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AN INTELLIGENT CULINARY INSTRUCTION GENERATOR FOR AUTOMATED RECIPE CREATION FROM VISUAL FOOD IMAGES

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Abstract: Cooking is a creative and sensory process that relies heavily on the visual perception of food ingredients and their presentation. With recent advancements in Artificial Intelligence and Deep Learning, automated food recognition and recipe generation have become important research areas. This project presents a recipe generation system that utilizes Convolutional Neural Networks (CNNs) to analyze food images and automatically generate corresponding recipes. The proposed model accepts a food image as input and identifies the dish by extracting visual features through CNN-based image classification techniques. Based on the recognized food item, the system generates a complete recipe, including the dish name, required ingredients, and step-by-step cooking instructions. The developed approach aims to assist users in understanding and preparing food dishes from visual information alone, thereby enhancing cooking experiences and promoting intelligent food recommendation systems. Experimental results demonstrate the effectiveness of the proposed method in generating meaningful and relevant recipes from food images.

I. INTROUDCTION

Food plays a vital role in human life, and preparing meals often requires knowledge of ingredients, cooking methods, and recipe instructions. With the rapid growth of Artificial Intelligence (AI) and Deep Learning technologies, intelligent systems are increasingly being used to automate tasks that traditionally required human expertise. One such application is food recognition and automatic recipe generation from images.

The widespread use of smartphones and social media platforms has led to the creation of vast collections of food images. These images contain valuable visual information that can be analyzed to identify food items and extract meaningful insights. However, manually determining the ingredients and preparation steps of a dish from an image can be challenging, especially for unfamiliar foods. Therefore, there is a growing need for automated systems capable of generating recipes directly from food images.Recent advancements in Computer Vision and Deep Learning, particularly Convolutional Neural Networks (CNNs), have significantly improved image classification and object recognition performance. CNNs are highly effective in extracting visual features from images and have been successfully applied in various domains, including medical imaging, facial recognition, and food analysis. By leveraging these capabilities, food images can be accurately classified and associated with corresponding recipes.

This project presents a CNN-based recipe generation system that automatically generates recipe information from food images. The proposed system accepts a food image as input, identifies the dish using deep learning techniques, and generates the dish name, ingredient list, and step-by-step cooking instructions. The system aims to assist users in discovering recipes, learning cooking procedures, and reducing the effort required to search for recipe information manually.

The primary objective of this work is to develop an intelligent and user-friendly solution that bridges the gap between visual food recognition and recipe recommendation. By combining image processing and machine learning techniques, the proposed system contributes to the advancement of smart cooking assistants and food recommendation technologies.

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Problem Statement:
Identifying food items and determining their corresponding recipes from images is a challenging task due to variations in food appearance, presentation styles, lighting conditions, ingredients, and cooking methods. Many individuals encounter difficulties in recognizing unfamiliar dishes and finding accurate recipes based solely on visual information. Traditional recipe search systems require users to manually enter dish names or ingredients, which can be time-consuming and inconvenient when the food item is unknown.Although large collections of food images are readily available through smartphones and social media platforms, extracting meaningful recipe information from these images remains a complex problem. Existing systems often focus only on food classification and do not provide complete recipe generation, including ingredient lists and cooking instructions.

Therefore, there is a need for an intelligent system that can automatically analyze food images, accurately identify the dish, and generate relevant recipe details. The challenge is to develop a robust and efficient model capable of learning visual food features and transforming them into meaningful recipe information. This project addresses the problem by utilizing Convolutional Neural Networks (CNNs) to recognize food items from images and generate corresponding recipe names, ingredients, and step-by-step cooking instructions.

II.LITERATURE SURVEY

1. Learning Cross-Modal Embeddings for Cooking Recipes and Food Images

Authors: Amaia Salvador, Nicholas Hynes, Yusuf Aytar, et al.
Year: 2017

Amaia Salvador and her colleagues proposed the Im2Recipe framework, which established a connection between food images and recipe texts using deep learning techniques. The system learned shared representations for images and recipes, enabling retrieval of recipes based on food photographs. This work provided a strong foundation for future research in image-based recipe generation.

2. Inverse Cooking: Recipe Generation from Food Images

Authors: Amaia Salvador, Michal Drozdzal, Xavier Giró-i-Nieto, Adriana Romero
Year: 2019

This study introduced an end-to-end framework capable of generating complete recipes from food images. The model first predicted ingredients using Convolutional Neural Networks (CNNs) and then generated cooking instructions using sequence generation methods. The research demonstrated the feasibility of automatically creating recipes from visual food data.

