

The interface is divided into three main sections:

- Recommendations source:** Lists '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...), Radiocative), and 'The top genres you have' (acoustic, afrobeat, alt-rock, alternative, ambient).
- Recommendations Processor:** Shows 'Weight of selected artists: 50' and 'Weight of selected tracks: 50'. It displays a playlist titled 'A playlist containing acoustic' with a Spotify player interface showing tracks like 'Stay...', 'Can...', 'Ho...', 'Blan...', 'Stol...', 'Sen...', and 'I'm ...'.
- Recommendations:** Features a 'Popularity' chart, a 'Music genres' list (chamber pop, mathpop, alternative pop rock, etc.), and a network graph of music genres (Hey, Soul, Out Of, Babel, Heart, Galaxie, Life Of, Stoned, Say You, Hear, Nebra, Knots, The Sal, World, Rock, Like We, Last On, Carry On). On the right, there is a vertical list of music recommendations with album covers and artist names like 'Frozen Gro...', 'Heartless', 'Babel', 'Out Of To...', 'Hear Me N...', and 'Hey, Soul S...'.

Take home messages

- Understanding is only a first step.
- Distrust of AI is healthy. But AI systems are not evil!
- Human-centered (X)AI benefits from questioning assumptions.
 - Long Term Program (10Y) (Co-I). [ROBUST: Trustworthy AI-based Systems for Sustainable Growth](#).

Thank you

In a world where
you can be
anything, be kind.



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