



# AI CHEF: AN INTELLIGENT CULINARY EXPERT USING DEEP LEARNING

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**Abstract:** In the era of advanced technology, the culinary world is embracing the power of artificial intelligence (AI) to revolutionize cooking experiences. Our project, titled 'AI Chef: An Intelligent Culinary Expert Using Deep Learning Techniques,' explores the integration of deep learning and machine learning to create an innovative culinary assistant. AI Chef an Intelligent Culinary Expert is a desktop application, which includes AI and ML based decision-making and data generation. This software mainly focuses on providing best recipe and ingredients using AI/ML approach. The confluence of Artificial Intelligence (AI) and Machine Learning (ML) with the culinary arts has given rise to a innovative concept-“AI Chef”. This innovative system envisions a culinary journey where AI becomes a personalized kitchen companion, guiding users through personalized recipe recommendations, innovative recipe generation through interfacing or image recognition. The system leverages ML algorithms to provide cooking guidance, adapting to individual preferences, and seamlessly integrating with AI-enhanced kitchen tools.

**Keywords:** Artificial Intelligence, Deep Learning, Machine Learning, Culinary Assistant, Image Recognition, Recipe Retrieval, Culinary Exploration.

## I. INTRODUCTION

In recent years, the convergence of artificial intelligence (AI) and culinary arts has led to the emergence of innovative solutions aimed at enhancing cooking experiences and culinary exploration. Our project, titled 'AI Chef: An Intelligent Culinary Expert Using Deep Learning Techniques,' represents a significant endeavor in this domain, leveraging cutting-edge technologies to develop an intelligent culinary assistant. “AI Chef an Intelligent Culinary Expert ” is an innovative desktop application that revolutionizes your culinary experience with the power of AI and ML.

Discover New Recipes effortlessly, One of the standout features of "AI Chef" is its AI-driven recipe generation. Elevate Your Culinary Skills with Feedback: “AI Chef” offers a sophisticated feedback system that not only refines the quality, quantity, and taste of your dishes but also empowers you to become a better chef. Your cooking adventures are about to reach new heights.

Furthermore, our project incorporates a sophisticated feedback system, integrating machine learning algorithms to continuously improve the accuracy and reliability of the AI Chef's predictions. This feedback mechanism allows users to contribute valuable insights based on their experiences, enabling the AI Chef to adapt and refine its predictive capabilities over time. With 'AI Chef,' we aim to redefine the culinary landscape by offering users a versatile and intelligent culinary assistant that empowers them to explore new cuisines, discover exciting recipes, and enhance their cooking skills. Through the seamless integration of deep learning and machine learning technologies, our project exemplifies the potential of AI to revolutionize traditional practices and elevate culinary experiences to new heights.

## II. LITERATURE SURVEY

In [1] Chaitanya et al. (2023) developed a CNN model utilizing transfer learning with Inception v3, trained on the Food-101 dataset with data augmentation and fine-tuning on Google Colab with a Tesla T4 GPU. The model attained a remarkable 87% accuracy in food image classification. Their use of transfer learning with Inception v3, alongside Python, Scrapy, and Selenium for web data extraction, contributed significantly to the study's success, aiding users in making informed dietary choices.



In [2] Kul and Sayar (2022) developed a Smart Recipe Recommendation System (SRSS) employing image processing and TensorFlow for object recognition. It gathers data from online recipe sources, stores it in MongoDB, and utilizes RabbitMQ for distributed processing. The system aims to efficiently suggest recipes based on available ingredients, addressing the challenge posed by COVID-19 related food consumption changes, promoting healthy eating, and saving time for users through personalized recommendations.

In [3] Rokon et al. (2022) introduced a novel approach utilizing Convolutional Neural Networks (CNN) to recognize food ingredients and suggest recipes. Their custom dataset comprised 32 food ingredient classes, achieving an impressive 84% accuracy. Transfer learning with ResNet50 further boosted model performance. Optimizers like Adam with a learning rate of 0.001 were employed, alongside OpenCV, TensorFlow, NumPy, and Keras for implementation, showcasing the potential of deep learning in culinary applications.

