# AI-POWERED NUTRITION ANALYZER FOR FITNESS ENTHUSIASTS

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## ABSTRACT:

The goal of this work is to provide an overview of existing approaches regarding AI nutrition recommender systems. A breakdown of such systems into task-specific components is presented, as well as methodologies concerned with each individual component. The components of an idealized AI nutrition recommender system are presented and compared to state-of-the-art approaches in the corresponding area of research. Finally, identified issues in some of these areas are also discussed.

## INTRODUCTION :

Food is essential for human life and has been the concern of many healthcare conventions. Nowadays new dietary assessment and nutrition analysis tools enable more opportunities to help people understand their daily eating habits, exploring nutrition patterns and maintain a healthy diet. Nutritional analysis is the process of determining the nutritional content of food. It is a vital part of analytical chemistry that provides information about the chemical composition, processing, quality control and contamination of food.

The main aim of the project is to building a model which is used for classifying the fruit depends on the different characteristics like colour, shape, texture etc. Here the user can capture the images of different fruits and then the image will be sent the trained model. The model analyses the image and detect the nutrition based on the fruits like (Sugar, Fibre, Protein, Calories, etc.).

## FOOD ANALYSIS :

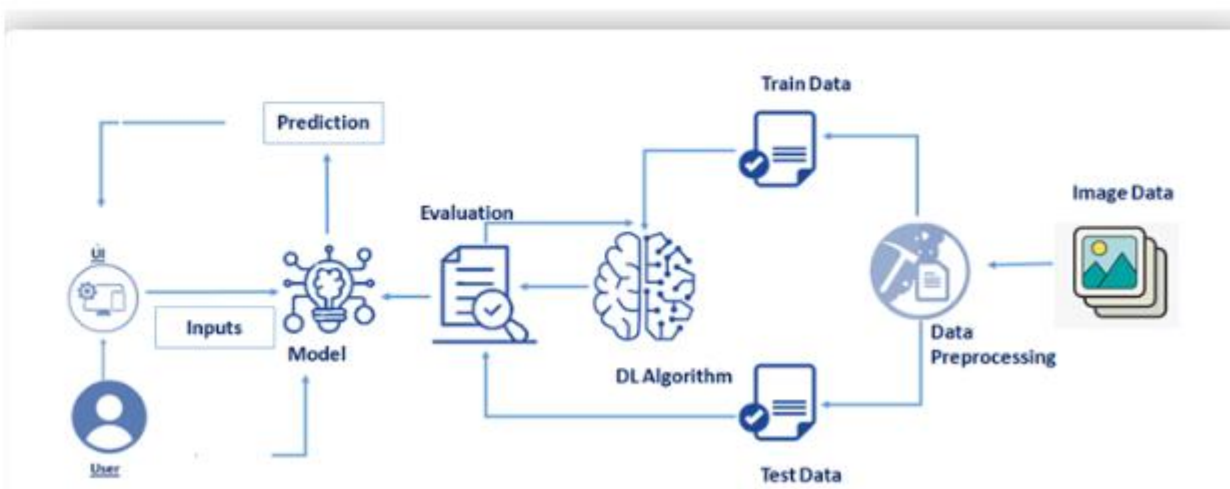
Food analysis is a core component of AI nutrition recommender systems, as it provides the prerequisites for obtaining a high-level understanding of the type and the amount of food consumed by the user. This category can broadly be divided into methods related to food category recognition, food ingredient and cooking instructions recognition and food quantity estimation.


## Food Category Recognition :

This category of food analysis is concerned with recognizing the class that an item of interest belongs to. The majority of the existing literature regarding automated food analysis belongs to this category, since the first data-sets that were made publicly available only contained information regarding the class of the items. Due to the same reason, the dominant focus area of existing methods is image analysis, but approaches based on audio [30, 34, 45], motion [30], colour [19] and odour [35] also exist. Technically, methods concerned with multiple tasks at the same time (e.g., food recognition and calorie estimation) could also be included in this category, but in order to avoid duplication, they will be described in sections 2.2 and 2.3. Regarding food categories, they can range from very broad ones, like rice, to very specific, such as chicken feet with black bean sauce. Another distinguishing factor for the methods of this category is the setting under which the food categorization was performed. On one hand, there are methods that operate on a completely unconstrained setting (no information about the food source is known), while on the other hand, there are methods that have confined the recognition setting to menu items of specific restaurants. Further analysis of some of the aforementioned methods, as well as other important works is presented next

Food Ingredient and Cooking Instructions Recognition In the last few years, the emergence of data-sets with accompanying information regarding the ingredients used in the recipe and the necessary cooking instructions to reproduce it, has brought about interesting new research ideas and directions. Methods belonging to this category are mainly concerned with creating appropriate representations for ingredients, cooking instructions and images and combining them in such a way so as to be possible to transition from one representation to another. This is most commonly employed for ingredient and cooking instructions recognition and retrieval from food images. The distinction between methods that perform recognition (classification) and retrieval is important, as the end-goal in each case is different. In the case of classification, a method predicts ingredients and instructions from a given image. In the case of retrieval, on the other hand, a method searches for and retrieves the closest ingredients and instructions from a given data-set for an input image. It is worth mentioning that in the case of retrieval, the opposite problem has also been studied; to retrieve images based on instructions and ingredients. Also, since this research direction is relatively recent, neural networks have dominated the field as the method of choice.

## TECHNICAL ARCHITECTURE:




## FOOD QUANTITY ESTIMATION:

The purpose of methods included in this category is to obtain an estimation of the quantity of consumed food or of its nutritional content and calories. The problem of calorie estimation has been approached in two different ways. One group of methods works by first obtaining an estimation of the food volume, or of its ingredients, and then translating this information into calories. The second group performs a direct estimation of the calories without any intermediate representation.

## EATING BEHAVIOUR ANALYSIS :

This section is concerned with methods that analyze human eating behaviour, and more specifically with chewing rate, mastication count, overall meal duration estimation, as well as distinguish between eating events and non-eating-related events. Unlike food category recognition, where most methods are based on image analysis, a number of different approaches have been used in the literature regarding eating behaviour analysis. These are based on weight [7], audio [2, 45], hand motion [14], image [5] and jaw motion [44] analysis, to name a few. Below we describe some of the methods in more detail.

## AI NUTRITION RECOMMENDER SYSTEMS :

This section initially provides a description of the components that an idealized AI nutrition recommender system would have. Each component is then compared to state-of-the-art methods and an assessment of its feasibility with current technology is provided. Finally, recent literature and EU-funded projects relevant to this task are presented, including the approach followed by the PROTEIN project, in which the authors of this work participate.

## CONCLUSION :

This work provided an overview of existing AI nutrition recommender systems, a field that has experienced substantial growth in the last few years. A categorization of such systems into task specific components was presented, along with approaches concerned with each component and relevant data-sets. An assessment of the feasibility of implementing an ideal AI nutrition recommender system using current methods was also provided, with the general conclusion being that some of the required components have not reached a mature state yet.

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