"AI Driven Personalized Recipe Generator"

A PROJECT REPORT

Submitted in partial fulfillment for the award of the degree of
BACHELOR OF TECHNOLOGY

Submitted to

Dr. Babasaheb Ambedkar Technological University, Lonere.

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CERTIFICATE

This is to certify that the Project entitled "AI Driven Personalized Recipe Generator" submitted by Miss. Neha Subhash Kumbhar, Miss. Namrata Dilip Pawar, Miss. Ankita Dnyandev Sanas, Miss. Vaishnavi Santosh Mahamulkar is a record of the Bonafide work carried out by them, under my guidance, and it is approved for the partial fulfillment of requirement of Dr. Babasaheb Ambedkar Technological University, Lonere for the award of the degree Bachelor of Technology (Computer Science and Engineering).

Prof. Shital Waghmare	**Dr. S. V. Balshetwar**	**Dr. V. Patil**
Guide	**HOD**	**Principal**
Computer Science	**Computer Science**	**YSPM's YTC, Satara**
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Place: Satara

Date:

Declaration by Student(s)

This is to declare that this report has been written by us. No part of the report is plagiarized from other sources. All information included from other sources has been duly acknowledged. We aver that if any part of the report is found to be plagiarized, we shall take full responsibility for it.

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Signature of Students

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ACKNOWLEDGEMENT

This is to acknowledge and thank all the individuals who played defining role in shaping this mini project report. Without their constant support, guidance and assistance this project report would not have been completed alone.

We take this opportunity to express my sincere thanks to my guide **Prof. Shital Waghmare** for her guidance, support, encouragement and advice. We will forever remain grateful for the constant support and guidance extended by our Guide, in making this mega project work.

We wish to express my sincere thanks to, Dr. S. V. Balshetwar (Head, Department of Computer Science and Engineering at YSPM'S YTC, Satara. We would also like to express my deep gratitude to our Hon'ble Dr. V. Patil who provides good opportunities for all of us.

Last but not the least, We would like to thank all our Friends and Family members who have always been there to support and helped us to complete this mega project work in time.

ABSTRACT

The purpose of the study is to explore the applications of AI in the field of culinary, especially new recipe generation from the existing ones. The paper presents a thorough background study in the AI field of culinary and the existing applications in the recipe generation domain. Authors came across various recipe recommendations and cuisine-specific recommendations. However, none focused on Recipe Generation, which could be a new field to explore. Generating recipes using artificial intelligence (AI) techniques has gained significant attention in recent years due to its potential to automate and enhance culinary creativity. This article provides an overview of state-of-the-art methods and challenges in AI based recipe generation.

We discuss various approaches, including natural language processing (NLP) models, recommender systems used in recipe generation. Key challenges such as ingredient combinations, cultural sensitivity and integration of user feedback are addressed, along with ethical considerations in formulation development. In addition, we explore future research opportunities and the potential impact of AI technologies on the culinary domain.

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LIST OF FIGURES

ABBREVIATIONS

AI	Artificial Intelligence
ML	Machine Learning
NLP	Natural Language Processing
CV	Computer Vision
API	Application Programming Interface

CHAPTER 1

INTRODUCTION

Chapter 1

Introduction

The AI-Driven personalized recipe generator represents a novel approach to revolutionize the culinary experience, blending cutting-edge artificial intelligence (AI) technologies with culinary arts. This overview provides a comprehensive introduction to the system's key components, functionalities, and the motivation behind its development.

recipe generation is an important real-world application of natural language processing. Given a user's personal and/or health taste restrictions, the task is to suggest a healthy and tasty dish that the user would like to eat. This task has been approached with knowledge-based. Knowledge-based systems typically start with a nutritional model of the food domain and a set of health goals (e.g. a target number of calories or a set of foods to avoid). The system then searches for a recipe that satisfies the constraints and is similar to a given input recipe. If the system has access to a cost model, it can suggest recipe modifications that are cheap and require few ingredient substitutions. A recipe recommendation engine that is health-driven and provides recipe revision suggestions is a flexible and powerful tool for nutritionists.

Keywords: Artificial Intelligence, NLP

CHAPTER 2

Literature Survey

Chapter 2

Literature Survey

1. AI Based Recipe Generator And Cook Assistant, May 2024

Authors: Devarasetty Tejaswini, V Sankar Reddy

The development of AI-based recipe generators and cook assistants holds significant promise for revolutionizing the way people discover, prepare, and enjoy food. Through advanced algorithms and machine learning techniques, these systems can offer personalized recipe recommendations, assist users in meal planning and grocery shopping, and provide step-by-step guidance during the cooking process. However, while AI-powered culinary assistants offer exciting opportunities, several challenges and considerations must be addressed. These include ensuring the accuracy and reliability of recipe recommendations, accommodating diverse dietary preferences and restrictions, and maintaining user privacy and data security

2. Enhancing Recipe Generation Using AI and ML, April 2024

Authors: Akshara Pareek, Aastha Kanwar Gahlot, Neha Khatri, Mohnish Sachdeva

AI-powered recipe generation structures, ultimately enhancing the culinary adventure for customers worldwide. The advanced recipe generator is based on state-of-the-art AI and ML solutions that offer one an in-depth customer experience. There are many layers of processes from data collection to results generation: the recipe databases, culinary literature, and user data were combined by the advanced AI technique in order to communicate intricate patterns connected to the ingredients usage, the link between chosen ingredients and chosen recipes, and harmonic interactions between ingredients.

