

RecSys challenges in achieving sustainable eating habits

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A short story about luck



Niels Stensen

Regula Benedicti to achieve your goals



Niels Stensen
(Nicolaus Steno)



Benedict of Nursia

Achieving behavioral goals is hard – even if you do not have to join an abbey

- Health domain behaviors differ with respect to how easy they are to achieve (compared to e.g. movies)
 - ‘Only’ eating 1 cookie a day *might* be easy, while sticking to a calorie goal is harder
 - Setting ambitious goals is fine, but making a giant leap in terms of improvement is unrealistic
- Behaviors are also ambiguous
 - Is riding a bike healthy, sustainable, or just convenient?

Why don't users make a giant leap in Sustainable eating?

- Cutting dairy, meat & eggs consumption by half would reduce 25%-40% in GHG emissions
- But... decision-makers are not fully-informed
 - Environmental impacts are not always visible (second-order effects, feedback is missing)
 - Knowledge is often lacking to make well-informed choices (misperceptions of kWh savings & CO2 emissions)

Current behavior \neq future goals

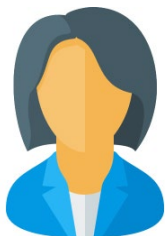
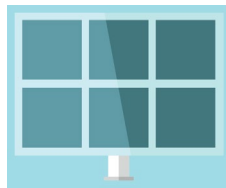
- CF might generate recommendations from other 'unhealthy' users, CB might propose preferred but unhealthy items
- A behavioral goal might be too difficult to achieve immediately
- To achieve behavioral change, capturing the execution difficulty among behaviors might help
 - And preferably suggest behaviors that have impact & are not effortful

Small behavioral steps could go a long way



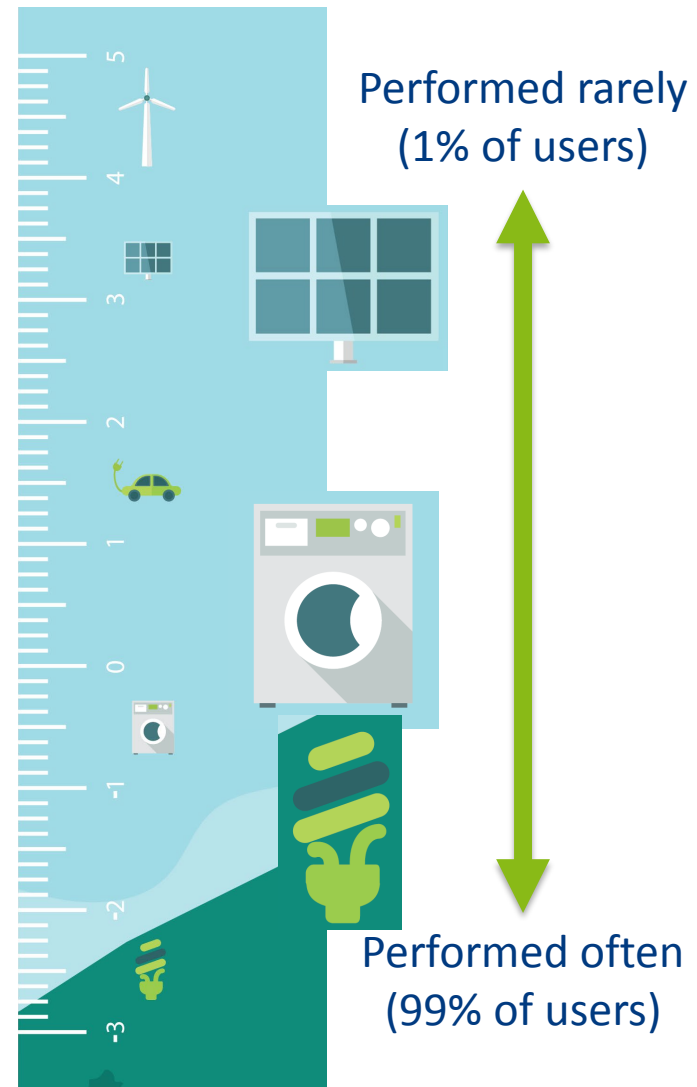
To consider future goals, we use a
2-parameter Rasch model

$$\Pr\{X_{ni} = 1\} = \frac{e^{\beta_n - \delta_i}}{1 + e^{\beta_n - \delta_i}}$$

