AI-Based Recipe Generator using GPT-4 – Created a system that generates custom recipes based on user inputs

[1]B. Ramesh Babu, [2]Sirigiri Bindhu Suma, [3]Varshith Sai Morla, [4]Irla Hemanth Kumar, [5]Mohamad Hafeeza Ashruf, [6]Tekumudi Mani Kiran

[1]*Assistant Professor, Department of Information Technology, Sir C R Reddy College of Engineering, Eluru, A.P, India.*

[2,3,4,5,6]*IV/IV B. Tech Students, Department of Information Technology, Sir C R Reddy College of Engineering, Eluru, A.P, India*

Emails: [1] rameshitcrr@gmail.com , [2] bindhusatyanarayana967@gmail.com, [3] mvarshith665@gmail.com, [4] hemanthirla4@gmail.com, [5] hafeezaashruf786.md@gmail.com, [6] mtekumudi30@gmail.com.

ABSTRACT

The culinary industry has been transformed by the quick developments in artificial Intelligence (AI) and natural language processing (NLP). This work describes an AI-Based Recipe Generator utilizing GPT-4, aimed to develop tailored recipes based on user inputs such as available ingredients, dietary preferences, and cuisine selections. This method uses deep learning to produce dynamic and creative meal suggestions, in contrast to conventional rule-based recommendation systems [1][2]. In order to encourage better eating practices and individualized nutrition, this research also investigates the integration of AI-driven solutions with nutritional tracking applications [5].

To investigate the development, underlying technology, and efficacy of recipe generators and dietary monitoring tools, a thorough literature review is carried out. Along with issues with data integrity, user engagement, and adaptability, key features including meal planning, food substitution, and real-time nutrient tracking are examined [3][6][7]. The results demonstrate how AI-driven kitchen helpers can improve home cooking and nutritional management. Improved user interfaces for greater accessibility, smooth wellness platform integration, and developments in AI-driven personalization are some of the upcoming improvements.

Keywords: GPT-4 Recipe Generation, Personalized Meal Planning, Natural Language Processing, Smart Kitchen Technology

I. INTRODUCTION

The study presents an AI-Based Recipe Generator Using GPT-4 that can create personalized recipes based on user inputs, such as preferred cuisine, dietary constraints, serving sizes, and accessible components [7][8]. The system generates logical and contextually relevant recipes based on user preferences by leveraging GPT-4's natural language production capabilities.

Users can enter their preferences and obtain customized recipes with graphic ingredient representations thanks to the project's interactive Gradio-based interface. Important features like meal customisation, item confirmation, and nutritional analysis guarantee precision and applicability while creating recipes [9][10]. With the help of this method, meal planning should become easier, more effective, flexible, and user-friendly.

Future developments include voice command functionality, multilingual support, and integration with smart kitchen appliances, further enhancing the usability and accessibility of AI-driven recipe generation [12][14].

II. LITERATURE REVIEW

Author(s)	year	Study Focus	Key Findings
AnnekethVij, ChanghaoLiu, Rahul N	2025	Fine-tuning small language models for recipes	Improved recipe generation quality by comparing models like T5-small and SmolLM-135M.
Lekha.T.R, Kiruthicksan.B, NarendraKumar.V	2024	Recipe generation from food images using AI & ML	Developed a system using CNNs and RNNs to analyze food images and generate recipes.
M.B. Vivek, N. Manju, M.B. Vijay	2023	Machine learning-based personalized recipe recommendations	Demonstrated the effectiveness of AI in tailoring recipes based on user preferences and dietary needs. Highlighted the role of deep learning in improving meal planning accuracy.
M S J Rokon, Md.Kisho, Ishra Binte Hasan, A. M.Saif,Rafid Hussain Khan	2022	Ingredient detection from images for recipe recommendation.	Developed a CNN-based model with 94% accuracy to detect ingredients and recommend suitable recipes.
Andrea Morales-Garzon, Juan Gomez-Romero, Maria J. Martin-Bautist	2021	Unsupervised adaptation of cooking recipes using word embeddings	created a technique to modify recipes to user preferences using word embeddings trained on ingredients and cooking directions, with a 95% confidence level for producing high-quality modifications.

III. EXISTING SYSTEM

Users have to look for recipes using traditional recipe suggestion systems, which rely on static databases, cookbooks, and internet sources. Meal planning becomes difficult with these systems since they frequently don't take into account portion control requirements, product availability, or individual dietary preferences. [1] [3]. Some platforms include simple filtering options, but their lack of real-time flexibility and adaptability limits their applicability in situations involving dynamic cooking [2][4].

Furthermore, on-demand creation of unique recipes is not possible with traditional methods. Rather, they offer preset meal recommendations devoid of clever component swaps or imaginative adjustments. Meal preparation creativity and personalization are hampered by this rigidity. Furthermore, because these systems do not effectively suggest ways to repurpose excess ingredients, food waste is still a major problem [5][6].

