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Food Classification and Recommendation for Health and Diet Tracking using Machine Learning

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Abstract - Many researchers have been published recently on food classification and recommendation separately, but combination of food classification and recommendation using deep learning is rare. The CNN algorithm is presented in this work because it is higher accuracy than other algorithms. In the present generation people are very concerned about their food habits in order to maintain their healthy balanced diet. This paper classifies Indian food images. The model/system uses a deep leaning process to train the machine. For this project the dataset is collected from Kaggle, UCI and some of the images from Google chrome, which contains 1000 images. The dataset is classified into 12 classes namely biryani, bisibelebath, butter naan, chats, chapatti, Dhokla, dosa, idly, noodles, upma, poori, samosa. On a different set of tests, the average accuracy is 86.33 percent. This paper also contributes to diabetic patients and also recommends the healthy note.

Key Words: Food classification, Deep learning, convolutional neural network (CNN), Machine learning (ML), Image Processing.

1. INTRODUCTION

People require automatic food labeling application due to technological advancements. Many academics have been aiming for autonomous food detection utilizing machine learning and recent advances in computer vision for this purpose. Most people have a propensity of overeating, which leads to a lack of physical activity. People are stressed and busy lives make it difficult to keep track of correct food dietary requirements, emphasizing the importance of proper food classification and information. Technology plays important roles are now necessary for proper food labeling, which can only be accomplished utilizing the increasingly popular deep learning technology. Not only for the social network area, is automatic food identification also an emerging research issue. Indeed, researchers are concentrating their efforts in this field due to the growing medical benefits. Automatic food recognition techniques will aid in the assessment of calories, food quality detection, and the development of diet monitoring systems to counter obesity, among other things.

Food, on the other hand, is deformable by nature and exhibits a wide range of appearances. Food images have a substantial intra-class variance and a low inter-class variance; traditional approaches fail to differentiate complex aspects. As a result, food identification is a difficult issue for which traditional methods fall short of distinguishing intricate features. CNNs can quickly recognize these traits and hence improve classification accuracy. As a result, this paper tries to classify food images using CNNs.

1.1 Related Work

The majority of food image classification relies on manually defined feature descriptions [3]. Food images, on the other hand, are tough to categorise, these methodologies' accuracy was generally low, and they couldn't discern a wide range of foods. Because deep learning is a full auto machine learning technique that is best suited to foods image processing, it outscored existing techniques in this sector [1,2,3]. A recent study on deep learning food recognition applications [4] was published.

1.2 Proposed Methodology

The proposed methodology for food images classification is shown in Fig. 1 and each block is explained in this section. Framework consists of following phases: Food image datasets, Image pre-processing, Train CNN models and Food Classification & Recommendation.

2. FOOD IMAGE CLASSIFICATION

In this block the dataset is taken from Kaggle and downloaded manually through Google, where some of the train and test images have noise, different colour intensity and images with the wrong tag. It is safekeeping for proper train and test phase and also, we rescaled the images to 50x50 pixels.

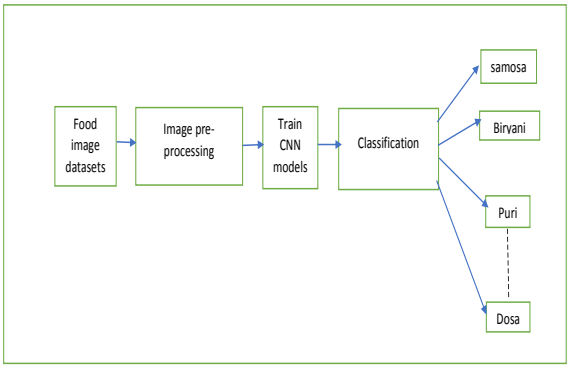

Fig -1: Proposed framework for food classification and recommendation

When we contemplate the numerous types of food and dishes that exist in the actual world, the challenge emerges during the classification process. Given the collection's range and size, identifying the various cultures in the sample will be complicated. The use of neural networks is seen to be the better option. Option for dealing with scaling difficulties, primarily because ability of neural networks to learn patterns that aren't obvious linear-separable. It is capable of a lot more than this. dealing with other aspects in the environment, such as noise images. The image-net database is widely used and accessible. A dataset that can be used to do image categorization has been thoroughly trained in CNN's. And has numerous existing categorization categories The Kaggle dataset and downloaded manually through google to the CNN model during training in order to generalize the system model. Furthermore, the model characteristics are as follows: the input images are resized 50x50 with a Max-pooling downscale in each spatial dimension. With the SoftMax activation function and a 0.4 dropout rate.

Table 1: Classification of food items.

Class Number	Class Name
1	Biryani
2	Bisibelebath
3	Butter naan
4	Chaat
5	Chapatti
6	Dhokla
7	Dosa
8	Idly
9	Noodles
10	Upma
11	Poori
12	Samosa

The results and analyses are provided in this study of our proposed approach for food classification performance evaluation technique. For the consecutive simulation of the model, we employed Python scripting language, with a system configuration of 8 GB RAM, Intel i5 processor, and Windows 11 operating system. Model evaluation with a large number of saved models and the ability to load and evaluate the models with the maximum accuracy and minimal loss. Additionally, we obtained the graph accuracy among the 12 classes (As shown in Table 1). There are total 12 classes has considered that contain 709 images for training and 124 images for testing.

This research also benefits diabetes people and suggests a healthy lifestyle by recommending whether the food can be consumed by diabetic patients.

Fig-2: Food Classification

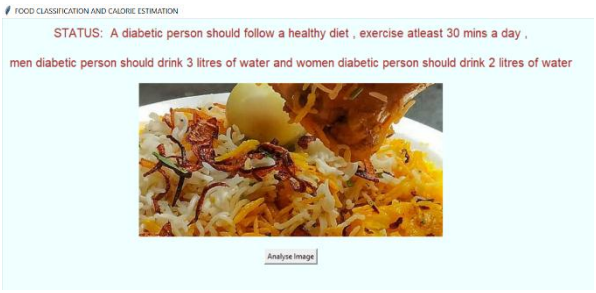

Fig-3: Food Classification

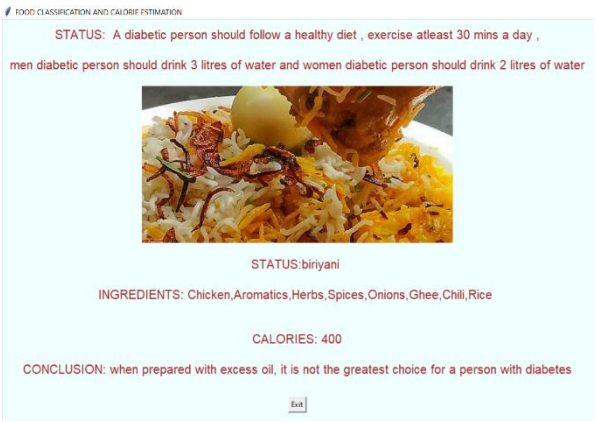

Fig-4: Food Classification

3. CONCLUSIONS

In this study, we discuss automatic food image categorization strategies based on deep learning methodology. Extractions of high-level complex characteristics improve food image categorization performance. There are two types of testing where in first method we will be capturing the image through web camera and in second method uploading the input images manually from the collected dataset and then displaying its calories and recommending the food. This paper also contributes to diabetic patients and recommending whether they should consume it or not.

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