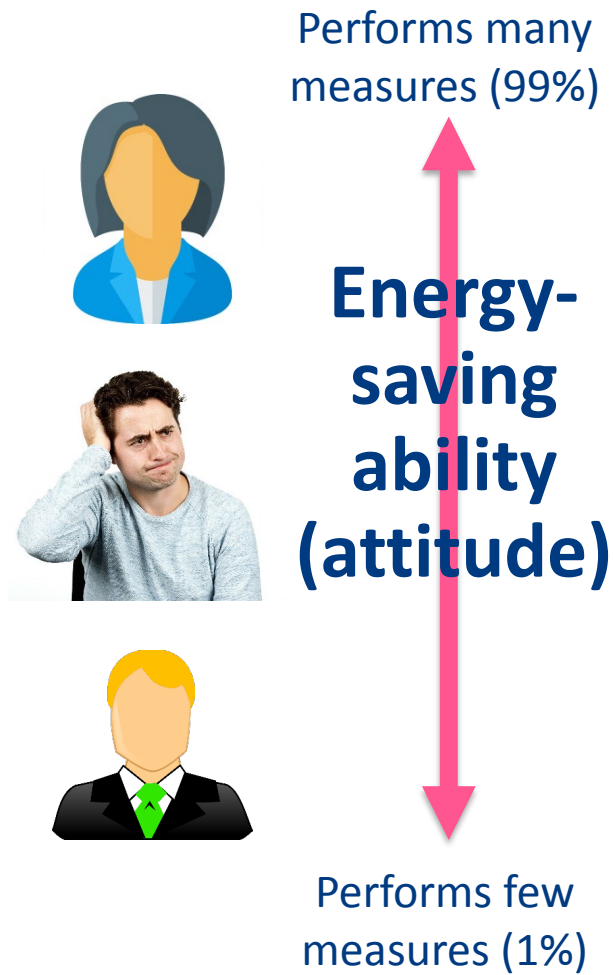


This is a 'Rasch scale'

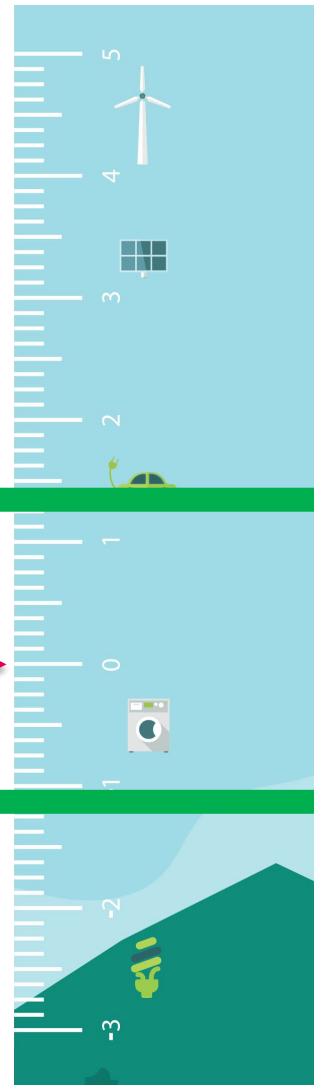
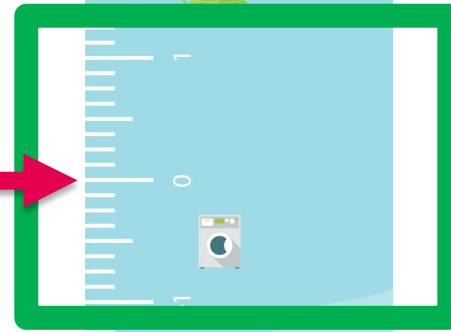
This order of measures is rather consistent across different populations



