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Food Category Prediction from Images Using CNN

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Abstract

Automated food recognition tools are becoming increasingly important in the medical and health fields, as they can be used to track diets, estimate calories, and more. In this research, deep learning-based automatic food classification methods were studied, using the Squeeze Net and VGG-16 convolutional neural networks. When data was added and hyperparameters were adjusted, these networks performed significantly better, making them appropriate for use in real-world health and medical applications. Squeeze Net is a lighter network that is simpler to set up, while VGG-16 achieves a respectable level of accuracy even with fewer parameters. The precision extraction of intricate elements from food photographs allows for the subsequent classification of food images. The suggested VGG-16 network enhances automatic food image classification performance much more. The accuracy of the proposed Squeeze Net has significantly improved due to the increased network depth. Squeeze Net performs better than VGG-16 in the classification of food images. Food item names are categorized with graphics to help with name recognition. Food classification, the Food 101 dataset, deep learning, transfer learning, image processing, CNN, VGG-16, and squeeze net are some of the related terms.

Keyword: Food Classification, Deep Learning, Transfer Learning, Image processing, CNN, VGG-16, Squeezenet.

1. INTRODUCTION

1.1 Introduction

Not just from the perspective of the social network realm, automatic food identification is an emerging study area. Indeed, because to its growing advantages from a medical standpoint, researchers are concentrating on this field. Tools for automatically identifying foods will make it easier to estimate calories, identify food quality, create diet monitoring systems to fight obesity, and more. Food, on the other hand, has a significant degree of variation in appearance and is intrinsically malleable. Due to the large intraclass variance and low interclass variance of food photos, complex features are not recognized by traditional techniques. Due to the fact that traditional techniques cannot distinguish complex As a result, this paper tries to classify food images using CNNs The CNN works by extracting features directly from images**[1].** The most widely used and well-liked image categorization method nowadays is the convolution neural network. On a diversified food dataset, image categorization is carried out utilizing a variety of transfer learning approaches. Since food is essential to life because it gives us various nutrients, it is important for each person to keep a close eye on their eating patterns. Food classification is therefore vital for living a better lifestyle. Pre-trained models are employed in this project instead of the more conventional ways of creating a model from scratch, which reduces the computing and cost, as well as better outcomes. For training and validating, a food dataset with numerous classes and

numerous photos within each class is employed. These pre-trained models will identify the provided food and make nutrient content predictions based on the image's color. According to statistics, 95% of people no longer adhere to any diets since they prevent them from eating the foods they normally would. A nutritious meal is required since the imbalance between an individual's energy and food consumption is the main cause of obesity. Therefore, many people place a high priority on keeping a healthy diet. Tracking calories consumed can be an extremely time-consuming task because In order to determine the number of calories ingested in each meal item, it necessitates that the user keep a food log and carry out a few messy computations. In this study, we attempt to categorize photographs of Indian food into the appropriate classes. The suggested software model detects the food image that the user uploads as input, processes it, recognizes it, and calculates the calories from the expected image using machine learning as its foundation. On services like Instagram, Facebook, and others, people are willingly recording, uploading, and sharing food photographs Max-pooling is performed over a 2×2-pixel window, with stride 2**[3-5]** aspects, food recognition is a challenging issue. Each convolutional neuron processes data only for its receptive field. Although fully connected feedforward neural networks can be used to learn features and classify data, this architecture is generally impractical for larger inputs such as high-resolution images**[2-3].**With the advent of deep learning and the accessibility of greater datasets and computer resources, image categorization has become less challenging. Using CNN, we learn deep features for scene recognition tasks, and establish new state-of-the-art results on several scene-centric datasets**.[6].**

2. Literature Survey

[1]. Liu, F., Qiu, Z., Zhou, L., Zhang, C., and He, Y. With numerous successful applications in image processing, speech recognition, object detection, and other fields, deep learning has established itself as a cutting-edge method for big data analysis. It has recently been used in food science and engineering as well. This review is the first in the food industry that we are aware of. In this article, we gave a quick overview of deep learning, described in great detail the structure of a few common deep neural network architectures, and discussed various methods for model training. Numerous studies using deep learning as a data analysis technique to address issues and challenges in the food industry, such as food recognition, calorie estimation, and quality control, were reviewed. detection of food contamination, the food supply chain, fruits, vegetables, meat, and aquatic products. Each research was examined for its specific challenges, datasets, preprocessing techniques, networks, and frameworks as well as its performance and comparison to other well-known solutions. We also looked at deep learning's potential as a cutting-edge data mining technique for studies on how people perceive and eat food. Our survey's findings suggest that deep learning is a promising tool for evaluating the quality and safety of food, outperforming alternative approaches like manual feature extractors and traditional machine learning algorithms. Deep learning has produced excellent results in classification and regression issues, which will spur greater research into its use in the realm of food.

