AI-powered Nutrition Analyzer for Fitness Enthusiasts

DOMAIN : Artificial Intelligence

BATCH NO : B2- 2M4E

TEAM MATES:

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Paper 1:Artificial Intelligence (ANN,DL,ML) in Nutrients Science Research:

Publication Year: 2021

Author: Jarosław Sak & Magdalena Suchodolska

In recent decades, there has been an expansion of AI applications in biomedical sciences. The possibilities of artificial intelligence in the field of medical diagnostics, risk prediction and support of therapeutic techniques are growing rapidly. The aim of the article is to analyze the current use of AI in nutrients science research. The literature review was conducted in PubMed. A total of 399 records published between 1987 and 2020 were obtained, of which, after analyzing the titles and abstracts, 261 were rejected. In the next stages, the remaining records were analyzed using the full-text versions and, finally, 55 papers were selected. These papers were divided into three areas: AI in biomedical nutrients research (20 studies), AI in clinical nutrients research (22 studies) and AI in nutritional epidemiology (13 studies). It was found that the artificial neural network (ANN) methodology was dominant in the group of research on food composition study and production of nutrients. However, machine learning (ML) algorithms were widely used in studies on the influence of nutrients on the functioning of the human body in health and disease and in studies on the gut microbiota. Deep learning (DL) algorithms prevailed in a group of research works on clinical nutrients intake. The development of dietary systems using AI technology may lead to the creation of a global network that will be able to both actively support and monitor the personalized supply of nutrients.

Paper 2: Study Protocol for the Effects of Artificial Intelligence (AI)-Supported Automated Nutritional

Intervention on Glycemic Control in Patients with Type 2 Diabetes Mellitus

Publication Year: 2019

Author: RIE OKA, AKIHIRO NOMURA

Nutritional intervention is effective in improving glycemic control in patients with type 2 diabetes but requires large inputs of manpower. Recent improvements in photo analysis technology facilitated by artificial intelligence (AI) and remote communication technologies have enabled automated evaluations of nutrient intakes. AI- and mobile-supported nutritional intervention is expected to be an alternative approach to conventional in-person nutritional intervention, but with less human resources, although supporting evidence is not yet complete. The aim of this study is to test the hypothesis that AI-supported nutritional intervention is as efficacious as the in-person, face-to-face method in terms of improving glycemic control in patients with type 2 diabetes. Methods This is a multicenter, unblinded, parallel, randomized controlled study comparing the efficacy of AI-supported automated nutrition therapy with that of conventional human nutrition therapy in patients with type 2 diabetes. Patients with type 2 diabetes mainly controlled with diet are to be recruited and randomly assigned to AI-supported nutrition therapy (n = 50) and to human nutrition therapy (n = 50). Asken, a mobile application whose nutritional evaluation has been already validated to that by the classical method of weighted dietary records, has been specially modified for this study so that it follows the recommendations of Japan Diabetes Society (total energy restriction with proportion of

carbohydrates to fat to protein of 50–60, 20, and 20–30%, respectively). Planned Outcomes The primary outcome is the change in glycated hemoglobin levels from baseline to 12 months, and this outcome is to be compared between the two groups. The secondary outcomes are changes in fasting plasma glucose, plasma lipid profile, body weight, body mass index, waist circumference, blood pressures, and urinary albumin excretion. The results of this randomized controlled trial will fill the gap between the demand for support of AI in nutritional interventions and the scientific evidence on its efficacy.

Paper 3: An Artificial Intelligence-Based System for Nutrient Intake Assessment of Hospitalised Patients*

Publication Year: 2019

Author: Ya Lu, Thomai Stathopoulou, Maria F. Vasiloglou, Stergios Christodoulidis, Beat Blum, Thomas Walser, Vinzenz Meier, Zeno Stanga, Stavroula G. Mougiakakou

Regular nutrient intake monitoring in hospitalised patients plays a critical role in reducing the risk of disease-related malnutrition (DRM). Although several methods to estimate nutrient intake have been developed, there is still a clear demand for a more reliable and fully automated technique, as this could improve the data accuracy and reduce both the participant burden and the health costs. In this paper, we propose a novel system based on artificial intelligence to accurately estimate nutrient intake, by simply processing RGB depth image pairs captured before and after a meal consumption. For the development and evaluation of the system, a dedicated and new database of images and recipes of 322 meals was assembled, coupled to data annotation using innovative strategies. With this database, a system was

developed that employed a novel multi-task neural network and an algorithm for 3D surface construction. This allowed sequential semantic food segmentation and estimation of the volume of the consumed food, and permitted fully automatic estimation of nutrient intake for each food type with a 15% estimation error

Paper 4: Artificial intelligence in food science and nutrition

Publication Year: 2022

Author: **Taiki Miyazawa, Yoichi Hiratsuka, Masako Toda, Nozomu Hatakeyama, Hitoshi Ozawa, Chizumi Abe, Ting-Yu Cheng, Yuji Matsushima, Yoshifumi Miyawaki, Kinya Ashida**

artificial intelligence (AI) technologies became complementary to the research areas of food science and nutrition. This review aims to summarize these technological advances by systematically describing the following: the use of AI in other fields (eg, engineering, pharmacy, and medicine); the history of AI in relation to food science and nutrition; the AI technologies currently used in the agricultural and food industries; and some of the important applications of AI in areas such as immunity-boosting foods, dietary assessment, gut microbiome profile analysis, and toxicity prediction of food ingredients. These applications are likely to be in great demand in the near future. This review can provide a starting point for brainstorming and for generating new AI applications in food science and nutrition that have yet to be imagined.

Paper 5:**Calculating Nutrition Facts with Computer Vision**

Publication Year: 2022

Author: **Durgesh Samariya**

The task of food detection/classification is not easy as it seems. During my early days, my primary goal was to create the world's largest Indian food dataset for my research. Initially, I defined 151 Food categories to create my model. However, it is difficult to distinguish some items such as Naan, Butter Naan, Cheese Naan, and Garlic Naan. Similarly, it is difficult to identify Dal, Dal Fry, Dal Tadka, or let's consider Paratha, Aloo Paratha, Gobi Paratha, and Paneer Paratha. Thus, I created a single category for Naan, Dal, Parotha, and many more. In the final version, I am planning to return all possible options related to the given Image. For example, if a user uploads a dal image then the Foodify.ai app return all dal's from our nutrition database such as Dal Tadka, Dal Fry, Dal Makhni, etc.