

Preference-based diet optimization using integer programming (topic presentation)

Harri Jalovaara

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Advisor: *Philine Schiewe*

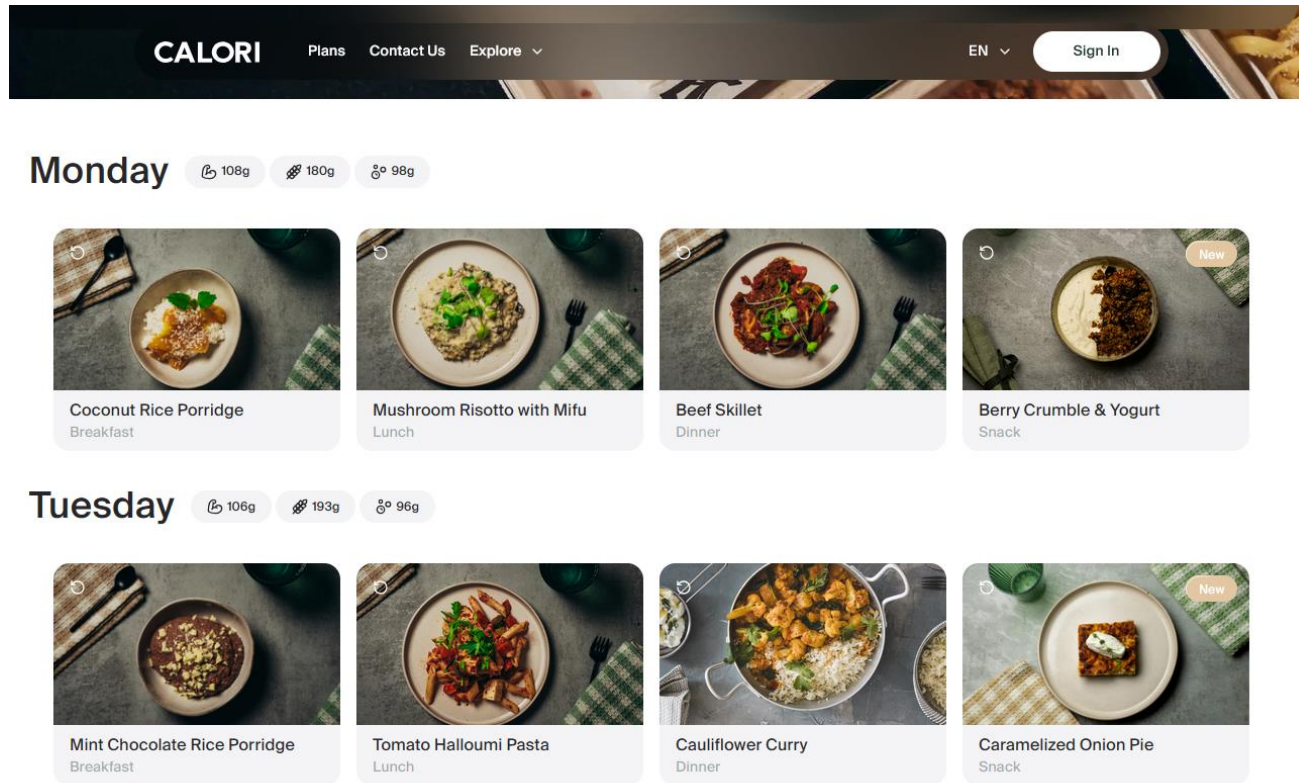
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Työn saa tallentaa ja julkistaa Aalto-yliopiston avoimilla verkkosivuilla. Muilta osin kaikki oikeudet pidätetään.

Background (1/2)

- Meal plan service *Calori* (Lagom Food Oy)
 - User selects foods to be prepared and delivered
 - Focus on healthy diet
- Choosing foods based on preference alone may result in an imbalanced diet
- Need for a tool that helps the user select a balanced diet

Background (2/2)



Meal plan selection on calori.fi (27.10.2025)

Generalized problem statement

- *Given a set of food items, which multisubsets provide the best nutrient content while accommodating personal dietary preferences?*
- Further specification needed:
 - Mathematical interpretation of "best nutrient content"
 - Quantification of dietary preferences
 - Relative importance of nutrition versus preference

Methods

- Review of existing literature on diet optimization
- Integer (linear) program
 - Parameters:
 - Set of available food items
 - Desired daily nutrient intake
 - Number of days
 - Dietary preferences
 - Optimize for nutrition while taking preferences into account
 - Multiobjective optimization?
 - Amounts of each food item as decision variables
- Implementation in Julia using the JuMP package

Scope of the thesis

- Development of the model and implementation in Julia
- Only consider combinations of given food items, not the composition of individual items
- Nutrition data is assumed to be accurate and complete
- Cost and ecological impact of food items will not be considered

Reference materials

- van Dooren, C. (2018). A Review of the Use of Linear Programming to Optimize Diets, Nutritiously, Economically and Environmentally. In *Frontiers in Nutrition* (Vol. 5). Frontiers Media S.A.
<https://doi.org/10.3389/fnut.2018.00048>
- Donkor, L., Essien, E., & Afrifah, N. S. (2023). A Systematic Review of Linear Programming Techniques as Applied to Diet Optimisation and Opportunities for Improvement. In *Journal of Optimization* (Vol. 2023). Wiley-Hindawi. <https://doi.org/10.1155/2023/1271115>
- JuMP documentation: <https://jump.dev/JuMP.jl/stable/>

Schedule

- Formulation of the problem: 10/2025
- Topic presentation: 10/2025
- Developing the model: 10–12/2025
- Writing the thesis: 11/2025–1/2026
- Thesis finished: 2/2026