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RecipeReveal – Ingredients and Recipe Generation from Food Image

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Abstract

Capture, Cook, Create! The project proposes a novel approach for recipe generation from food images using advanced machine learning techniques. By leveraging convolutional neural networks (CNNs) for image classification and natural language processing (NLP) for recipe extraction, the system aims to analyze food images and generate accurate, contextually relevant recipes. The proposed method involves training a deep learning model to identify ingredients, cooking methods, and dish types. This project not only addresses the need for automated recipe generation but also contributes to the fields of computer vision and AI in food technology

INTRODUCTION

In this project we develop a system that can analyze a food image, identify the ingredients, and generate a recipe.

Goal and Objective Goals: The goal of this project is to create an intelligent system that can accurately analyze food images to identify ingredients and generate complete recipes. This system aims to assist users by providing recipes based solely on a picture of the dish, making cooking more accessible.

Objectives: Image Processing: Use Convolutional Neural Networks (CNNs) to identify and classify food items from images.

Recipe Generation: Convert identified food items into detailed recipes using Natural Language Processing (NLP).

Solution Provided to Problem

Use a convolutional neural network (CNN) to classify the food image and detect ingredients.

Based on the detected ingredients, use a pretrained model (like GPT) to generate a recipe that matches the identified dish you can create a system that improves access to care and supports health management effectively.

Key Features of the System:

- Food image recognition using deep learning (CNNs).
- Recipe generation from food images or dish names.
- Multilingual recipe output in Marathi, Hindi, and English.
- Ingredient listing in three languages for easy understanding.
- Related cooking video recommendations for better guidance.
- User-friendly web-based interface for easy access.
- Integration with a large-scale recipe dataset (RecipeNLG).

LITERATURE SURVEY

1. Fire: Food Image to Recipe Generation
According to the authors Prateek Chhikara, Dhiraj Chaurasia, Yifan Jiang, Omkar Masur, and Filip Ilievski, this 2024 paper addresses the problem of current image-to-recipe systems being heavily dataset-dependent and struggling to produce accurate and generalizable recipes. It uses retrieval-based approaches that match food images with existing recipes but lack personalization and accuracy. The future scope involves improving recipe generation precision, customizing recipes based on user preferences, and exploring recipe-to-code transformations for automated cooking. [1]

2. An Update on Cooking Recipe Generation with Machine Learning and NLP
Nikolaos Ioannis Galanis and George A. Papakostas, in their 2022 study, tackle the challenge of generating recipes based on available ingredients or user preferences. The existing systems offer filtering but not true recipe generation. Techniques include machine learning and NLP, and the future scope lies in more sophisticated models that suggest novel ingredient combinations and automatically generate coherent recipes. [2]

3. Reinforcement Learning for Logic Recipe Generation: Bridging Gaps from Images to Plans
Mengyang Zhang and his team (2021) highlight the difficulty in bridging static food images with dynamic recipe steps. Existing systems focus on ingredient detection or retrieval, but struggle with generating full, logical recipes. They use reinforcement learning to address this, and future improvements may enhance ingredient sequencing and recipe logic accuracy. [3]

4. Food-Lens: Improving Culinary Experiences with AI-Driven Meal Analysis and Recipe Generation
Shivendra Pratap Singh and colleagues (2024) examine the lack of precision in existing systems and their inability to suggest healthy meals. They use CNNs and MobileNetV2 for food recognition and integrate text-to-speech for accessibility. Future directions include nutrition-focused recipe generation and AI-driven meal planning personalization. [4]

5. Inverse Cooking: Recipe Generation from Food Images
Amaia Salvador et al. (2019) address how earlier systems failed to generate new recipes effectively from images. Instead of just retrieving recipes, this paper focuses on combining image and ingredient data to synthesize new ones. The future scope includes integrating more datasets, enhancing accuracy, and applying the method to diverse cuisines. [5]

6. Ratatouille: A Tool for Novel Recipe Generation
Mansi Goel and team (2022) focus on overcoming redundancy in online recipes by using deep learning to generate novel, realistic, and diverse recipes. Future improvements involve boosting creativity, including user feedback, and integrating interactive features into web apps. [6]

