AI-powered Nutrition Analyzer for Fitness Enthusiasts

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ABSTRACT

Nutritional deficiencies can be regarded as a major source of negative effects on individual growth and health in India. A proper balanced diet is essential from infancy onwards for proper growth, development, staying active, and reducing the risk of diseases. A proper diabetes diet that is based on their

energy requirements is essential for those with diabetes. As a result, a need has been identified to develop educational software that will perform the routine task of analysing, optimising, and transforming diets while taking their energy requirements and medical problems into account. Artificial Intelligence can be applied in multidisciplinary fields, including patient service and care. It enables

precise and personalized medical nutrition care by assessing food and nutrient intake, nutritional evaluation. The application of AI for the provision of food services to hospitalized patients is of immense scope. This review details the various ways through which AI can be applied for the nutrition assessment. Even though commercial AI-based nutritional assessment systems are available, many do not evaluate the nutrient intake, and the data available through them were not validated. Also, the major challenge posed by such systems is the availability of locally appropriate data sets. Hence further research and validation are essential in this field.

KEYWORDS

Artificial Intelligence, food and nutrient intake, Fitness Enthusiasts.

INTRODUCTION

Artificial intelligence (AI) is defined by IBM as "any human-like intelligence demonstrated by a computer, robot, or other device

machines".[1]

Artificial intelligence allows computers to

programmes for learning from datasets indicating cases and

knowledge, identifying substances, and assisting in decision-making by solving problems AI has a wide range of applications.

applications, such as the provision of health care and

Nutritional support.[2]

Precision medicine and personalised medicine

Nutrition is one area where AI can make a significant contribution.

Precision medicine makes use of data from previous interventions.

using advanced diagnostics and better tailoring

Economically tailored treatments Corinne[3] and colleagues

proposed that personalised nutrition be defined as "a field in which

uses human diversity to drive nutrition

strategies for disease presentation, management, and treatment

improve health".

Patients' nutritional status can be assessed using lab tests as well as general and specific nutritional assessment tools such as the Malnutrition Screening Tool (MST),

[4,5] Mini Nutritional Assessment Short Form (MNA-SF), [6] Nutritional Risk Screening (NRS), [7]Short Nutritional Assessment Questionnaire (SNAQ), [8] Simplified Nutritional Appetite Questionnaire (SNAQ), [9] Generated Subjective Global Assessment (PG-SGA), [10]Nutrition Risk in The Critically Ill (NUTRIC), [11,12] Modified Nutrition Risk in The Critically Ill (NUTRIC) (ASPEN).

[13,14] The various datasets produced as a result of the application of these nutritional assessment tools include demographic data, anthropometry and its changes, details of food and supplement intake and appetite, changes in taste and satiety, level of physical activity, metabolic demands, data concerning physical activity, Acute Physiology, Age, Chronic Health Evaluation II(APACHE II), SOFA (Sequential Organ Failure Assessment(SOFA) Score15, and Acute Physiology, Age, Chronic Health Evaluation II(APACHE II), SOFA However, it has been reported that physicians' effective use of these data to address the issue of malnutrition development in hospitals is very low.

[14] In this regard, artificial intelligence can play a more significant role in personalized nutrition and the assessment of individualized nutritional recommendations and meal plans that can improve the patients' food and nutrient intake. Furthermore, it can identify patients at risk of malnutrition and can provide advice to enhance nutritional status.

AI-assisted assessment of food and nutrient intake

The globally accepted methods for assessing a person's food and nutrient intake are a 24-hour recall of food intake, a food diary, and a three-day food weighment survey. These methods are time-consuming and necessitate the use of skilled individuals to interview patients and collect data. They primarily rely on the person being investigated's memory. [15] As a result, the data's accuracy is minimal, especially if the person is elderly or suffering from diseases that affect memory, such as dementia and Alzheimer's disease. As nutritional adequacy is a challenge in such cases, providing proper nutrition and assessing authentic food and nutrient intake is a challenge.

LITERATURE SURVEY

[16]A Survey on AI Nutrition Recommender System by Thomas Theodoridis Centre for Research and Technology Hellas Thessaloniki, Greece, 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.

