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Calorie Estimation of Food and Beverages Using Deep Learning

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ABSTRACT: "SmartBite" is a project aiming to make diet monitoringeasier and healthier using advanced technology. It uses deep learning, a type of artificial intelligence, to recognize different foods and estimate their calorie content quickly and accurately. The project trained its model using a large dataset of food images and achieved impressive accuracy in recognizing various food items.The SmartBite system works by analyzing pictures of food uploaded by users on a website. Within seconds, it identifies the specific food and provides an estimate of its calorie content. This information helps users keep track of what they're eating and make healthier choices.By using SmartBite, users can understandtheir eating habits better, set goals, and adjust their diets for better health. The project shows how cutting-edge technology like deep learning can be used to improve our daily lives, promoting healthierlifestyles for everyone.

KEYWORDS: SmartBite, Diet monitoring, Advancedtechnology, Food Recognition,Calorie Estimation,Health promotion.

I. INTRODUCTION

1.1Overview

The aim of this project is to propose and develop a comprehensive and advanced system, called "SmartBite: Deep Learning-driven Food Recognition and Calorie Estimation for Intelligent Diet Monitoring," that leverages state-of-the-art deep learning techniques to address the challenges associated with accurate food recognition and calorie estimation. By combining deep learning methodologies, an extensive food dataset, and innovative features, this system aims to provide users with a reliable and user-friendly tool for monitoring their dietary intake and promoting healthier eating habits.

1.2 About The Project

SmartBite: Deep Learning-driven Food Recognition and Calorie Estimation for Intelligent Diet Monitoring" is a pioneering project aimed at revolutionizing diet monitoring and fostering healthy eating habits through advanced deep learning techniques. The project utilizes Python programming language and MobileNet architecture model to accurately recognize various food items and estimate their calorie content in real-time.

1.3 Purpose:

The primary purpose of the SmartBite project is to enhance diet monitoring and promote healthy eating habitsamong users. By leveraging deep learning algorithms, the system aims to provide intelligent and personalized diet monitoring capabilities.

1.4 Scope:

Scope of the project "SmartBite: Deep Learning-driven Food Recognition and Calorie Estimation for Intelligent Diet Monitoring" encompasses the development of a software system that utilizes deep learning techniques to recognize various food items and estimate their calorie content in real-time.The project specifically focuses on implementing the MobileNet architecture model within a Python programming framework to achieve high accuracy in food recognition and calorie estimation. The system is designed to process input images offood items, identify them, and provide users with accurate calorie information

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II. LITERATURE SURVEY

1)State recognition of food images usingdeep features

AUTHORS: Ciocca, G.; Micali, G.; Napoletano,

State recognition of food images is a recent topic that is gaining a huge interest in the Computer Vision community. Recently, researchers presented a dataset of food images at different states where unfortunately no information regarding the food category was included. In practical food monitoring applications it is important to be able to recognize a peeled tomato instead of a generic peeled item. To this end, in this paper, we introduce a new dataset containing 20 different food categories taken from fruits and vegetables at 11 different states ranging from solid, sliced to creamy paste. We experiment with most common Convolutional Neural Network (CNN) architectures on three different recognition tasks: food categories, food states, and both food categories and states. Since lack oflabeled data is a common situation in practical applications, here we exploits deep features extracted from CNNs combined with Support Vector Machines (SVMs) as an alternative to the End-to-End classification. We also compare deep features with several hand-crafted features. These experiments confirm that deep features outperform hand-crafted features on all the three classification tasks and whatever is the food category or food state considered. Finally, we test the generalization capability of the most performing deep features by using another, publicly available, dataset of food states. This last experiment shows that the features extracted from a CNN trained on our proposed dataset achieve performance quite close to the one achieved by the state of the art method. This confirms that our deep features are robust with respect to data never seen by the CNN.

2) Using deep learning for food and beverage imagerecognition

AUTHORS: Mezgec, S.; Seljak, B.K.

Recently, deep learning achieved the state of the art in the field of food image recognition. In this paper we describe our deep learning contributions to the field: NutriNet, a novel deep learning architecture, and a pixel-level classification solution for images of fake food. NutriNet was trained on a food image dataset of alarger size and containing more food classes than previous works, and was the first to recognize beverageimages. Our work on fake-food image recognition includes the first automatic system for recognizing images of fake food, while the visual similarity of fake and real food makes it useful for fake-food experimentsas well as real food recognition.

3) An Instance Segmentation approach to Food Calorie Estimation using Mask R-CNN

AUTHORS: Poply

The aim of this paper is to build a Deep Learning and Computer vision-based model for estimating the calorie contents of any food item (to an extent) using its picture. Deep Learning-based Convolutional Neural Network (CNN) called Mask R-CNN is used to perform the task of instance segmentation. The Mask R-CNN recognizes distinct instances of distinct food objects and outputs a mask for the food objects. The surface area of the detected food item(s) is then computed using the mask. The surface area along with the calorie per square inch value of the food item is used to estimate the calories present in the food. The developed model achieves a mean average precision (mAP) of about 93.7% on food item detection and an accuracy of about 95.5% on calorieestimation.