In [4] The paper "Deep Learning for Image Classification: Advancements and Methodologies" reviews recent strides in image classification, highlighting the effectiveness of convolutional neural networks (CNNs) in achieving state-of-the-art results. It discusses the role of transfer learning in fine-tuning pre-trained CNN models for specific datasets and explores the integration of attention mechanisms to enhance interpretability and feature extraction.

### III. SCOPE AND METHODOLOGY

#### Aim of the project

"AI Chef: An Intelligent Culinary Expert Using Deep Learning Techniques," the aim of the AI Chef project is to develop an intelligent culinary expert using state-of-the-art deep learning techniques, specifically ResNet50, to accurately identify food items from images and provide users with comprehensive ingredient lists and cooking instructions. By leveraging the power of artificial intelligence, the project seeks to bridge the gap between traditional cooking practices and modern technology, making cooking more accessible and efficient for users of all skill levels.

Additionally, the project aims to enhance user experience by incorporating a feedback system, allowing users to provide input on the accuracy of predictions and continuously improve the system's performance over time. The ultimate goal is to create a seamless and intuitive cooking companion that not only assists users in preparing delicious meals but also fosters a deeper appreciation for the art of cooking and encourages culinary exploration.

#### Existing system

The existing culinary assistance systems lack comprehensiveness in identifying food images and providing detailed cooking instructions. They often struggle with diverse cuisines and fail to deliver reliable results. Thus, there's a need for a more robust and intelligent solution to address these limitations.

#### System Architecture

The architecture diagram depicts a streamlined process for automated recipe extraction from images. It begins with inputting recipe images in a specific format, which are part of a dataset. Preprocessing steps include cleaning and splitting the dataset into training and validation sets. Two models, a Deep Learning Model and a Machine Learning Model, including the training of a ResNet50 model, are then trained and validated.

Model performance is evaluated and refined, potentially incorporating user ratings and feedback. Once trained, the models predict ingredients and instructions from new images, delivering recipe information to the user. This systematic workflow illustrates an effective approach to image processing in a machine learning system dedicated to recipe recognition and extraction.