7. Learning Structural Representations for Recipe Generation and Food Retrieval
According to authors Hao Wang, Guosheng Lin, and colleagues (2022), recipe generation systems struggle with lengthy recipes and multi-ingredient dishes. Their approach focuses on structural learning using vision-language data. Future scope includes improving unsupervised learning for sentence-level tree structures and accommodating more complex recipes. [7]

8. Self-Attention Architecture for Ingredient Generation from Food Images
In 2023, J.N.V.R. Swarup Kumar and his team tackled the issue of translating food images into complete recipes. Prior solutions focused only on dish or ingredient recognition. This study uses a self-attention mechanism for both ingredient detection and recipe generation. Future goals include enhancing prediction accuracy and adding user interaction features in recipe web apps. [8]

9. Learning Program Representations for Food Images and Cooking Recipes
Dim P. Papadopoulos and co-authors (2022) discuss how current systems lack structured representation for recipes. Their work emphasizes sentence-level logic and joint embeddings of food images and cooking instructions. Future directions include improving these representations for broader cuisine coverage and recipe diversity. [9]

10. Food Image to Cooking Instructions Conversion Through Compressed Embeddings Using Deep Learning
Madhu Kumari and Tajinder Singh (2019) highlight the complexity of turning food images into precise cooking steps due to instruction variability. Their approach focuses on compressed embeddings and contextual learning. Future work may improve cross-modal training and instruction generation for multiple items in one image. [10]

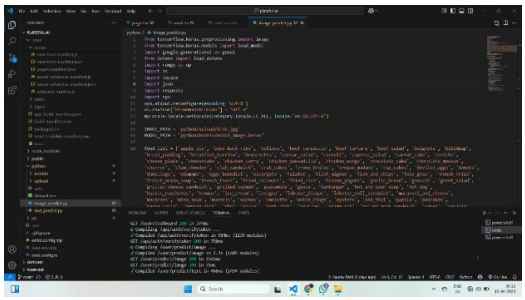
Limitations of existing system:

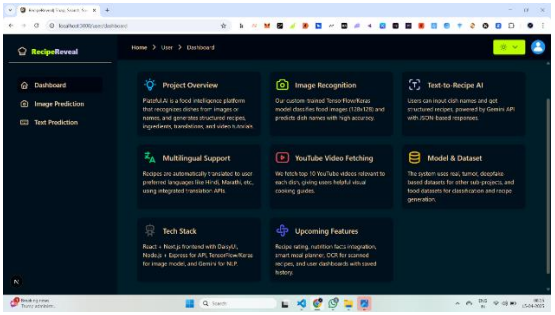
- Image Quality and Clarity: Poor-quality or low-resolution images can hinder accurate identification of ingredients and food items.
- Ambiguous or Complex Dishes: Dishes with multiple mixed ingredients (like soups or stews) may be difficult for the system to accurately identify.
- Ingredient Substitution: The system may not

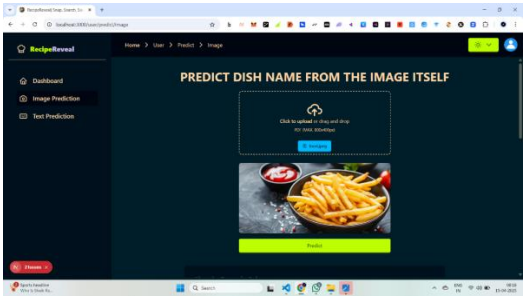
account for regional or cultural variations in ingredients and may suggest inappropriate substitutions.

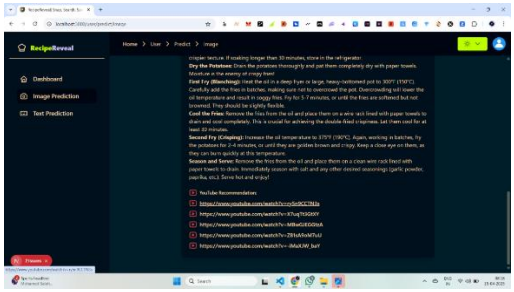
- Incomplete Ingredient Identification: The system may miss detecting ingredients that are not visually apparent, such as spices or blended elements.

