AI-Powered Food Discovery and Recommender App

Authors: Abhishek Tibrewal (MT23009), Aruba Sood (MT23022), Mayank (MT23045), Purbasha Barik (MT23068), Mehakdeep Kaur (MT23126), Rajith Ramchandran (MT23132)

Introduction

The desire for personalized and convenient cooking experiences has become increasingly pronounced in the contemporary culinary landscape. While existing platforms offer recipe recommendations based on user inputs, they often lack the sophistication required to analyze real-world images of ingredients, limiting their ability to provide tailored and engaging cooking guidance. In this context, our research proposes a novel solution**: *an artificial intelligence-powered food discovery and recommender app.***

While users can access many recipes, discovering new culinary options based on available ingredients or desired meals remains a cumbersome task. The aim is to develop a comprehensive solution that identifies food items through image recognition and engages users in a personalized, conversational manner, offering nutritional insights and suggesting recipes aligned with individual preferences.
Existing recipe applications predominantly rely on user inputs and lack the capability to analyze images for ingredient recognition. The missing element in current approaches is the integration of advanced technologies such as deep learning for image recognition, natural language processing for interactive communication, and personalized recommendation systems.

Our research aims to contribute a comprehensive solution to the existing challenges in culinary applications. The integration of advanced image recognition, natural language processing, and personalized recommendation systems distinguishes our approach. The proposed app's potential contributions include precise food item identification, interactive and engaging user communication, customized recipe recommendations, detailed nutritional insights, and an aesthetically pleasing user interface.

Novelty

Our proposed solution involves the development of an artificial intelligence-powered food app. This app will utilize state-of-the-art image recognition algorithms to analyze photos of food items, providing users with detailed information on ingredients. The incorporation of a chatbot, employing natural language processing, will facilitate interactive and personalized communication. The accuracy of image recognition algorithms will be measured to ensure precise identification of food items. User satisfaction surveys and feedback sessions will gauge the app's effectiveness, ease of use, and overall user experience. Furthermore, the app will employ recommender system algorithms to suggest recipes based on user preferences, dietary restrictions, and past interactions.

Literature review:

1) *Cooking Recipe Analysis based on Sequences of Distributed Representation on Procedure Texts and Associated Images [Akari Ninomiya; Tomonobu Ozaki; Nihon University Tokyo, Japan]*

   The study analyzes cooking recipes using distributed representations from cooking steps and images, employing BERT for text and VGG16 for images. Cluster analysis on four dishes reveals recipe relationships based on DTW distances, highlighting the unique aspects captured by cooking image sequences. The research underscores the importance of appearance in dish classification and suggests future work on graph-based recipe analysis.

2) *Food Recipe Alternation and Generation with Natural Language Processing Technique [Yuran Pan,Qiangwen Xu; Yanjun Li; Dept. of Computer and Information Sciences Fordham University New York, U.S.A.]*

   The project uses NLP to suggest ingredient substitutes and generate new recipes authentically. By leveraging word embedding and similarity measures, users can find replacements or similar recipes. N-gram and neural network models aid in creating diverse cuisine-style recipes. The goal is to assist those with ingredient constraints and encourage culinary exploration, with plans to expand the dataset and collaborate with chefs for better recipe interpretation.

3) *Food Image Classification with Convolutional Neural Networks [Malina Jiang Department of Computer Science Stanford University]*

   This paper explores using CNNs to classify food images, aiming to enhance food experiences and aid in dietary choices. It compares training CNNs from scratch to transfer learning with pre-trained weights, achieving 61.4% accuracy and 85.2% top-5 accuracy. The best model is a pre-trained InceptionV3 with gradually unfrozen layers during transfer learning. Future work includes optimizing hyperparameters and adding features like bounding boxes to boost classification accuracy.

4) *A Cooking Recipe Recommendation System with Visual Recognition of Food Ingredients [Keiji Yanai, Takuma Maruyama and Yoshiyuki Kawano The University of Electro-Communications, Tokyo, Japan]*

   The research paper presents a Cooking Recipe Recommendation System for smartphones, allowing users to access recipes by pointing their cameras at ingredients. It addresses the challenge of recipe access while shopping and utilizes object recognition technology for real-time suggestions. The system employs a color-histogram-based approach for image representation, simplifying the cooking decision-making process and offering a user-friendly solution for quick recipe recommendations based on recognized ingredients.

5) *Recipe2Vec: Multi-modal Recipe Representation Learning with Graph Neural Networks [Yijun Tian, Chuxu Zhang, Zhichun Guo, Yihong Ma, Ronald Metoyer, Nitesh V. Chawla]*

   Recipe2Vec is a novel model for multi-modal recipe representation learning that integrates visual, textual, and relational information using Graph Neural Networks. It outperforms existing methods by effectively capturing the nuances of recipe data. The Large-RG recipe graph dataset facilitates graph-based food studies and enhances the model's performance.