

# Recommendations, Decisions, Feedback Loops, and Maybe Saving the Planet

Michael D. Ekstrand

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BOISE STATE UNIVERSITY



People and  
Information  
Research  
Team

# questions

- How do humans interpret and make use of recommendations?
- When is it acceptable to use knowledge of human decision-making?
  - **Individual or global?**

we are nudging

**Recommender systems nudge**, at the very least

- How?
- Towards what?
- With what accountability?

Not addressing this means we **don't know what our nudges are**, not that we aren't making them.

# case study: energy savings [Starke et al., RecSys 2017]

**Goal:** encourage citizens to adopt energy-saving measures

**System:** web portal for exploring energy saving measures

**Method:** model difficulty & user ability on a Rasch scale, recommend measures based on user ability

**Findings:** increased user satisfaction, increased adoption (4 weeks out)

## Besparingshulp

Kies maatregelen die u nog niet toepast maar wel wilt gaan toepassen.

Wanneer u klaar bent gaat u naar uw winkelwagen. Controleer uw keuzes en klik op 'bevestigen'.

Basis

Aanbevolen

Uitdagend

Ga ik doen (0)



### Dag-nachttarief

Een dag-nachttarief meter plaatsen kan veel geld besparen wanneer er tijdens de daltarieven energie verbruikt wordt voor bijvoorbeeld wassen of drogen.

MATCH

97%

BESPARING

0 kWh/j

BESPARING

€ 0,- p.j.

INVESTERING

€ 103,-

Ga ik doen



### Geiser schoon houden

Een geiser verbrandt gas om water te verwarmen. Als de geiser van binnen vies is (roet) wordt het gas minder efficiënt verbrand en het is schadelijk voor mensen. Eén keer per jaar schoonmaken kan dit al verhelpen.

MATCH

96%

BESPARING

120 kWh/j

BESPARING

€ 25,- p.j.

INVESTERING

€ 0,-

Ga ik doen

Klaar?

From Starke, A., Willemsen, M.C. and Snijders, C. 2017. Effective User Interface Designs to Increase Energy-efficient Behavior in a Rasch-based Energy Recommender System. In Proc. ACM RecSys 2017.



# WHAT IS A DECISION?\*

SAMUEL EILON

*Imperial College of Science and Technology*

The decision process is described as a series of steps, starting with information output and analysis and culminating in resolution, namely a **selection from several available alternatives**. Various aspects of rationality in decision making are reviewed and the concept of personalistic versus impersonalistic choice is discussed. It is suggested that with time management control tends to involve an increasing number of formal procedures and thereby to become more impersonalistic in character.