These drawbacks emphasize the necessity of AI-powered systems that can produce customized recipes on-the-fly, guaranteeing adaptability, originality, and effective ingredient use. AI-powered solutions have the potential to transform cooking by utilizing deep learning and natural language processing, which will make meal planning more sustainable and user-friendly. [7] [8].

IV. PROPOSED SYSTEM

The proposed AI-Based Recipe Generator using GPT-4 offers a dynamic and intelligent solution for personalized recipe creation. By utilizing Natural Language Processing (NLP) and deep learning, the system generates customized recipes based on user inputs, such as available ingredients, preferred cuisines, dietary restrictions, and meal types.

Real-time user engagement, ingredient analysis, data collecting, and recipe formulation through GPT-4 are all part of the system's structured methodology. Additionally, when specific foods are

unavailable, it recommends substitutes to maximize meal possibilities. This strategy adjusts to customer preferences to increase efficiency, decrease food waste, and encourage better eating
To further increase the accuracy and usability of the system, future developments can concentrate on enhancing ingredient matching, enhancing recipe coherence, and including nutritional analysis.

V. OBJECTIVES

The primary objective of this project is to develop an AI-powered recipe generator using GPT-4 that creates personalized recipes based on user-defined inputs such as:

1. **User Input Processing:** Users provide details such as available ingredients, dietary restrictions, preferred cuisines, and number of serves.
2. **Contextual Understanding:** The AI interprets the input contextually, ensuring personalized and coherent recipe generation.
3. **Recipe Generation:** The model generates detailed cooking instructions, suggests alternative ingredients, and optimizes nutritional values.
4. **Evaluation Metrics:** The effectiveness of generated recipes is assessed based on user feedback, coherence, and nutritional balance.

VI. METHODOLOGY FOR AI-BASED RECIPE GENERATOR

(A system that generates custom recipes based on user inputs)

Step 1: User Input Collection

Prompt the user to enter:

1. Ingredients they have (e.g., tomato, cheese, chicken)
2. Dietary restrictions (e.g., vegetarian, gluten-free, keto)
3. Cuisine preference (e.g., Italian, Indian, Chinese)
4. Number of Servings (Specify how many servings are required)

Step 2: Data Preprocessing

Ingredient Standardization

1. Convert ingredients into a uniform format (e.g., “tomatoes” → “tomato”).
2. Use NLP techniques (like stemming & lemmatization) to clean user input.

Ingredient Matching

1. Search for recipes that contain the user's available ingredients.
2. Use similarity metrics (TF-IDF, cosine similarity) to find the best matches.
3. Use a predefined database or AI model for substitution recommendations.

Step 3: Recipe Generation Approaches

1. Predefined Recipe Matching:

   With this method, the system looks through a sizable recipe database to identify the one that most closely resembles the user's input. Details like preferred cuisine, dietary restrictions, and ingredients that are available can be entered by users. The system suggests the best recipe if an exact match is discovered. Additionally, the system offers substitute recipes that suit the user's preferences in the event that specific products are unavailable or if they have particular dietary requirements. This approach guarantees that users get tried-and-true recipes that meet their needs.

2. AI-Generated Recipes:

   The system employs GPT-4 to generate a custom recipe based on user input when an exact match cannot be located in the database. A recipe title, a comprehensive ingredient list with exact amounts, and extensive cooking directions are all dynamically generated by the AI. Because of the freedom and creativity this method offers, users can experiment with different food ideas according to their tastes. Even in the absence of a preset option, the system's usage of AI guarantees that consumers always receive a tailored and pertinent recipe.

Step 4: Customization & Enhancement

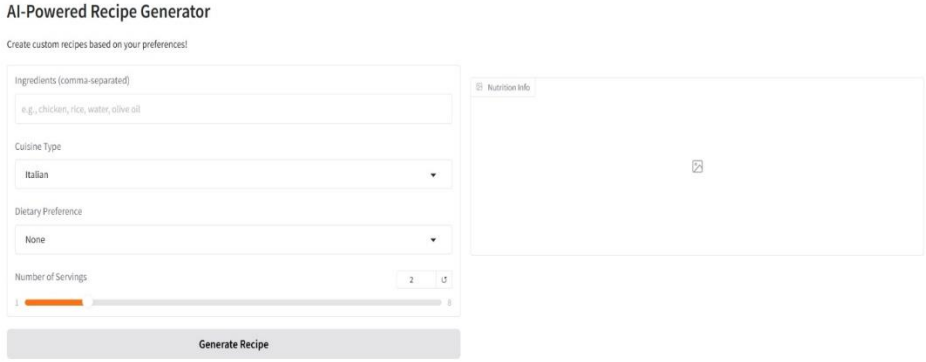
1. Allow users to modify the generated recipe (e.g., change ingredients).
2. Provide alternative cooking methods (stovetop, oven, air fryer).
3. Suggest pairing options (e.g., recommended side dishes).s

