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Contribution - FOOD RECOGNITION IN ASSESSING THE MEDITERRANEAN DIET: A HIERARCHICAL APPROACH

Topic: DS applications and challenges in Medicine, Natural Sciences, and Engineering

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Abstract

The Mediterranean diet (MD) is a dietary pattern that can lower the risk of non-communicable diseases, including diabetes. The MD Adherence (MDA) index determines how closely individuals follow MD, based on their consumed meals. The index can be automatically evaluated with a system which accurately recognises the food items that appear in a photo of a person's meal. We propose a novel hierarchical algorithm to address the problem of multi-label automatic food recognition. The input of the system is an image of a meal and the outputs are the MD-related food categories it contains. Firstly, a convolutional neural network (CNN) is trained to recognise the food items that exist in an image. The food categories are often confused by the CNN but are merged into coarse classes. Then, a newly introduced CNN following a hierarchical architecture learns to output from the coarse classes to the MD-related food categories. We used a dataset that contains 5778 food images captured under free living conditions. The images are annotated into 31 food categories of interest for MD, from which the MDA index is defined. For the 31 MD related food categories, the hierarchical model achieved a mean Average Precision of 52.71%. The proposed algorithm can more accurately predict the food items that appear in an image than the baseline method and will be integrated into a smartphone application that estimates the weekly MDA on the basis of each consumed meal/drink.