On The Way  
To Work

Damien  
Hirst






Gordon  
Burn

SUSAN BRIGHT ART PHOTOGRAPHY NOW

ANDY WARHOL  
"GIANT" SIZE

# recommender vocabulary

**Items**       
are the things we recommend

**Users**       
receive & act on recommendations  
provide input used for recommendation

**Ratings**     
encode user preference for items

# Recommender Tasks

## Predict

estimate how much 🧐 likes




can be: predicted rating  
purchase probability  
score





# recommender tasks

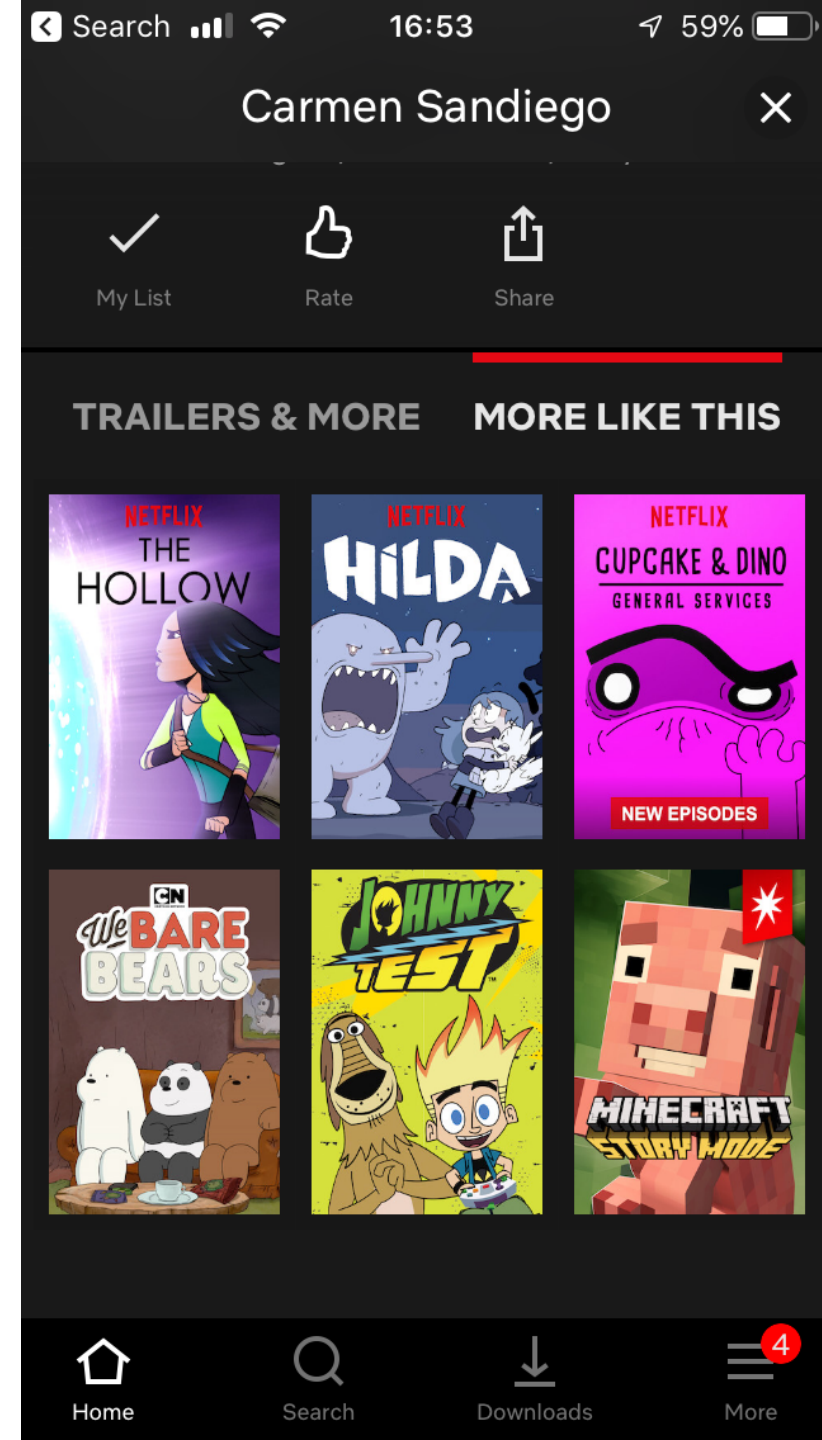
## Predict

estimate how much 🧐 likes  


can be: predicted rating  
purchase probability  
score

## Recommend

identify items that 🧐 may like  
maybe a 🚀?