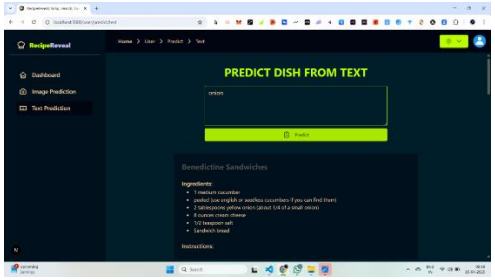
RESULTS/OUTPUT

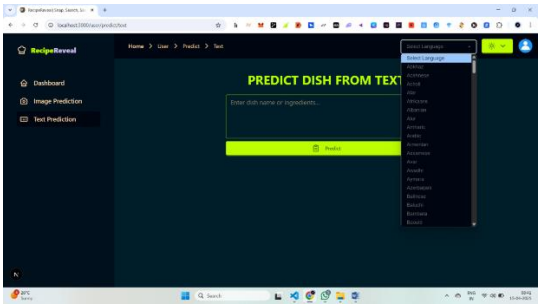












CONCLUSION

- Image Recognition: Use deep learning models (CNNs) to identify ingredients from food images.
- Ingredients Prediction: Train on large food image datasets to detect ingredients.
- Recipe Generation: Utilize NLP models (like GPT) to create recipes based on detected ingredients..
- User Flow: Users upload images, system predicts ingredients, and generates recipes.
- Enhancements: Add nutritional info and customizable ingredient options.

Reference

Eduardo Aguilar, Beatriz Remeseiro, Marc Bolaños and Petia Radeva, "Grab pay and eat: Semantic food detection for smart restaurants", IEEE Transactions on Multimedia, vol. 20, no. 12, pp. 3266-3275, 2018.

L. R. Varshney, F. Pinel, K. R. Varshney, D. Bhattacharjya, A. Schorgendorfer and Y.-M. Chee, "A big data approach to computational creativity: The curious case of chef watson", IBM Journal of Research and Development, vol. 63, no. 1, pp. 7-1, 2019.

G. Li, G. Kou and Y. Peng, "A group decision making model for integrating heterogeneous information", IEEE Trans. Syst. Man Cybern.: Syst., vol. 48, no. 6, pp. 982-992, Jun. 2018.

Ferhat Kurtulmus, "Identification of Sunflower Seeds with Deep Convolutional Neural Networks", JOURNA OF FOOD MEASUREMENT AND CHARACTERIZATION, 2020.

Micael Carvalho, Rémi Cadène, David Picard, Laure Soulier, Nicolas Thome and Matthieu Cord, "Cross-modal retrieval in the cooking context: Learning semantic text-image embeddings", SIGIR, 2018.

H. H. Lee, K. Shu, P. Achananuparp, P. K. Prasetyo, Y. Liu, E.-P. Lim, et al., "Recipegpt: Generative pre-training based cooking recipe generation and evaluation system", Companion Proceedings of the Web Conference 2020, pp. 181-184, 2020.

K. Wang, Q. Yin, W. Wang, S. Wu and L. Wang, "A comprehensive survey on cross-modal retrieval", 2016.

J. Fujita, M. Sato and H. Nobuhara, "Model for Cooking Recipe Generation using Reinforcement Learning", 2021 IEEE 37th International Conference on Data Engineering Workshops (ICDEW), pp. 1-4, 2021.

Samira Abnar and Willem Zuidema, "Quantifying attention flow in transformers", ACL, 2020

L. Castrejon, Y. Aytar, C. Vondrick, H. Pirsiavash and A. Torralba, "Learning aligned cross-modal representations from weakly aligned data", Computer Vision and Pattern Recognition (CVPR) 2016 IEEE Conference on, 2016