The work done by Martin CK, Kaya S, Gunturk BK. Quantification of food intake using food image analysis produced Reliable and accurate food and nutrient intake data are essential to plan and assess the effect of therapeutic menus for a patient under medical care. Earlier studies reported that the reliability of the data obtained through traditional methods might be biased due to incorrect estimation of the food intake data.[17]

Yulika and Alex[18] used face recognition or a vision-based system to recognize the food items and portions consumed to solve the issue.

The Use of Mobile Devices in Aiding Dietary Assessment and Evaluation by Zhu F, used the technique of face recognition was applied in specific user interfaces for cell phones and was used for the development of food recognition and portion estimation.[19]

OBJECTIVE

To build a model which is used for classifying the food 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 food.

ENERGY REQUIREMENTS AND ITS EVALUATION

The amount of each nutrient needed for an individual depends upon his/her age, body weight, and physiological status which can be calculated in terms of energy [20].

RDA recommends that energy requirement must be assessed in terms of energy expenditure rather than in terms of energy intake.

i:e: Total Energy Expenditure = Predicted Body Mass Ratio * Physical activity level

Physical activity ratio values for activities performed in a day can be aggregated over that period to yield the physical activity level (PAL). A detailed table of PAR values for different activities is available in the FAO/WHO/UNU 2004 report [20].

NUTRIENTS CONSIDRATION

The primary macronutrients which are important and are considered are protein, fats, and carbohydrates which are converted into energy in different quantities, i.e., 1 g of protein contribute 17 kJ of energy, 1 g of fat constitute 37 kJ of total energy, 1 g of carbohydrates contribute 17 kJ and 1 g of dietary fiber contribute 8 kJ where 1 kJ = 0.239 kcal[21].

ALGORITHM

Step 1 – Download the Dataset.

Step 2 – Import the Image Data Generator.

Step 3 – Configure Image Data Generator Class.

Step 4 – Apply Image Data Generator functionality to trainset and testset.

Step 5 – Import the Model building libraries.

Step 6 - Initializing the model.

Step 7 – Adding CNN layers.

Step 8 – Addung dense layers.

Step 9 – Configure the learning process.

Step 10 – Train the Model.

Step 11 – Save the Model.

Step 12 – Test the Model.

Step 13 – Create HTML Pages.

Step 14 – Build Python Code.

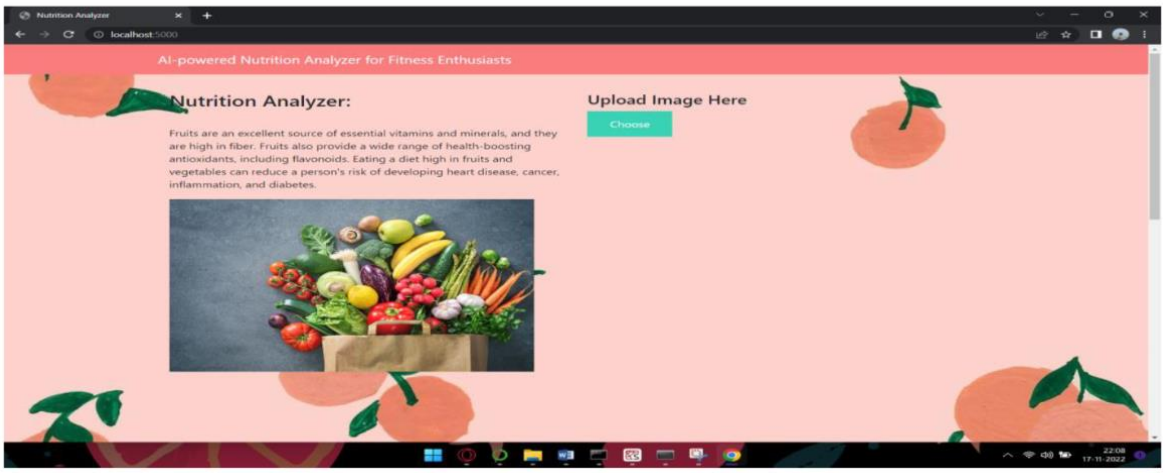
Step 15 – Configure our Flask Application and loading our Model by using Load_model Meathod.

Step 16 – Routing to the HTML page.