Persons are ordered on the same scale:



The position on the scale serves as a starting point for energy-saving recommendations



Probability of already performing a measure:

2%

5%

12%

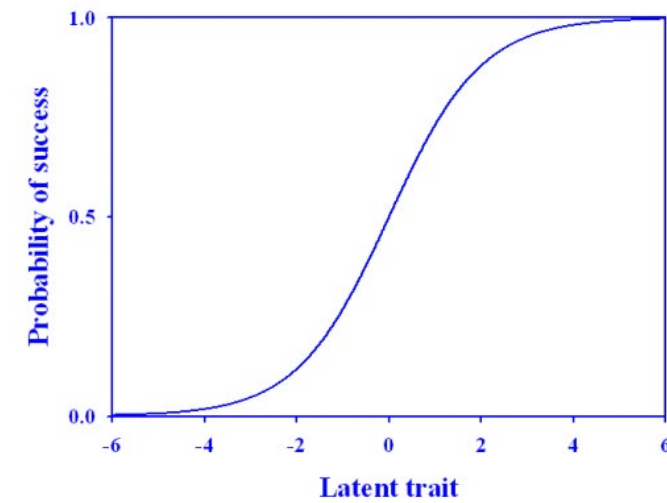
25%

50%

75%

90%

95%



Rasch considers a behavioral goal as a single latent factor

- Household energy conservation (Starke et al., 2017; RecSys'17)
- Nutrition intake (Schäfer & Willemsen, 2019; IUI'19)
- Hypertension treatment (Radha et al., 2016; UMAP'16)
- Medicine adherence (Kleppe et al., 2015)

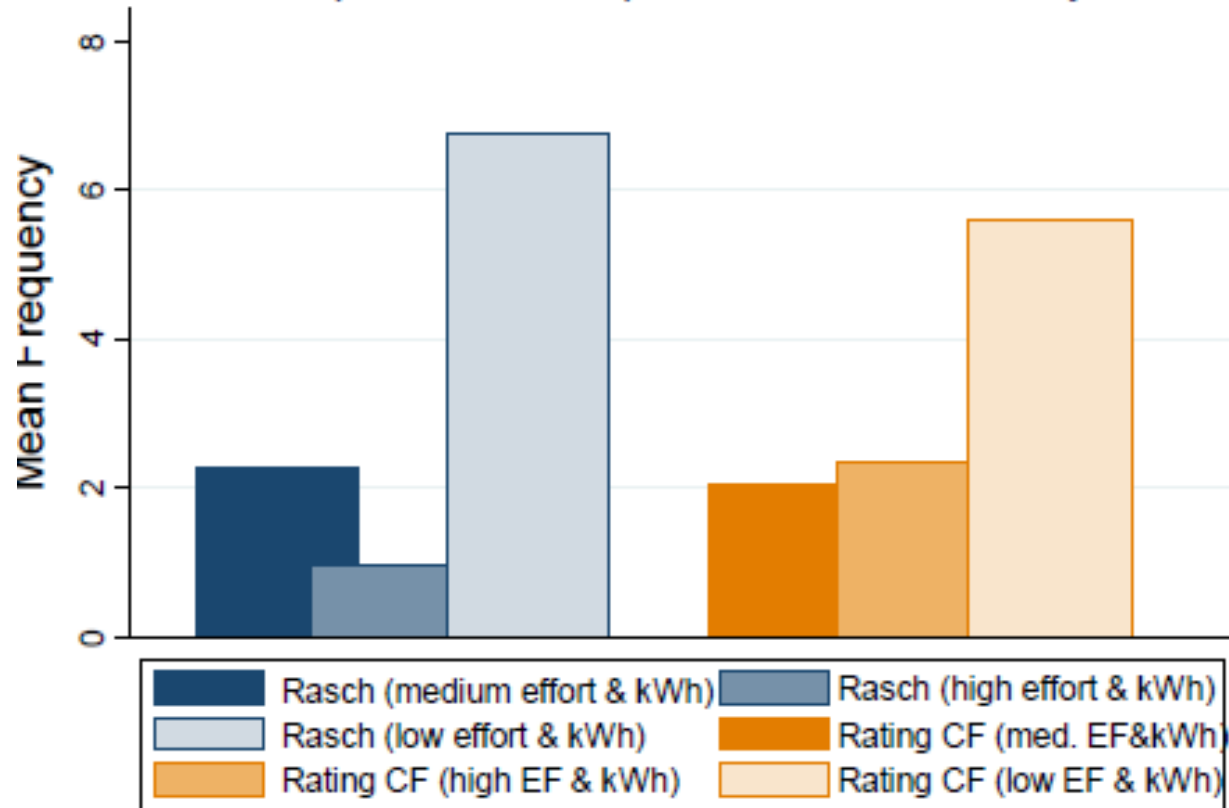
Example analysis: How sensitive are different algorithms to changes in ability/attitude/expertise?