III. EXISTING SYSTEM

The earlier system was designedusing a six-layer Convolutional NeuralNetwork (CNN) architecture for food recognition. It aimed to classify food imagesinto 20 distinct food classes. The systemutilized a dataset consisting of food imagesspecifically categorized into these 20 classes. During the training phase, the system achieved an impressive accuracy of 93.29%. This high accuracy indicated that the system effectively learned and recognized various food items within its limited set of classes. The training process involved the optimization of network parameters through back propagation and gradient descent algorithms.

IV. PROPOSED SYSTEM

The proposed system, "SmartBite: Deep Learning- driven Food Recognition and Calorie Estimation for Intelligent Diet Monitoring," introduces a comprehensive and advanced approach to food recognition and diet monitoring. By leveraging deep learning methodologies and incorporating innovative features, the proposed system aims to address the limitations of the existing system and offer improved accuracy, functionality, and usability.

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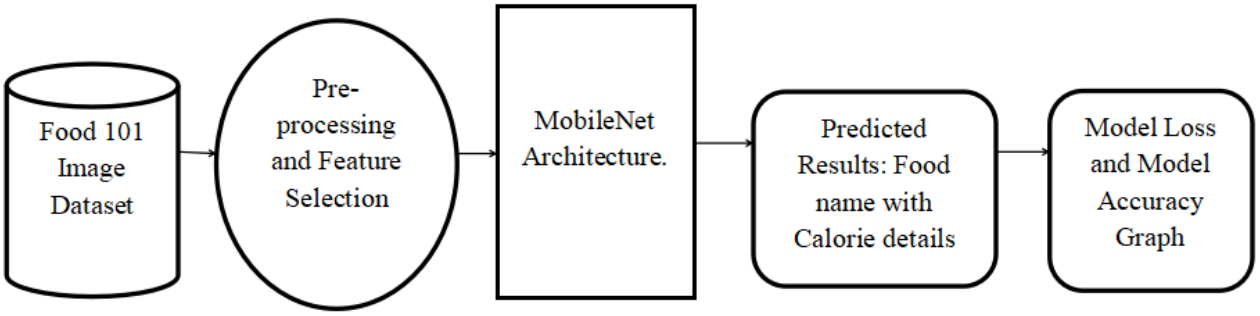
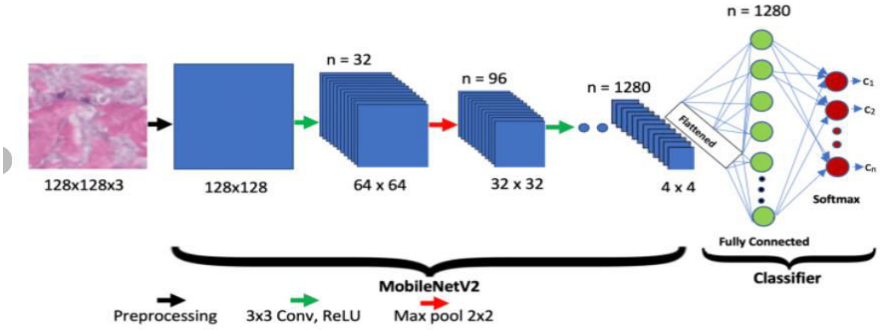


Mobile-Net Architecture:

MobileNets: Efficient Convolutional Neural Networks for Mobile Vision Applications paper from Google.They developed a class of efficient models called MobileNets which mainly focuses on mobile and embedded vision applications. In one word the main focus of their model was to increase the efficiency of the network by decreasing the number of parameters by not compromising on performance.



The network consists of 28 convolutional layers and 1 fully connected layer followed by a softmax layer.

V. RESULTS AND ANALYSIS

Home Page:

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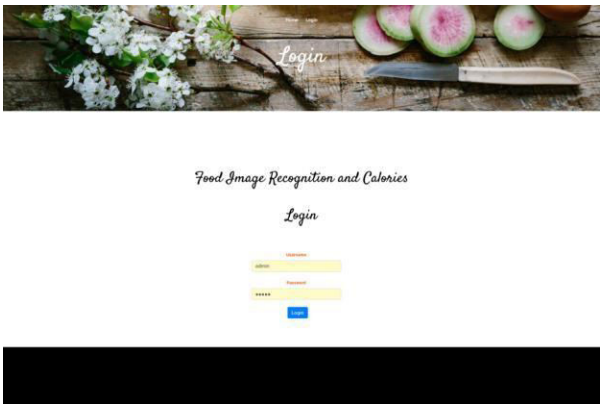

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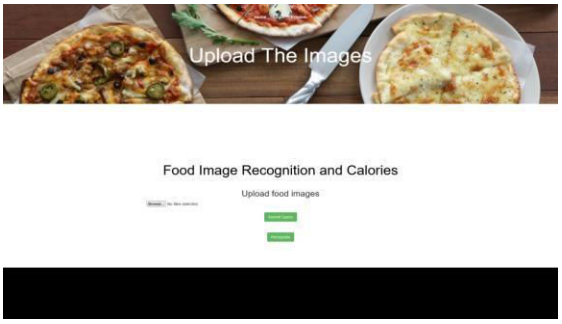