3. Food Image Analysis and Recipe Generation: A Review

Authors: L. Gao, Y. Wang, and Others
Year: 2020

The authors presented a comprehensive review of food image analysis and recipe generation techniques. The survey discussed various machine learning and deep learning approaches used for food recognition, ingredient prediction, and recipe recommendation. It also highlighted current challenges and potential future directions in food computing.

4. Reinforcement Learning for Logic Recipe Generation: Bridging Gaps from Images to Plans

Authors: Mengyang Zhang, Guohui Tian, Ying Zhang, and Peng Duan
Year: 2021

This research proposed a reinforcement learning-based approach for generating logically structured recipes from food images. The model focused on improving the coherence and correctness of generated cooking instructions. Experimental results showed enhanced recipe quality compared to traditional sequence generation methods.

5. FIRE: Food Image to Recipe Generation

Authors: Prateek Chhikara, Dhiraj Chaurasia, Yifan Jiang, Omkar Masur, and Filip Ilievski
Year: 2023

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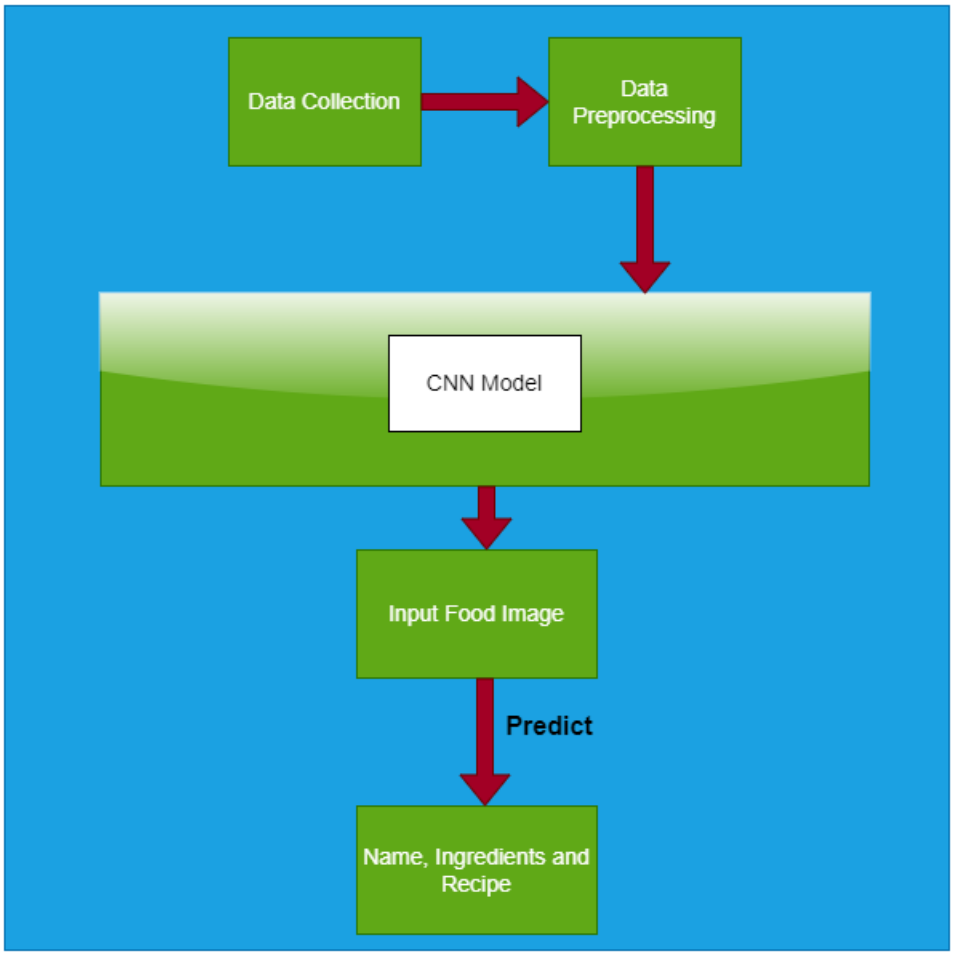
The FIRE framework employed advanced deep learning models, including Vision Transformers and language generation networks, to produce recipe titles, ingredients, and cooking instructions directly from food images. The study achieved improved accuracy and demonstrated the effectiveness of combining computer vision and natural language processing techniques for recipe generation.

