Food Recognition and Calorie Measurement Using Artificial Intelligence

Mrs. Sophia G[1], Ahammed Moin Nawaz[2], Deepak R[3], Ankush B R[4], H G Uttam[5]

[1]Assistant Professor, Department of Computer Science and Engineering, MVJ College of Engineering, Bangalore, Karnataka, India.

[2,3,4,5]Undergraduate Scholar, Department of Computer Science and Engineering, MVJ College of Engineering, Bangalore, Karnataka, India.

sofiya316@gmail.com : ahammedmoinnawaz@gmail.com 3 deepakrdeepu670@gmail.com7,4 Uttamgsiddapur7@gmail.com,

5ankushreddy944@gmail.com

A B S T R A C T

Food recognition and calorie measurement are crucial aspects of promoting healthy eating habits and managing dietary intake. In this modern era, advancements in artificial intelligence, computer vision, and machine learning have facilitated the development of intelligent systems that can accurately identify food items from images or videos and estimate their calorie content. This paper presents an overview of the state-of-the-art techniques and technologies employed in food recognition and calorie measurement. It explores the challenges involved in accurately recognizing diverse food items, including different cuisines and complex dishes. Additionally, the paper discusses the factors considered in estimating the calorie content of recognized food items, such as portion size, ingredients, and nutritional composition. Furthermore, it examines the real-time processing capabilities, user-friendly interfaces, and integration with other health and fitness platforms to enhance the user experience and facilitate comprehensive calorie tracking. The paper also highlights the potential benefits of these technologies in promoting informed dietary choices, personalized nutrition, and continuous learning for improved accuracy. Overall, this paper sheds light on the advancements and future prospects of food recognition and calorie measurement systems, emphasizing their importance in fostering healthier lifestyles and well-being

1. INTRODUCTION

Food recognition and calorie measurement AI is an innovative technology that combines computer vision and machine learning algorithms to identify various types of food items from images or videos and estimate their calorie content. It aims to assist individuals in making informed dietary choices, tracking their calorie intake, and promoting healthier eating habits. Food recognition AI utilizes deep learning models, such as convolutional neural networks (CNNs), to analyze visual features of food images or videos. These models are trained on large datasets, containing annotated food images with corresponding labels, ingredients, portion sizes, and nutritional information. Through extensive training, the AI learns to recognize and classify different types of food items accurately. Calorie measurement AI complements food recognition by estimating the calorie content of recognized food items. It takes into account various factors, including portion size, ingredients, cooking methods, and nutritional composition. By leveraging nutritional databases or APIs, the AI retrieves relevant information and combines it with the recognized food item to provide an estimate of its calorie content. The development of food recognition and calorie measurement AI involves collecting diverse and representative datasets, training deep learning models, and refining algorithms to ensure accurate and reliable results. Real-time processing capabilities are essential, allowing users to capture food images or videos and quickly receive information about the recognized food items and their calorie measurements. A user-friendly interface enhances the accessibility and usability of the AI system. Users can easily interact with the technology through intuitive interfaces on various devices, such as smartphones, tablets, or web browsers. The interface provides feedback on recognized food items, displays calorie measurements, and may offer additional features like portion size adjustment, meal tracking, or personalized recommendations. Furthermore, adaptability and scalability are crucial aspects of food recognition and calorie measurement AI. The system should continually learn and improve over time, inc corporating user feedback to handle new food items, cuisines, and dietary preferences. It should also be

2. LITRATURE SURVEY

Computer-Aided Dietary Assessment Using Deep Learning for Food Image Recognition.

Using deep learning techniques, this research suggests a method for identifying food in images that it calls Deep Food. The authors offer a sizable food dataset and create a deep convolutional neural network (CNN) architecture to categorise food photos. The algorithm shows positive signs of success in identifying food items that can be used for calorie counting. Estimating and evaluating one's diet.

Convolutional Neural Networks with Deep Spatial Fusion for Food Image Recognition.

The authors offer a convolutional neural network (CNN)-based system for recognising food images with deep spatial fusion. The suggested method captures both low-level and high-level visual features by fusing the feature maps from several CNN layers. As a result of enhanced recognition accuracy demonstrated in experiments, this method has promise for use in calorie measurement and dietary analysis. "A Calorie Estimation Dataset for Complex Common Foods"

"Visual Food Recognition and Dietary Assessment"

This essay examines the issue of visual food recognition and how it relates to nutritional evaluation. To identify food items in photos, the authors suggest an approach that combines image retrieval methods with object recognition.The method performs effectively in categorising different foods, establishing the groundwork for future studies on calorie counting and dietary evaluation.

3. IMPLIMENTATION

Resizing First,

the input food image is fed to resizing stage. This module resizes image based on width and height. The resizing is done such that the image should have 64 pixels. Next rescaling of images are carried so that their greatest side is assigned as 64*64 pixels which measures the size feature of food image ARTIFICIAL INTELLIGENCE

Feature Extraction

This module extracts different features of the given image using three algorithms namely SIFT, Gabor filter and Color histogram method.

SIFT Method

Scale Invariant Feature Transform algorithm is used to detect and describe the local features of an image. Resized image is given as input to feature extraction module. This phase extracts key points and feature vector from a dense grid on the image as shown in Figure3. SIFT algorithm is used to extract key points and feature vector. This algorithm consists of four steps (Madival &Vishwanath 2012).

Scale Space Extrema Detection

This step searches the overall image locations for extracting the key points using difference of Gaussian function is mentioned in Equation (4.1). The key points thus extracted are invariant to scale and orientation. $L(x, y, \sigma) = G(x, y, \sigma) I(x, y)$ (4.1) where, $G(x, y, \sigma)$ is a Gaussian function $I(x,y)$ is an input image and $L(x,y)$ is a scale-space function

Key Point Localization

This step searches the overall image locations for extracting the key points using difference of Gaussian function is mentioned in Equation (4.1). The key points thus extracted are invariant to scale and orientation. $L(x, y, \sigma) = G(x, y, \sigma) I(x, y)$ (4.1) where, $G(x, y, \sigma)$ is a Gaussian function $I(x,y)$ is an input image and $L(x,y)$ is a scale-space function

All the extracted key points will not have same level of contrast. The key points with low contrast cannot be considered for further processing. So it needs to be eliminated. This step eliminates the low contrast key points from the extracted key points. This step assigns the orientations for every key point locations based on gradient direction on an image. As a result, the image has been transformed relative to the assigned orientation, scaling. The location of each feature is used for further operations. The invariance of these transformations is as in Equation (4.2) $\theta(x, y) = \tan^{-1}((L(x, y + 1) - L(x, y - 1))/(L(x + 1, y) - L(x - 1, y)))$ (4.2) where $L(x, y)$ is a scale space, $\theta(x, y)$ is pre computed using pixel difference, $I(x, y)$ is an input image and $L(x, y, \sigma)$ is a scale-space function.

4. CONCLUSION

Food recognition and calorie measurement technologies have the potential to revolutionize the way individuals track their dietary habits, make informed food choices, and manage their calorie intake. By leveraging artificial intelligence, computer vision, and machine learning algorithms, these systems can accurately identify various food items and estimate their calorie content. In this thesis work, an architecture for the proposed Intelligent Food Recommendation System has been designed and explained. This architecture provides the various components of the food recommendation system and explains the function of each module. All the modules present in the architecture cooperate and provide an environment for recommending food. This architecture considers three types of data sets namely food image dataset, disease dataset and food dataset for food recognition, disease prediction and food recommendation respectively

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