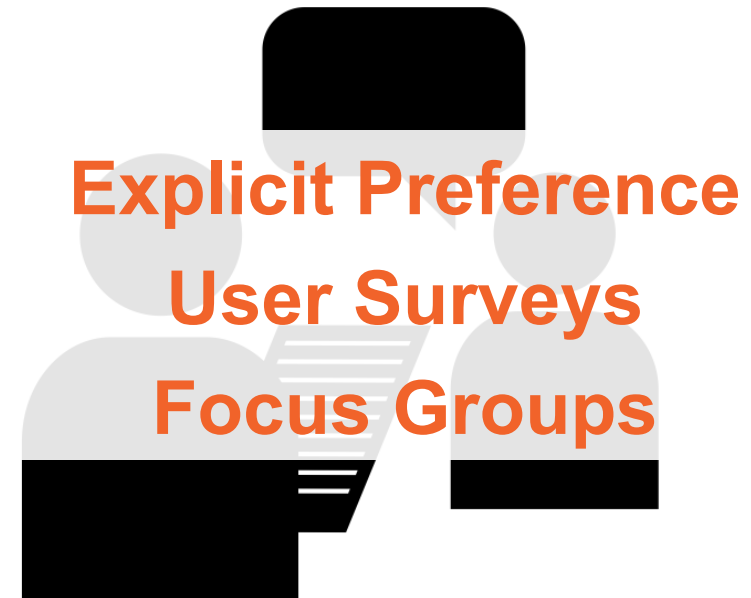


# learning about users

Look at what they do



Listen to what they say



# objective functions for modeling users

Score item  $i$  (or set  $I^*$ ) for user  $u$  with need  $h$  in context  $x$ :

$$s_{iu,h,x}$$

$$s(I^* | u, h, x)$$

Optimize to predict:

- Rating ( $r_{ui} - s_{iu}$ )
- Consumption probability ( $P_{iu} = \text{logit}^{-1}(s_{iu})$ )
- Relative order ( $i \succ_u j \Leftrightarrow s_{iu} > s_{ju}$ )
- Regret (e.g.  $P(I \cap G_u = \emptyset)$ )



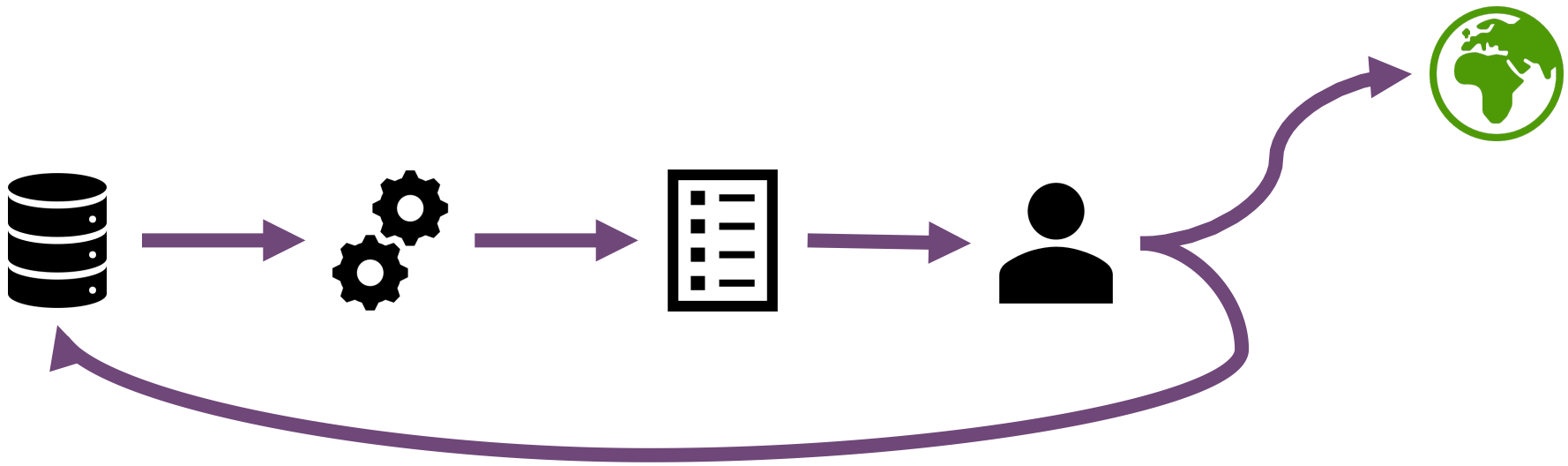
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# recommendations in context



score the alternatives

# prioritize the alternatives


movie|ens    347   

MovieLens recommends these movies


## top picks

found 65918 movies.


sort by:




