



Designing automated dietary guidance

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Background

Maintaining a balanced diet is essential for a healthy lifestyle. Since the impact of food on health is complex, it requires timely, context-dependent and personalized guidance. For making such advice available for each individual, automation is needed. Creating an automated advice requires psychological, social, metabolic, medical and practical aspects and interactions to be taken into account. Current advisory tools and apps do not sufficiently address this complexity and too often disregard the full complexity of the problem.



Figure 1. Complexity of making decision on what to eat

Objective

Our goal is to develop a tool for researchers, professionals and app developers to evaluate different design choices when constructing digital dietary advice solutions. These choices depend on the target audience, available products, availability of personal parameters, required level of evidence, etc.

Introduction

In theory, an advice should be based on personal health status, preferences and scientific evidence of such that:

1. Detailed data about current individual dietary habit.
2. Continuously monitored individual health status, personal preferences and context.
3. Scientifically established relations between nutrients and health parameters.
4. Advice on alternative, specific amounts of products for each eating moment.

This ideal cannot yet be reached due to lack of data, algorithms and scientific evidence, so we need approximations.

1. Advice at the level of food categories rather than specific products.
2. Consumers classified in segments with similar health status, preferences and context.
3. Using cut-off values of healthy amounts for consumer segments.
4. Food-health relations as expressed by the professionals.

Typically, nutritional professionals use heuristics, as for example expressed by the Dutch Health Council.

	51-69 jaar man	51-69 jaar vrouw	>70 jaar man	>70 jaar vrouw
Groente	250 g/d	250 g/d	250 g/d	250 g/d
Fruit	200 g/d	200 g/d	200 g/d	200 g/d
Brood	6-7 snee/d 210-245 g/d	3-4 snee/d 105-140 g/d	4-6 snee/d 140-210 g/d	3-4 snee/d 105-140 g/d
Graanproducten en aardappelen*	4 porties/d 240 g/d	3-4 porties/d 180-240 g/d	4 porties/d 240 g/d	3 porties/d 180 g/d
Vis	1 keer per wk 100 g/wk			
Peulvruchten	2-3 opscheplepels/wk 135 g/wk	2-3 opscheplepels/wk 135 g/wk	2-3 opscheplepels/wk 135 g/wk	2-3 opscheplepels/wk 135 g/wk
Vlees**	Max 500 g/wk 100 g/keer			

Figure 2. Typical dietary advice rules used in practice

Solution

We have developed a software demonstrator that combines these two approaches in order to make optimal use of the available data and knowledge. The demonstrator allows a developer of consumer apps to make specific design choices. In particular we support

- Gradual steps based on overall improvement rather than one-to-one product improvement.
- Product alternatives based on predefined, standard replacements, but on the application of *similarity filters*.
- A choice between the use of personal health parameters or population-based approximations.
- A flexible architecture based on a semantic data repository, knowledge rules and Bayesian Belief Networks.

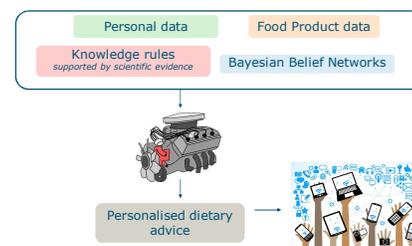


Figure 3. Design of the Digital Dietary Advice Demonstrator

Results

The demonstrator allows a developer of consumer apps to make her own design choices depending on the data and knowledge is available for a target audience, product set or behavioural method. The first version of the demonstrator has been applied in a case study on promoting increased fibre intake.

Figure 4. Example screen of the Digital Dietary Advice Demonstrator

Conclusions

- It is possible to combine personal data and population based recommendations for digital, dietary coaching.
- Generating acceptable alternative products should be distinguished from rating these in terms of health impact.
- More product data is needed to address the full range of food intake and alternatives.

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