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?

Cf. Schäfer & Willemsen, 2019
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)

Asano & Biermann, 2019; Attari et al., 2010
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:

- Energy-saving ability (attitude)
  - Performs many measures (99%)
  - Performs few measures (1%)

- Behavioral Costs
  - Performed rarely (1% of users)
  - Performed often (99% of users)
The position on the scale serves as a starting point for energy-saving recommendations.
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)
CF is more skewed to easier content
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