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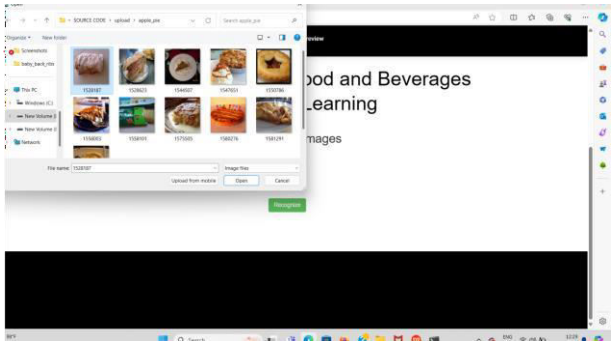

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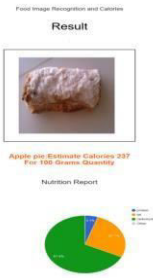

Model Accuracy and Model Loss

VI. CONCLUSION

"SmartBite: Deep Learning-driven Food Recognition and Calorie Estimation for Intelligent Diet Monitoring". In this project we used Python and the MobileNet architecture model to accurately recognize different food items and estimate their calorie content in real-time. With such high accuracy and intelligent features, SmartBite has the potential to revolutionize how we track and manage our dietary habits. It's incredible how technology can empower us to make informed decisions about our food choices and promote healthier lifestyles.

REFERENCES

1. Bray, G.; Bouchard, C. (Eds.) Handbook of Obesity-Volume 2: Clinical Applications; CRC Press: Boca Raton, FL, USA, 2014.
2. Prentice, A.M.; Jebb, S.A. Beyond body mass index. Obes. Rev. 2001, 2, 141–147.
3. Petimar, J.; Ramirez, M.; Rifas-Shiman, S.L.; Linakis, S.; Mullen, J.; Roberto, C.A.; Block, J.P. Evaluation of the impactof calorie labeling on McDonald'srestaurant menus: A natural experiment. Int. J. Behav. Nutr. Phys. Act. 2019, 16, 99.
4. Health Canada. Health Canada NutrientValues. November 2011. Available online: https://www.canada.ca/en/health- canada/services/food-nutrition/healthy- eating/nutrient-data/nutrient-value-some-common-foods-booklet.html (accessed on31 August 2022).
5. Kasar, M.M.; Bhattacharyya, D.; Kim,
6. T.H. Face recognition using neural network: A review. Int. J. Secur. Its Appl.2016, 10, 81–100.
7. Li, G.Z.; Bu, H.L.; Yang, M.Q.; Zeng, X.Q.; Yang, J.Y. Selecting subsets of newly extracted features from PCA and PLS in microarray data analysis. BMC Genom. 2008, 9, S24.
8. Ciocca, G.; Micali, G.; Napoletano, P. State recognition of food images usingdeep features. IEEE Access 2020, 8,

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32003–32017.

9. Park, S.J.; Palvanov, A.; Lee, C.H.;Jeong, N.; Cho, Y.I.; Lee, H.J. The development of food image detection and recognition model of Korean food for mobile dietary management. Nutr. Res.Pract. 2019, 13, 521–528.
10. Mezgec, S.; Seljak, B.K. Using deep learning for food and beverage image recognition. In Proceedings of the 2019 IEEE International Conference on Big Data (Big Data), Los Angeles, CA, USA,December 2019; pp. 5149–5151.
11. Mezgec, S.; Eftimov, T.; Bucher, T.; Seljak,
12. B.K. Mixed deep learning and natural language processing method for fake-food image recognition and standardization to help automated dietary assessment. Public Health Nutr. 2019, 22, 1193–1202.
13. Moolchandani, D.; Kumar, A.; Sarangi, S.R. Accelerating cnn inference on asics: A survey. J. Syst. Archit. 2021, 113, 101887.
14. Liang, H.; Gao, Y.; Sun, Y.; Sun, X. CEP: Calories estimation from food photos. Int. J. Comput. Appl. 2020, 42, 569–577.
15. Poply, P. An Instance Segmentation approach to Food Calorie Estimation using Mask R- CNN. In Proceedings of the 2020 3rd International Conference on Signal Processing and Machine Learning, Beijing, China, 22–24 October 2020; pp. 73–78.
16. Hoashi, H.; Joutou, T.; Yanai, K. Image recognition of 85 food categories by feature fusion. In Proceedings of the Proceedings of the 2010 IEEE International Symposium onMultimedia, Taichung, Taiwan, 13–15 December 2010; pp. 296–301.
17. Pouladzadeh, P.; Shirmohammadi, S.; Al-Maghrabi, R. Measuring calorie and nutrition from food image. IEEE Trans. Instrum. Meas.2014, 63, 1947–1956.

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