AI-POWERED NUTRITION ANALYZE FOR FITNESS ENTHUSIASTS

ABSTRACT

The goal of this work is to provide an overview of existing approaches regarding AI nutrition recommender systems. A break-down of such systems into task-specific components is presented, as well as methodologies concerned with each individual component. The components of an idealized AI nutrition recommender system are presented and compared to state-of-the-art approaches in the corresponding area of research. Finally, identified issues in some of these areas are also discussed.

INTRODUCTION

Eating is for some people just a necessary everyday activity, while for others, a unique moment in their daily schedule that gives them great enjoyment. No matter the side that each person has chosen,it is becoming more and more evident that the role food plays in our overall health is of utmost importance. From a superficial point of view, our bodies need a specific amount of energy to function properly and food provides just this. However, in reality, not all calories are created equal; the accompanying nutrients play a vital role in the way food is processed by the human body, thus affecting our overall health. To this end, the consumption of a wide variety of food items is necessary in order for the human body to obtain the right amounts of nutrients. Failing to follow such a well-balanced diet, in combination with a generally unhealthy way of living,has been shown to increase the risk for cardio vascular disease,type II diabetes and some forms of cancer. Taking all these factors into consideration, food intake monitoring can provide substantial benefits in certain cases.

FOOD ANALYSIS

Food analysis is a core component of AI nutrition recommender systems, as it provides the prerequisites for obtaining a high-level understanding of the type and the amount of food consumed by the user. This category can broadly be divided into methods related to food category recognition, food ingredient and cooking instructions recognition and food quantity estimation. In the next sections each category is further analyzed and the most important relevant literature is presented.

EATING BEHAVIOUR ANALYSIS

This section is concerned with methods that analyze human eating behaviour, and more specifically with chewing rate, mastication count, overall meal duration estimation, as well as distinguish between eating events and non-eating-related events. Unlike food category recognition, where most methods are based on image analysis, a number of different approaches have been used in the literature regarding eating behaviour analysis. These are based on weight, audio, hand motion, image and jaw motion analysis, to name a few. Below we describe some of the methods in more detail.

AI NUTRITION RECOMMENDER SYSTEMS

This section initially provides a description of the components that an idealized AI nutrition recommender system would have. Each component is then compared to state-of-the-art methods and an assessment of its feasibility with current technology is provided.Finally, recent literature and EU-funded projects relevant to this task are presented, including the approach followed by the PROTEIN project, in which the authors of this work participate.To begin with, an ideal AI nutrition recommender system would be able to identify the type of food consumed by the user, providing as detailed a description as possible. For example, identifying a dish as Chicken Salad with Wild Rice instead of Salad. This field of study has received the most attention from the research community and is in a mature state, with standardized large-scale data-sets being available for evaluation purposes. Although recent approaches in food category recognition have reported results above the 90% mark in Food, good evaluation results on a data-set equivalent in scale to Image Net, such as Recipe1M, would be needed in order to get closer in fulfilling this requirement.

CONCLUSION

This work provided an overview of existing AI nutrition recommender systems, a field that has experienced substantial growth in the last few years. A categorization of such systems into task-specific components was presented, along with approaches concerned with each component and relevant data-sets. An assessment of the feasibility of implementing an ideal AI nutrition recommender system using current methods was also provided, with the general conclusion being that some of the required components have not reached a mature state yet.

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