- Comparison of changes in Top-10 recommendation sets:
 - CF Rating prediction model
 - Rasch model
 - Logistic regression
- 3 Categories were made by k-means similarity on kWh savings & perceived effort

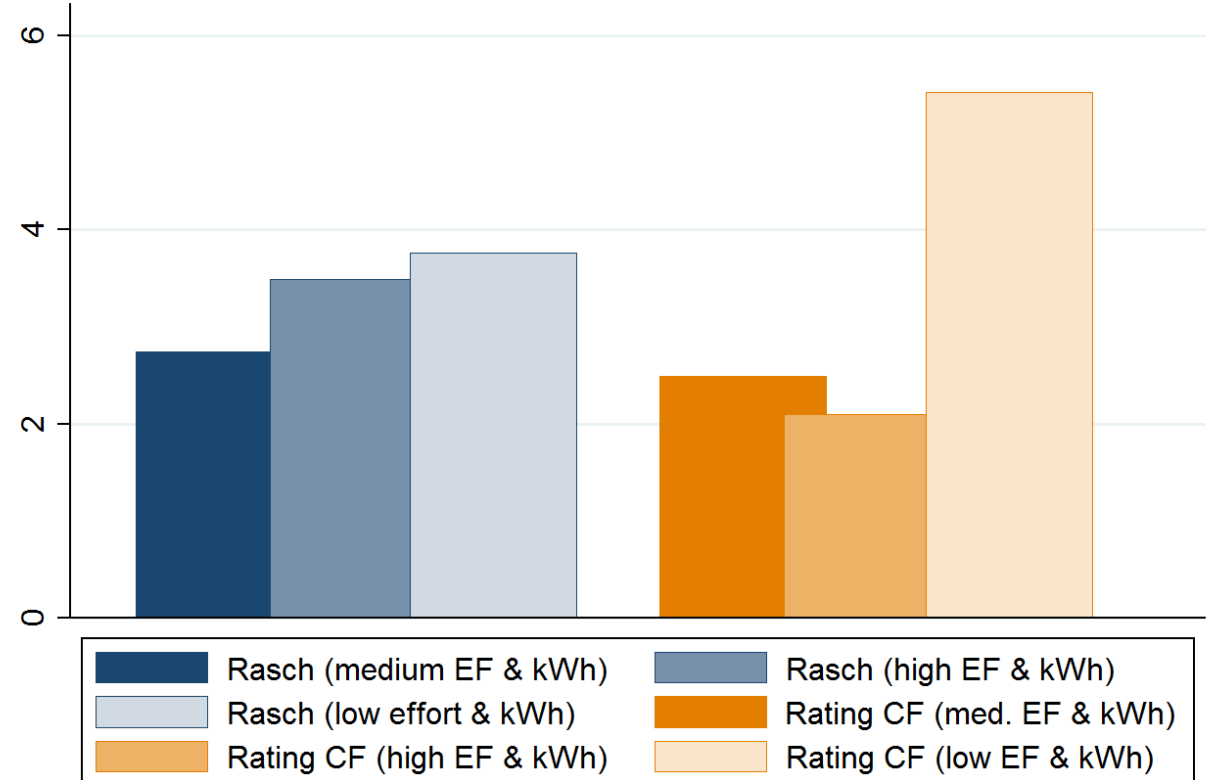
We collected dichotomous self-reports from 304 users
on 134 energy-saving measures (N=7551)