Summary: the class-based Bag of Tetons representation in relation to the classification of foods. Tetons vocabularies that are based on classes are created using the MRS4 filter banks. For categorization purposes, a Support Vector Machine relates to the visual representation. On the publicly accessible Pittsburgh Fast-Food Image Dataset (PFID), this representation is contrasted with other cutting-edge techniques. In comparison to all the other ways, the class-based Bag of Tetons representation produced better results. Future research may focus on using Tetons (and/or other texture-similar features, such CLBP) in conjunction with other types of features and on storing spatial information between local Tetons (for example, through correlograms of Tetons) to improve food item discrimination. Also, it might be crucial to conduct tests. Tetons-based representation (both global and class-based) on larger food image datasets for classification and retrieval.

3. OVERVIEW OF THESYSTEM

3.1 Existing System

This model focuses an existing method that is created utilizing some deep learning methods. The technique is carried out here using ResNet51, which is one of the

transfer learning methods, however it does not achieve great accuracy.

3.1.1 Disadvantages of Existing System

- Less feature compatibility
- Low accuracy.

3.2 Proposed System

We are doing classification of either the Plant nutrient deficiency detection employing Convolution Neural Network (CNN) of deep learning together with the Transfer learning approaches in the purposed way. As image analysis-based ways for detecting nutritional insufficiency. As a result, appropriate classification is essential for proper nutrition, which will be attainable with our proposed method. The proposed method's block diagram is illustrated below.

3.3 Methodology

In this project work, I used five modules and each module has own functions, such as:

1. System Module
2. User Module

3.3.1 Dataset Collection:

The dataset containing images of the Food101 images with the Classification i.e., normal are to be classified is split into training and testing dataset with the test size of 30-20%.

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3.3.2 Preprocessing

Resizing and reshaping the images into appropriate format to train our model.

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3.3.3 *Training:*

Use the pre-processed training dataset is used to train our model using CNN Deep learning algorithm along with some of the transfer learning methods.

3.3.4 Classification

The results of our model are display of Food images are either with food items name.

3.3.5 User Module

Upload Image

The user has to upload an image which needs to be classified.

View Results

The classified image results are viewed by user.

4 Architecture

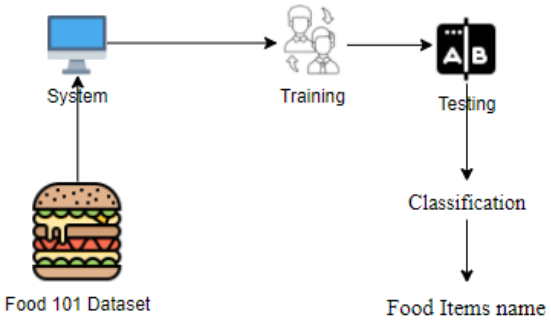
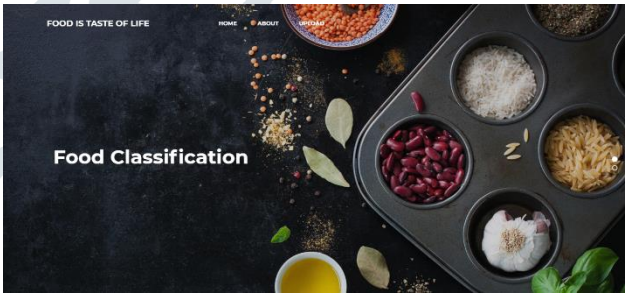


Fig 1: Frame work of proposed method

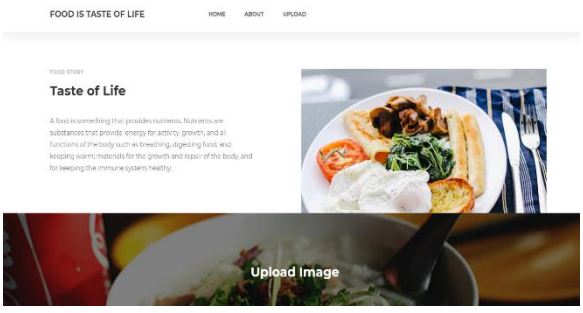
Above architecture diagram shows three stages of data flow form one module to another module. Data collection, preprocessing, and algorithm training.

5 RESULTS SCREEN SHOTS

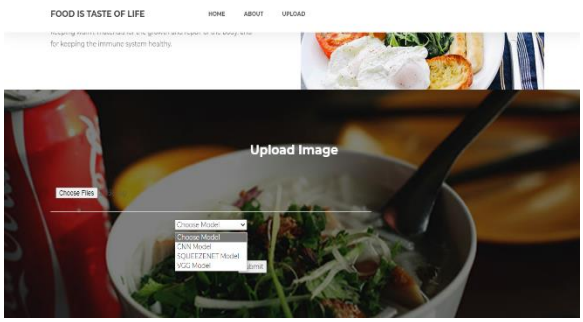
Home Page:



Upload image:



Choose options:



Predict Result:

7. CONCLUSION

We effectively classified the photos of Food image classification, which are either impacted with the Food items name, in this project utilizing deep learning and transfer learning. Here, we evaluated the Food101 dataset, which will be of many types and different Food items and trained using CNN, as well as some SequeezeNet, VGG16 transfer learning method. Following the training, we tested the system by uploading a picture and classifying it.

Future Enhancement

This can be used in the future to categorize different types of food items with images and names. based on the name.

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