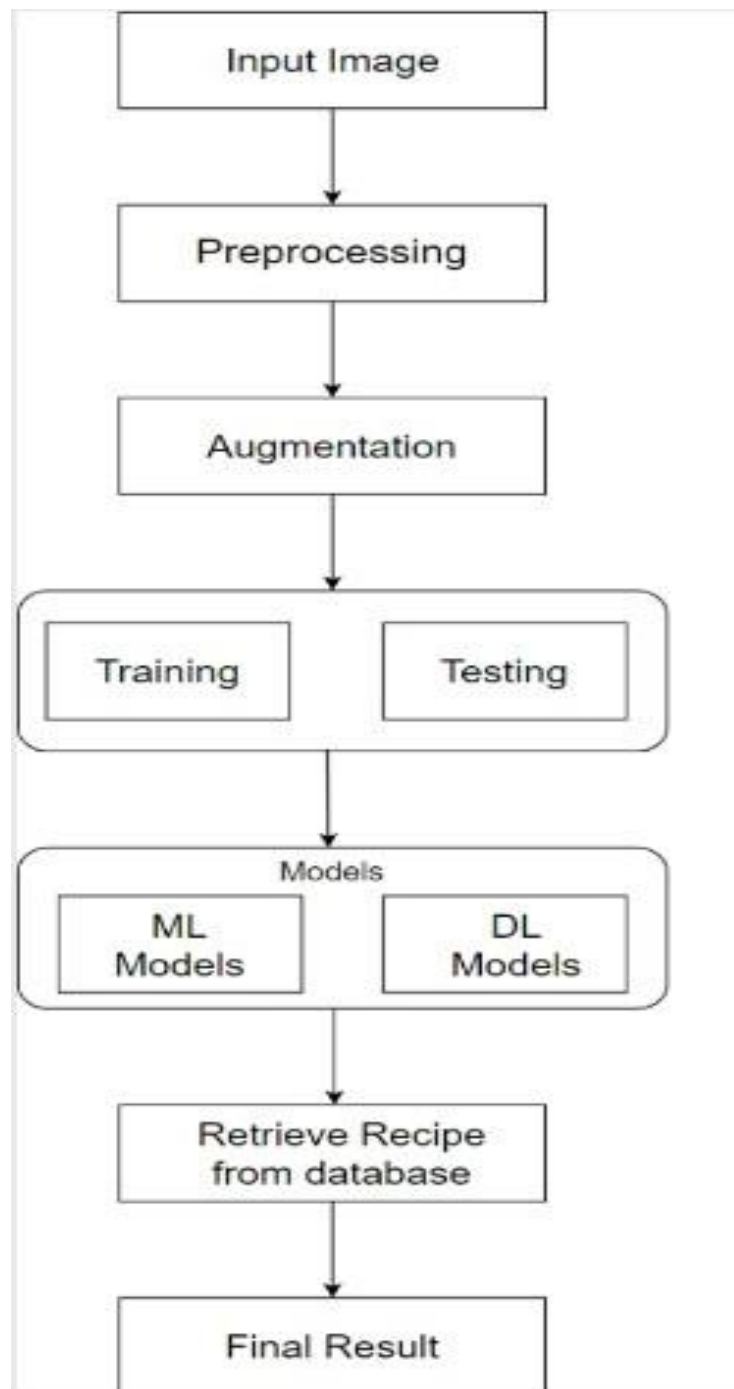


Fig 1. System Architecture

#### IV. CONCLUSIONS

In conclusion, the AI Chef project successfully addressed the limitations of existing culinary AI systems by leveraging deep learning techniques, particularly ResNet50, to accurately predict food images and provide detailed ingredient lists and cooking instructions.

The implementation of a feedback system further enhanced user interaction and system improvement. This project demonstrates the potential of AI in culinary applications and lays a foundation for future advancements in this field.



## REFERENCES

- [1]. Chaitanya, A., Shetty, J. and Chiplunkar, P., 2023. Food image classification and data extraction using convolutional neural network and web crawlers. *Procedia Computer Science*, 218, pp.143-152.
- [2]. Kul, S. and Sayar, A., 2021, November. A Smart Recipe Recommendation System Based on Image Processing and Deep Learning. In *The Proceedings of the International Conference on Smart City Applications* (pp. 1023-1033). Cham: Springer International Publishing.
- [3]. Morol, M.K., Rokon, M.S.J., Hasan, I.B., Saif, A.M., Khan, R.H. and Das, S.S., 2022, March. Food recipe recommendation based on ingredients detection using deep learning. In *Proceedings of the 2nd International Conference on Computing Advancements* (pp. 191-198).
- [4]. Freyne, J. and Berkovsky, S., 2010, February. Intelligent food planning: personalized recipe recommendation. In *Proceedings of the 15th international conference on Intelligent user interfaces* (pp. 321-324).
- [5]. Wang, X., Kumar, D., Thome, N., Cord, M. and Precioso, F., 2015, June. Recipe recognition with large multimodal food dataset. In *2015 IEEE International Conference on Multimedia & Expo Workshops (ICMEW)* (pp. 1-6). IEEE.
- [6]. Phichonsatcha, T., Pentrakoon, D., Gerdri, N. and Kanjana-Opas, A., 2021. Development of a smart food recipe system to enhance food innovation opportunities. *Academy of Strategic Management Journal*, 20, pp.1-13.
- [7]. P. R. Kaushik, P. H. M, R. S. Srinivas, S. Puri and A. M, "Automated Recipe Generation using Ingredient Classification based on an Image from a Real-Time Photo Station," 2023 4th International Conference for Emerging Technology (INCET), Belgaum, India, 2023, pp. 1-6, doi: 10.1109/INCET57972.2023.10170563.
- [8]. Pan, Y., Xu, Q. and Li, Y., 2020, April. Food recipe alternation and generation with natural language processing techniques. In *2020 IEEE 36th International Conference on Data Engineering Workshops (ICDEW)* (pp. 94-97). IEEE.