Less sensitivity between experienced & inexperienced users for CF (logit not shown)

Top-10 RecLists per cluster - Low Ability

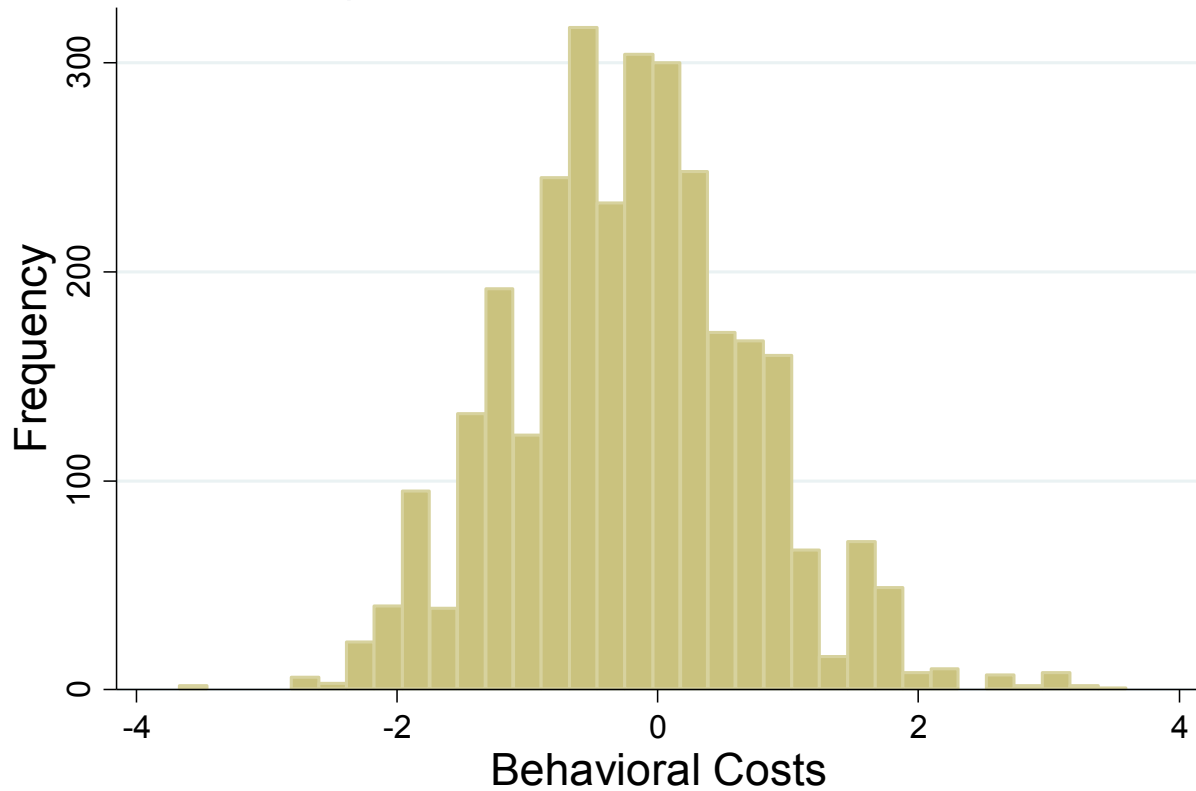


Top-10 RecLists per cluster - High Ability

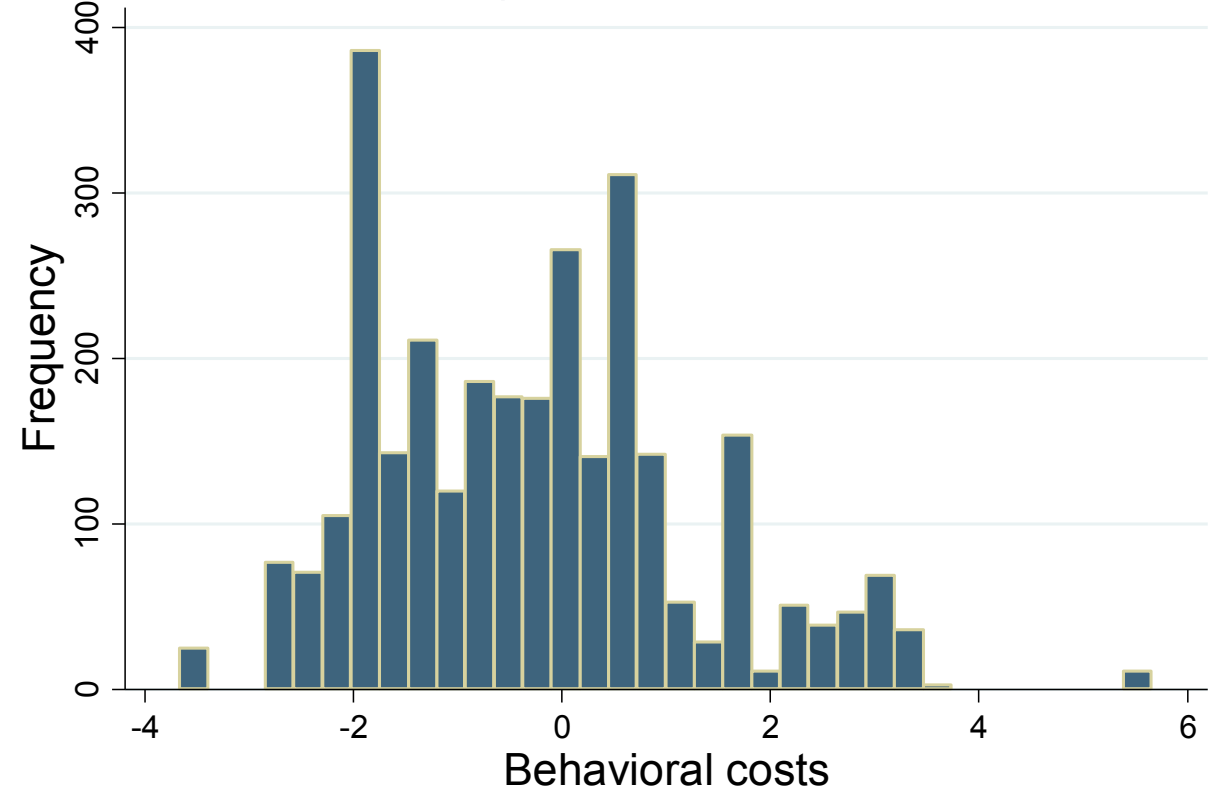


CF is more skewed to easier content

Top-10 Rasch Recommendation sets



Top-10 CF-based sets



Upcoming work

- Habit-forming is not captured by the presented models, but considering the behavioral trajectory may help. Small behavioral steps might be able to support users better
- Studies that go beyond choices are necessary
 - How quickly do treatment effects diminish?
 - How do self-reports relate to actual behavior?
 - Longitudinal studies can show causality

Thanks