Coco  
★ 4.7




Nightcrawler  
★ 4.8





The Grand Budapest Hotel  
★ 4.6




Drive  
★ 4.6



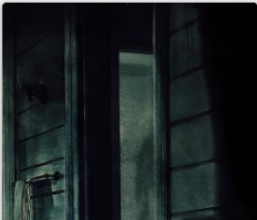
Get Out  
★ 4.5 





Room  
★ 4.6





Avengers: Endgame  
★ 4.6

















# expand the alternatives

The screenshot shows the Spotify interface for a user named mdekstrand. At the top, there is a navigation bar with a search bar, an 'UPGRADE' button, and the user's profile. Below this, the 'Discover Weekly' playlist is featured, described as 'MADE FOR MDEKSTRAND'. The playlist cover art is a colorful geometric design. The description states it's a weekly mixtape of fresh music, updated every Monday. Below the description, there are buttons for 'PLAY', a heart icon, and a three-dot menu. A 'Filter' search bar and a 'Download' toggle are also visible. The main content is a list of songs with columns for 'TITLE' and 'ARTIST'. The first song is 'Never Look Away' by Vienna Teng, which is highlighted in green. Other songs listed are 'Mile In These Shoes' by Jennifer Lopez, 'Push the Button' by Amy Lee, 'Chasing Shadows' by Shakira, and 'Agony' by Paloma Faith.

< > Search UPGRADE mdekstrand

**Discover Weekly**  
MADE FOR MDEKSTRAND  
Your weekly mixtape of fresh music. Enjoy new discoveries and deep cuts chosen just for you. Updated every Monday, so save yo...  
Made for mdekstrand by Spotify • 30 songs, 1 hr 54 min

