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Artificial Intelligence applications in Personalized Nutrition

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INTRODUCTION: Recent advances in Artificial Intelligence (AI) resulted in a multitude of applications of this technology in a wide range of fields. At the same time, the extensive use of smartphones and smart devices, which are equipped with a large variety of sensors, allows for capturing and analysis of numerous personal health related data by the user himself. In this work, we will provide an overview of the algorithms and applications – related to personalized nutrition – that are developed by the authors, including methods performing food identification, eating analysis and meal planning and recommendations.
METHODS: The proposed food identification method can be applied to identify a certain food and its ingredients using only a single photo (of the food) captured with a standard mobile phone camera. The method is based on a deep learning neural network that employs Variational Autoencoders and is trained with a large database of a million images. The eating analysis method can be applied to analyse a video captured by a mobile phone and identify when someone bites and hence calculate his eating rate. This method initially uses a deep learning network that extracts body and face features from each video frame and, then, a second one that uses the extracted features and identifies the frames in which bites occur. Finally, the meal planning method can be used to propose personalised meal plans, based on expert knowledge (ontology), the user's health profile, physical activity, food intake as well as the user's preferences.

RESULTS: Eating analysis method has been tested with real users achieving results similar to the manual annotation while food identification method outperforms the state of the art. Meal planning and recommendation algorithm is currently being tested using promising results.

CONCLUSION: In this work three types of applications of AI in personalised nutrition have been presented. The eating analysis method is significant, especially for people with eating disorders, since it can identify abnormal eating rates and notify the user/ her/his medical doctor. The food identification method can be used as a component in nutrition applications, enabling the user to log his food intake in an easy and fast way. Even though it does not reach very high accuracy (despite being at the state of the art), it can however be used in a semi-automatic setup. Finally, using the meal planning method a user can improve her/his dietary health and, thus, achieve optimal health.

1. Conflict of Interest: None

Keywords: artificial intelligence, deep learning, personalized nutrition, meal planning and recommendations,

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