III.METHODOLOGY

In this project, Convolutional Neural Networks (CNNs) are used as a key component for generating recipes from food images. CNNs are a type of deep learning model that are particularly effective in analyzing and understanding visual data. They are widely used in image recognition and computer vision tasks because they can automatically detect important patterns and features within images.

In the context of this project, the CNN model is trained on a large-scale dataset of food images. Each image in the dataset is associated with information about the dish, such as the list of ingredients and the cooking instructions. By training on this large collection of images, the CNN learns to identify various visual characteristics of food, including colors, textures, shapes, and patterns that correspond to different ingredients and cooking styles.



Another important capability of CNNs in this project is their ability to learn the spatial arrangement of ingredients in a dish. Food items are often arranged in specific ways on a plate, and recognizing these arrangements can help the model understand the structure of the dish. For example, the placement of toppings, sauces, or side ingredients can give clues about the type of recipe and the steps required to prepare it.

During the training process, the CNN gradually improves its ability to extract meaningful visual features from food images. These extracted features are then used by the system to predict possible ingredients and generate appropriate cooking instructions. By combining image analysis with recipe generation techniques, the model can transform a simple food photograph into a structured recipe that includes ingredient lists and step-by-step preparation instructions.

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Overall, the use of CNNs enables the system to effectively interpret food images and bridge the gap between visual food content and practical cooking knowledge, making it easier for users to recreate dishes based on images alone.

CONCLUSION

People enjoy food photography because they appreciate food. Behind each meal there is a story described in a complex recipe and, unfortunately, by simply looking at a food image we do not have access to its preparation process. Therefore, in this project we introduce an inverse cooking system that recreates cooking recipes given food images. Improve the system's ability to identify complex and mixed ingredients, including hidden components not easily visible in the image, by integrating advanced computer vision techniques and multimodal learning models.Allow users to modify certain aspects of the predicted recipe (e.g., substitute ingredients, change portion sizes) and automatically update the steps accordingly, making the system highly interactive and user-specific.

REFERENCES

[1] A. Salvador, N. Hynes, Y. Aytar, J. Marin, F. Ofli, I. Weber, and A. Torralba, "Learning Cross-Modal Embeddings for Cooking Recipes and Food Images," *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 3020–3028, 2017.

[2] A. Salvador, M. Drozdzal, X. Giró-i-Nieto, and A. Romero, "Inverse Cooking: Recipe Generation from Food Images," *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 10453–10462, 2019.

[3] L. Gao, Y. Wang, Q. Song, and Z. Li, "Food Image Analysis and Recipe Generation: A Review," *Artificial Intelligence Review*, vol. 53, no. 6, pp. 3949–3981, 2020.

[4] M. Zhang, G. Tian, Y. Zhang, and P. Duan, "Reinforcement Learning for Logic Recipe Generation: Bridging Gaps from Images to Plans," *Knowledge-Based Systems*, vol. 220, pp. 106899, 2021.

[5] P. Chhikara, D. Chaurasia, Y. Jiang, O. Masur, and F. Ilievski, "FIRE: Food Image to Recipe Generation," *Proceedings of the ACM International Conference on Multimedia*, pp. 5834–5842, 2023.

[6] M. Bossard, L. Guillaumin, and L. Van Gool, "Food-101 – Mining Discriminative Components with Random Forests," *European Conference on Computer Vision (ECCV)*, pp. 446–461, 2014.

[7] Y. Kawano and K. Yanai, "Food Image Recognition with Deep Convolutional Features," *Proceedings of the ACM International Joint Conference on Pervasive and Ubiquitous Computing*, pp. 589–593, 2014.

[8] Y. Chen, J. Wang, and M. Krovetz, "Recipe Recommendation Using Deep Learning and Image Recognition Techniques," *International Journal of Computer Applications*, vol. 175, no. 18, pp. 25–31, 2021.

[9] K. Simonyan and A. Zisserman, "Very Deep Convolutional Networks for Large-Scale Image Recognition," *International Conference on Learning Representations (ICLR)*, 2015.

[10] A. Krizhevsky, I. Sutskever, and G. E. Hinton, "ImageNet Classification with Deep Convolutional Neural Networks," *Advances in Neural Information Processing Systems (NeurIPS)*, vol. 25, pp. 1097–1105, 2012.