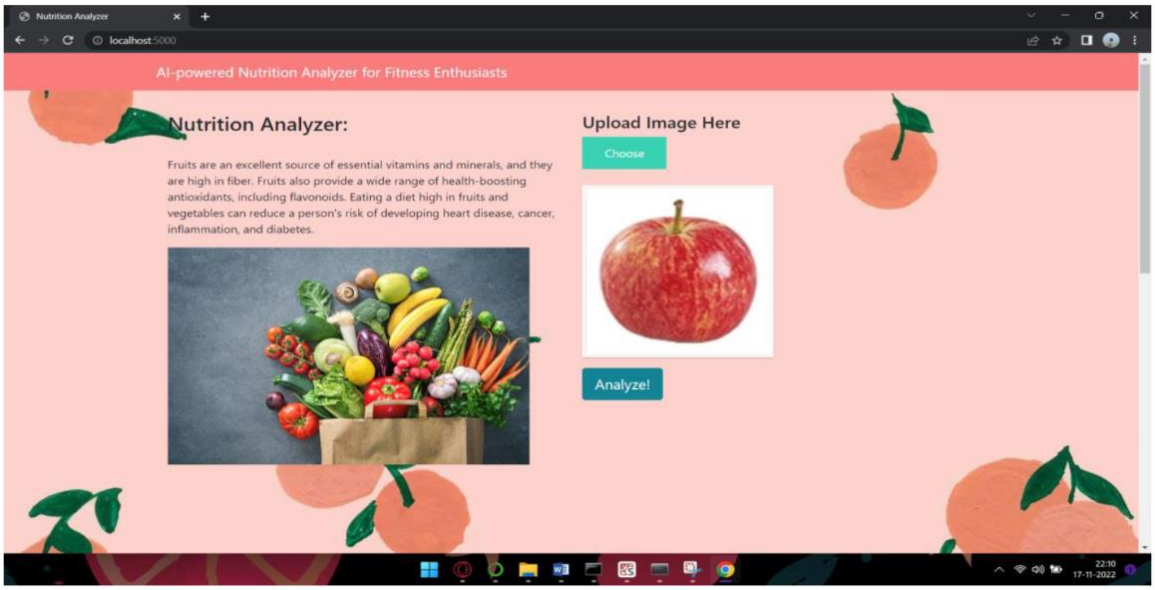
Step 17 – Run the Application.

OUTCOME

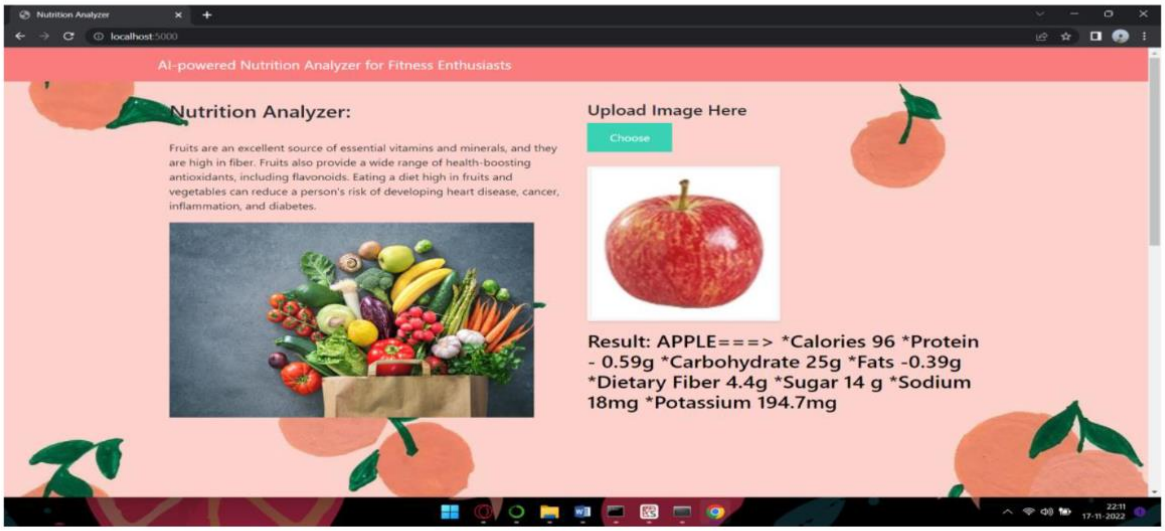
Choose the image to analysed



After uploading



Click on the Analyse button to the results



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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