PLAY

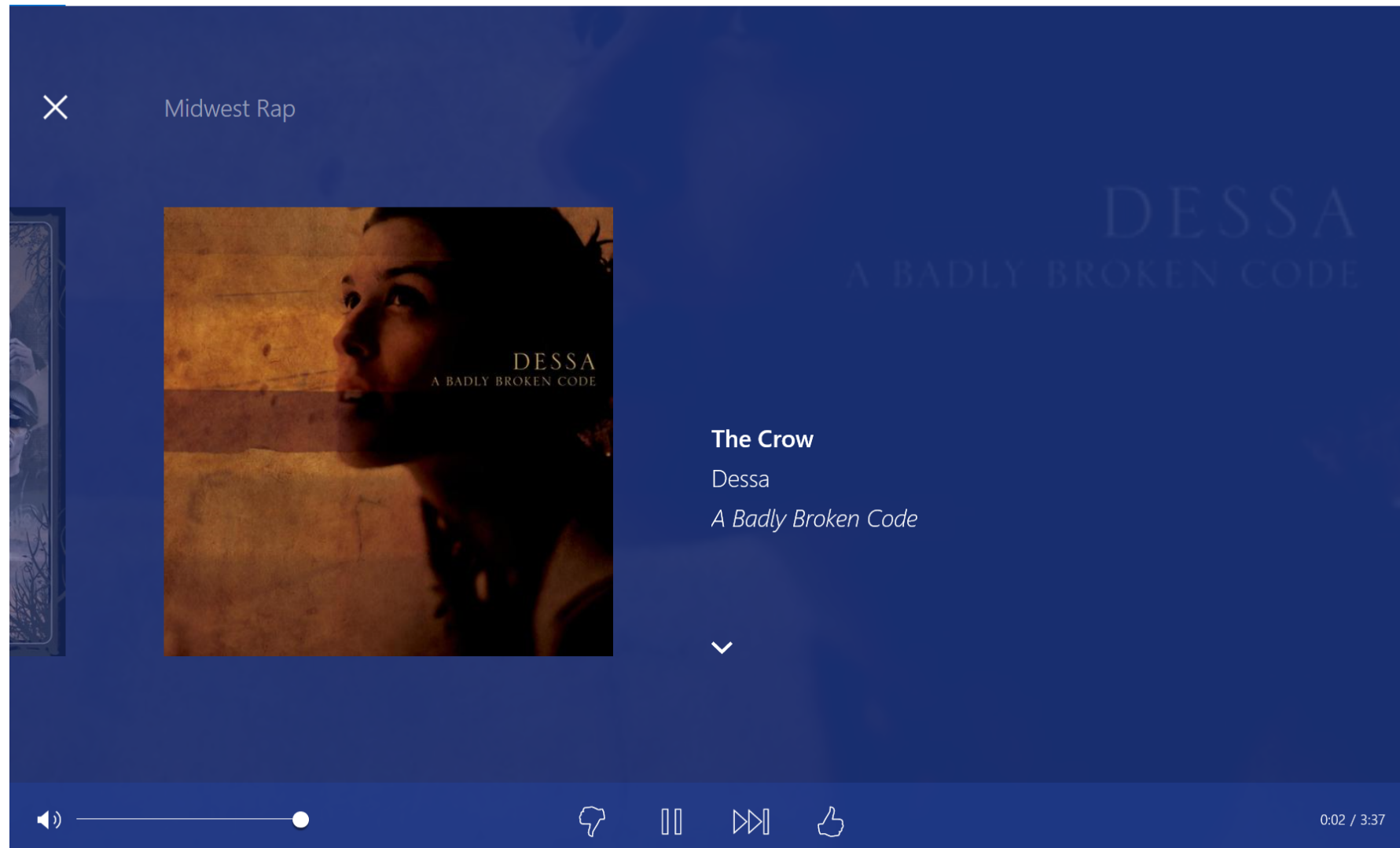
Filter Download

	TITLE	ARTIST	
♥	Never Look Away	Vienna Teng	⊖
♥	Mile In These Shoes	Jennifer Lopez	
♥	Push the Button	Amy Lee	
♥	Chasing Shadows	Shakira	
♥	Agony	Paloma Faith	

constrain the alternatives

explain the alternatives

# postpone the alternatives





## scores and users

- Scores bias user ratings [Cosley et al., 2003]
  - For both seen and unseen movies
  - Users may sense this
- Scores + decisions may exacerbate unfairness [Green & Chen 2019]
- People are reluctant to incorporate algorithmic inputs [Yeomans et al. 2019]

# explanations and users

Explanations can ...

- ... improve system adoption [Herlocker et al, 2000]
- ... skew expectations [Bilgic & Mooney 2005]
- ... improve score adoption [Yeomans et al. 2019]

**Prediction is not explanation**

**Explanation != justification**

# recommendations and users

- Diverse recommendations can decrease choice difficulty
- Recommendations and filters increase/decrease likelihood of awareness

# recommendations and fairness

## Fair recommendations ...

- ... serve all users [Ekstrand et al., FAT\* 2018]
- ... fairly allocate exposure or attention [Biega et al. 2018]
- ... promote group representation [Ekstrand et al., RecSys 2018; Sapiezynski et al. 2019]
- ... fairly orders item pairs [Beutel et al. 2019]
- ... what else?

# nudge to what?

The user's goal's [Ekstrand & Willemsen 2016, Yang et al. 2019]

Social good

- Energy savings [Starke et al. 2017]
- Sustainability [Tomkins et al. 2018]
- Fairness?

Profit

powerful nudges

Recommender systems'  
behavior-targeting capabilities  
provide **incredible power** and  
**substantial risk**.

We can identify nudges users are *more likely* to adopt.

# open questions

How do people respond? Much still unknown.

- In fairness-relevant settings?
- What drives different kinds of adoptions?
- What kind of adherence is needed?
- When & how to restrict autonomy?

How do we elicit user goals for nudging?

# moral framework impedance

Virtue



Our intentions  
were good / not  
bad.

Deontology



We followed the  
rules.

Nihilism



Why should we  
care?

Consequentialism



**What is the impact?**



# Thank You

## Questions?



<https://purl.org/mde/FairEcon>