Step 5: Output & User Interaction

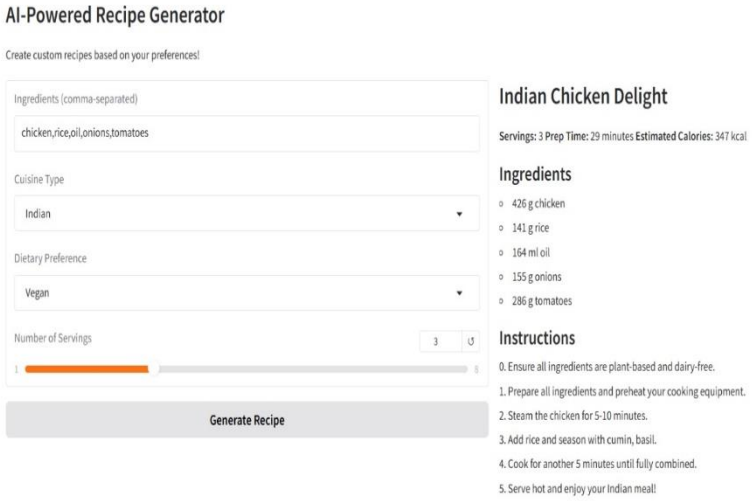
1. Display the final recipe in a structured format.
2. Allow users to save, print, or share their recipe**.**

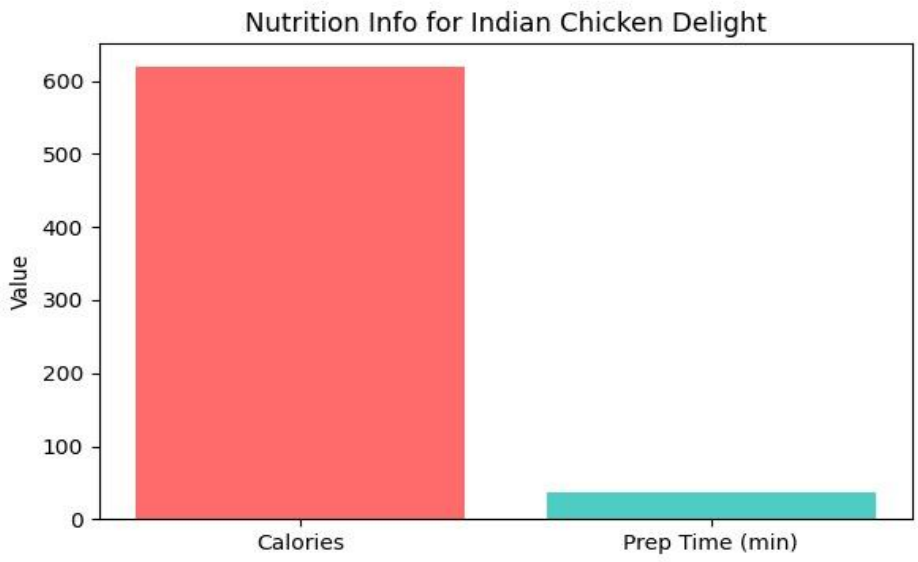
VII. RESULT

1. Before User given input to Chatbot



2. After User given input to Chatbot





VIII. CONCLUSION

The AI-Based Recipe Generator powered by GPT-4 introduces a transformative approach to personalized meal planning by dynamically generating recipes based on user preferences and available ingredients. Unlike traditional systems that rely on static databases, this solution leverages advanced NLP techniques and deep learning models to create unique and adaptable recipes, ensuring relevance to user-defined constraints such as dietary preferences and cuisine choices.

The system's capacity to recommend alternative ingredients not only increases adaptability but also lowers food waste, making it a sustainable option. This project establishes the foundation for incorporating AI into regular cooking by offering an engaging and intuitive experience that enables users to experiment with inventive, healthful, and time-saving meal options. Subsequent enhancements might concentrate on improving algorithms for matching ingredients, adding real-time nutritional analysis, and increasing the system's flexibility to accommodate changing dietary preferences

IX. Future Works

Future developments for the GPT-4-powered AI-Based Recipe Generator will incorporate real-time nutritional analysis to encourage better eating practices and improve item replacement through AI-powered suggestions. Recipe personalization and accuracy can be improved by integrating image-based input and feedback loops. While a collaborative recipe database can enhance the system with user-generated material, voice assistant integration will offer hands-free cooking advice. These improvements will increase the system's adaptability, interactivity, and suitability for a range of user requirements.

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