Ideation Phase

Literature Survey

A Study of Multi-Task and Region-Wise Deep Learning for Food Ingredient Recognition-[2021]

Authors : Jingjing Chen, Bin Zhu, Chong-Wah Ngo, Tat-Seng Chua, Yu-Gang Jiang

Food recognition has captured numerous research attention for its importance for health-related applications. The existing approaches mostly focus on the categorization of food according to dish names, while ignoring the underlying ingredient composition. In reality, two dishes with the same name do not necessarily share the exact list of ingredients. Therefore, the dishes under the same food category are not mandatorily equal in nutrition content. Nevertheless, due to limited datasets available with ingredient labels, the problem of ingredient recognition is often overlooked. Furthermore, as the number of ingredients is expected to be much less than the number of food categories, ingredient recognition is more tractable in the real-world scenario. This paper provides an insightful analysis of three compelling issues in ingredient recognition. These issues involve recognition in either image-level or region level, pooling in either single or multiple image scales, learning in either single or multi-task manner. The analysis is conducted on a large food dataset, Vireo Food-251, contributed by this paper. The dataset is composed of 169,673 images with 251 popular Chinese food and 406 ingredients. The dataset includes adequate challenges in scale and complexity to reveal the limit of the current approaches in ingredient recognition.

Development and Evaluation of a Nutritional Smartphone Application for Making Smart and Healthy Choices in Grocery Shopping-[2017]

Authors : Desiree López , Michelle Torres , Jammy Vélez , Jhensen Grullon , Edwin Negrón , Cynthia M Pérez , Cristina Palacios

We developed a smartphone nutritional application (app) for making smart and healthy choices when purchasing food in grocery stores and tested its feasibility, usability, satisfaction and acceptability.Methods: "MyNutriCart" was developed following the ADDIE (analysis, design, development, implementation, and evaluation) model. The goals of the app were to improve food selection when purchasing foods in the grocery stores based on a pre-defined budget, to improve dietary patterns based on the Dietary Guidelines for Americans,

and to improve weight status. It was evaluated within a pilot randomized trial using a convenient sample of 26 overweight or obese adults aged 21-45 years for 8 weeks.Results: The developed app provided a grocery list of healthy foods to meet the individual requirements of all family members within a budget following the recommendations of the Dietary Guidelines for Americans. The average use of the app was 75% on each purchase and only 37% of the recommended products were purchased. The main reasons for not purchasing the recommended items were that participants did not like these (28.5%) and that the item was unavailable in the supermarket (24.3%). Over 50% of participants considered the app as feasible, usable, satisfactory, and acceptable ($p < 0.05$).Conclusions: "MyNutriCart" is the first available app for making smart and healthy choices when purchasing food in grocery stores. This app could be used as a tool to translate recommendations into a practical grocery list that meet the needs of a family within a budget.

The Impact of Nutrition Education Intervention with and Without a Mobile Phone Application on Nutrition Knowledge Among Young Endurance Athletes-[2019]

Authors : Maria Heikkilä , Mikko Lehtovirta , Ossi Autio , Mikael Fogelholm , Raisa Valve

Athletes often have significant gaps in their nutrition knowledge. Thus, the aim of this study was to investigate whether young Finnish endurance athletes' nutrition knowledge and dietary intake can be improved through an education intervention with or without a mobile food application. Seventy-nine endurance athletes, 18.0 years (SD: 1.4), participated in this randomized, controlled intervention. We compared the effects of participatory nutrition education sessions alone (group EDU) to those including the use of a mobile food application (group EDU + APP) for four days after each session. Both groups attended three 90-min education sessions fortnightly. The participants completed a validated nutrition knowledge questionnaire in Weeks 0, 5, and 17, and a three-day food diary in Weeks 0 and 17. The education plan was based on the Self-Determination Theory and the concept of meaningful learning process. The EDU group's nutrition knowledge scores were: 78 (week 0), 85 (week 5), and 84 (week 17) and the EDU + APP group's 78, 86, and 85, respectively. Nutrition knowledge increased significantly (main effect of time ($p < 0.001$)), but we observed no significant group × time interaction ($p = 0.309$). The changes in dietary intakes were minor ($p > 0.05$). The amount of carbohydrates was below endurance athletes' recommendations throughout the intervention. The reported energy intakes were also below the estimated energy expenditures. In conclusion, nutrition knowledge improved significantly after only three education sessions and food diary feedback, but the mobile app did not improve learning further. However, the nutrition education intervention alone was not enough to change dietary intake.

