AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

LITERATURE SURVEY

Mobile applications based on systems using AI are of significant importance in the field of nutritional prophylaxis. In 2008, Sun et al. proposed an electronic photographic approach and associated image processing algorithms to estimate food portion size. Lu et al., in a recent publication, offered go FOODTM as a dietary assessment system based on AI. It can estimate the calorie and macronutrient content of a meal, on the sole basis of food images captured by a smartphone. Yang et al. proposed a new methodological approach in the field of nutritional epidemiology, Ontology for Nutritional Epidemiology (ONE). It is a resource to automate data integration, browsing and searching. ONE can be used to assess reporting completeness in nutritional epidemiology. Lo et al. created an objective dietary assessment system based on a distinct neural Network . They used a depth image, the whole 3D point cloud map and iterative closest point (ICP) algorithms to improve the dietary behaviour management. Fang et al. estimated food energy based on images and the generative adversarial network (GAN) architecture (n = 45). Ji et al. assessed the relative validity of an image-based dietary assessment app keenoa and a 3-day food diary in a sample of healthy Canadian adults (n = 102). The authors in this randomized controlled trial showed that Keenoa had better validity at the group level than the individual level and it can be used when focusing on the dietary intake of the general population. Hsu et al. used the fuzzy decision model to develop a web-based support system that searches food composition databases and calculates dietary intake. This research project was carried out due to the lack of integrated databases for Chinese menus and the need for a decision-making tool for dietitians in Taiwan.

One of the main problems in analyzing publications on the use of AI in nutrient research is the range of research areas to be considered. This type of research creates a very diverse spectrum of problems. They are not limited to the field of biomedical sciences, but also apply to plant and animal breeding, including the breeding of microorganisms. The limitations which were found in the methodology of the review were dictated by the intention to maintain transparency. Therefore, studies that directly or indirectly relate to human health were included, excluding research on nutrients in agricultural and veterinary sciences. The review of the publications revealed three application areas of AI technology biomedical nutrients research, clinical nutrients research and nutritional epidemiology.

The use of AI in biomedical nutrients research reflects the need for efficient analysis of large datasets that could not be analyzed using traditional statistical methods. This applies in particular to the study of the relationship between nutrients and the functioning of the human body and in the study of the gut microbiota [40–42]. The increasing use of AI algorithms in this area is an expression of scientific progress and is becoming not only a privilege, but even a necessity in the pursuit of obtaining valuable results. The possible decoding of the gut microbiota functioning mechanisms can bring significant benefits in the form of possibilities to develop modern and very effective probiotics. The application of AI algorithms in clinical nutrients research is expressed both by systems supporting dietary activities, diseases risks in relation to food and nutrients patterns and supplementation research. An important issue in this research area is the assessment of the reliability and credibility of the test results obtained using AI techniques. Another essential issue is the modification of the dietician–patient relationship in the case of replacing, in whole or in part, the work of a medical professional by AI systems [43–53]. The problem of trust in AI-based systems, especially in the elderly, remains open. In the social dimension, however, with the implementation of modern technologies in everyday activities, an increase in trust in both robotic systems and AI systems in medicine is observed. Especially on the basis of the articles included in the review, it is possible to state potentially good-quality effects of using dietary AI systems. Comparing them with the assessment of professional nutritionists, it is worth noting that in both cases, there were similar difficulties with regard to estimating the caloric value of some food products (e.g., GoCARB). The use of AI systems in dietary assessments enables personalized nutrition, which in some diseases is a priority. The development of AI systems in dietetics may lead, in the near future, to a partial replacement of medical personnel and reducing the need for personal contact with a nutritionist.

In the face of contemporary epidemiological threats, this seems to be of significant importance. The further dynamic 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. In this case, consideration should be given to geographical and cultural differences in the management of food and nutrients. Perhaps the development of AI in nutrients research will enable the creation of personalized nutrition databases as a starting point for modulating daily nutrition, as enabled by Nutri-Educ based on fuzzy arithmetic. On the basis of this review, it is worthwhile to consider the possibility of creating AI systems to coordinate both biomedical and clinical nutrients research with nutritional epidemiology. Perhaps the gut microbiota function may

be an important mediator of this kind of advanced coordination. Therefore, research on the importance of the intestinal flora is of fundamental importance in the field of nutrients research. A significant challenge for the near future is the use of AI technology in the creation of gut microbiota biobanks for the purpose of scientific research. Despite the fact that AI technologies are dynamically developing, the problem in nutrients research is not currently obtaining more and more advanced algorithms, but the application of those that have already been developed and are standardly used in other fields of knowledge, and even in other areas of biomedicine.

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