Pediatric Adapted Liking Survey (PALS) with Tailored Nutrition Education Messages: Application to a Middle School Setting-[2021]

Authors : Rachel Hildrey , Heidi Karner , Jessica Serrao , Carolyn A Lin , Ellen Shanley , Valerie B Duffy

We tested the feasibility of a school-based, liking-based behavioral screener (Pediatric Adapted Liking Survey (PALS)) and message program to motivate healthy diet and activity behaviors. Students, recruited from middle- ($n = 195$) or low-income ($n = 310$) schools, online-reported: likes/dislikes of foods/beverages and physical/sedentary activities, scored into healthy behavior indexes (HBI); perceived food insecurity; and sleep indicators. Students received tailored motivating or reinforcing messages (aligned with behavior change theories) and indicated their willingness to improve target behaviors as well as program feasibility (acceptability; usefulness). Although HBIs averaged lower in the lower versus middle-income school, frequencies of food insecurity were similar (39-44% of students). Students in both schools reported sleep concerns (middle-income school-43% reported insufficient hours of sleep/night; low-income school-55% reported excessive daytime sleepiness). Students across both schools confirmed the PALS acceptability (>85% agreement to answering questions quickly and completion without help) and usefulness ($\geq$73% agreed PALS got them thinking about their behaviors) as well as the tailored message acceptability ($\geq$73% reported the messages as helpful; learning new information; wanting to receive more messages) and usefulness (73% reported "liking" to try one behavioral improvement). Neither message type nor response varied significantly by food insecurity or sleep measures. Thus, this program feasibly delivered students acceptable and useful messages to motivate healthier behaviors and identified areas for school-wide health promotion.

Mobile Apps for Health Behavior Change in Physical Activity, Diet, Drug and Alcohol Use, and Mental Health: Systematic Review-[2020]

Authors : Madison Milne-Ives , Ching Lam , Caroline De Cock , Michelle Helena Van Velthoven , Edward Meinert

This systematic review aimed to assess the effectiveness of mobile apps in improving health behaviors and outcomes and to examine the inclusion and effectiveness of behavior change techniques (BCTs) in mobile health apps.Methods: PubMed, EMBASE, CINAHL, and Web of Science were systematically searched for articles published between 2014 and 2019 that evaluated mobile apps for health behavior change. Two authors independently screened and selected studies according to the eligibility criteria. Data were extracted and the risk of bias was assessed by one reviewer and validated by a second reviewer.Results: A total of 52 randomized controlled trials met the inclusion criteria and were included in the analysis-37 studies focused on physical activity, diet, or a combination of both, 11 on drug and alcohol use, and 4 on mental health. Participant perceptions were generally positive-only one app was rated as less helpful and satisfactory than the control-and the studies that measured engagement and usability found relatively high study completion rates (mean 83%; n=18, N=39) and ease-of-use ratings (3 significantly better than control, 9/15 rated >70%). However, there was little evidence of changed behavior or health

outcomes.Conclusions: There was no strong evidence in support of the effectiveness of mobile apps in improving health behaviors or outcomes because few studies found significant differences between the app and control groups. Further research is needed to identify the BCTs that are most effective at promoting behavior change. Improved reporting is necessary to accurately evaluate the mobile health app effectiveness and risk of bias.

Wearing the Future-Wearables to Empower Users to Take Greater Responsibility for Their Health and Care: Scoping Review-[2022]

Authors : Harjeevan Singh Kang, Mark Exworthy

This study aimed to identify, summarize, and synthesize knowledge on how wearable health technology can empower individuals to take greater responsibility for their health and care.Methods: This study was a scoping review with thematic analysis and narrative synthesis. Relevant guidance, such as the Arksey and O'Malley framework, was followed. In addition to searching gray literature, we searched MEDLINE, EMBASE, PsycINFO, HMIC, and Cochrane Library. Studies were included based on the following selection criteria: publication in English, publication in Europe or the United States, focus on wearables, relevance to the research, and the availability of the full text.Results: After identifying 1585 unique records and excluding papers based on the selection criteria, 20 studies were included in the review. On analysis of these 20 studies, 3 main themes emerged: the potential barriers to using wearables, the role of providers and the benefits to providers from promoting the use of wearables, and how wearables can drive behavior change.Conclusions: Considerable literature findings suggest that wearables can empower individuals by assisting with diagnosis, behavior change, and self-monitoring. However, greater adoption of wearables and engagement with wearable devices depend on various factors, including promotion and support from providers to encourage uptake; increased short-term investment to upskill staff, especially in the area of data analysis; and overcoming the barriers to use, particularly by improving device accuracy. Acting on these suggestions will require investment and constructive input from key stakeholders, namely users, health care professionals, and designers of the technology. As advancements in technology to make wearables viable health care devices have only come about recently, further studies will be important for measuring the effectiveness of wearables in empowering individuals. The investigation of user outcomes through large-scale studies would also be beneficial. Nevertheless, a significant challenge will be in the publication of research to keep pace with rapid developments related to wearable health technology.