3. Recipe Generator using Deep Learning, May 2022

Authors: Disha Moolya, Sakshi Pansare, Anushree Kshirsagar, Prof. Sonali Bodekar-Kale

The project enabled understanding the changes in output affected by the change made in hyperparameters. After successful creation of the model generating seemingly precise model we can move ahead to the next step of adding features to enhance user interactions. In future the model can make use of pre-trained transformers for definite and cohesive text generation thus correcting the model prediction and accuracy. Furthermore, to make the project ideal and efficient other filters for searching along with search by ingredients can be added, such as search by image, search by cuisine type, health monitoring of recipes generated. Adding another approach to recipe generation such as recipe generation from title rather than ingredients, can be an innovative direction to recipe

generation using AI.

4. ChefAI.IN: Generating Indian Recipes with AI Algorithm, Oct 2022
Authors: Smriti Chaudhary, Binita Soni, Aditya Sindhavad, Archi Mamaniya, Ashwini Dalvi, Irfan Siddavatam

The proposed work experimented with different modules and permutations of different methods to provide the most accurate results. An interactive web app was subsequently created for ease of access and interactivity. Further, an exhaustive survey was conducted over a set of expected properties of the recipes generated by the evolutionary model. The feedback received supported the acceptance of newly generated unique Indian cuisine-centric recipes; more than 86% agreed that they might prepare/cook the recipe generated by the model.

5. A Literature Survey on Recipe Generation From Food Images using AIML February 2024
Authors: Tejas D and Varun C M

A recipe generation system from food images holds significant potential across various domains, offering innovative solutions and enhancing user experiences. The applications span from assisting home cooks with personalized recipes to revolutionizing restaurant menus and contributing to educational and wellness initiatives. The system's adaptability and integration capabilities with existing platforms are crucial for its success in the dynamic and ever-evolving culinary landscape.

6. Prompt Optimization for AI-Powered Recipe Generation: Challenges and Insights November 2024 Authors: Aadya Jha

This project demonstrates the potential of AI-powered recipe generation to revolutionize meal planning by offering users personalized recipe suggestions based on available ingredients. By utilizing Spoonacular API and advanced prompt engineering techniques, we were able to develop an interactive system that can generate recipes with varied ingredients, instructions, cooking times, and serving suggestions. Key findings include the effectiveness of AI in addressing common challenges in recipe generation, such as ingredient-based filtering and customization for dietary preferences. However, there is room for further optimization, particularly in refining the AI's understanding of flavour profiles and regional cuisine diversity. The use of synthetic data (in this case, ingredient combinations) and real-time user input demonstrates promising results, although more work is needed to enhance the complexity and practicality of the generated recipes.

7. Smart Cuisine: Generative recipe & ChatGPT powered nutrition assistance for sustainable cooking
   October 2023

   Authors: Ponrawin Kansaksiri , Pongpipat Panomkhet , Natthanet Tantisuwichwong

   In conclusion, the "Smart Cuisine" system presented in this paper is a valuable tool that has the potential to make a real difference in people's lives. The system's innovative features, such as the ingredient calculator, AI-generated recipe, and OpenAI completion chat service, provide users with a user-friendly interface to help them make informed decisions about their food choices and reduce food waste. By calculating the proportions and costs of ingredients in their recipes, users can plan their meals more efficiently and save money. The AI-generated recipe feature encourages users to be more creative in the kitchen and reduces food waste by allowing them to discover new recipes based on the ingredients they have on hand. The OpenAI completion chat service provides users with expert advice on food, nutrition, and health-related questions, enabling them to make more informed decisions about their dietary choices.Furthermore, the system's features promote a healthy lifestyle by encouraging users to make informed food choices.

8. FIRE: Food Image to REcipe generation February 2023

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

   This paper introduced FIRE, a methodology tailored for food computing, focusing on generating food title, extracting ingredients, and generating cooking instructions solely from image inputs. We leveraged recent advancements in CV and language modeling to achieve superior performance against strong baselines. Furthermore, we demonstrated practical applications of FIRE for recipe customization and recipe-to-code generation, showcasing adaptability and automation potential of our approach. Experimental results validated the efficacy of FIRE, highlighting its promising prospects for future advancements and wide-ranging adoption in food computing.

9. NutriNet: A Deep Learning Food and Drink Image Recognition System for Dietary Assessment
   June 2017

   Authors: Simon Mezgec and Barbara Koroušić Seljak

   In this paper presents the food and drink image detection and recognition system that we built, in the scope of which we developed a deep convolutional neural network architecture called NutriNet in order to provide a higher classification accuracy for the recognition of food and drink images from the 520-class dataset that we acquired using Google image searches, while keeping the model training time low to enable faster fine-tuning. Our recognition system is used inside the PD Nutrition dietary-assessment application for Parkinson's disease patients, and it also incorporates online training that automatically updates the model with new images and new food and drink

classes.

10. Personalized Classifier for Food Image Recognition AUGUST 2015

Authors: Shota Horiguchi, Member, IEEE, Sosuke Amano, Makoto Ogawa, and Kiyoharu Aizawa

In this paper, it introduces a personalization problem in food image recognition and proposed a method for classifier personalization. Personalized food recognition contains problems of incremental learning, domain adaptation, and one-shot learning. Our method combines a fixed-class NCM classifier that performs competitively with CNN and a user specific classifier that learns the user's input incrementally, with heavier weighting given to later input. In contrast to existing studies in which experiments were conducted using artificial scenarios, we introduced a new dataset to evaluate personalized classification performance in realistic situations

CHAPTER 3

System Specification

Chapter 3

System Specification

Software Requirements:

➢ Operating system: Windows 10 and above

➢ Front End: React.js, HTML, CSS

➢ Back End: Python

➢ Tool: Visual Studio

Hardware Requirements:

➢ Process: Intel i5

➢ Hard Disk: 1 TB

➢ Monitor: 15 VGA Color

➢ Ram: 8 GB

CHAPTER 4

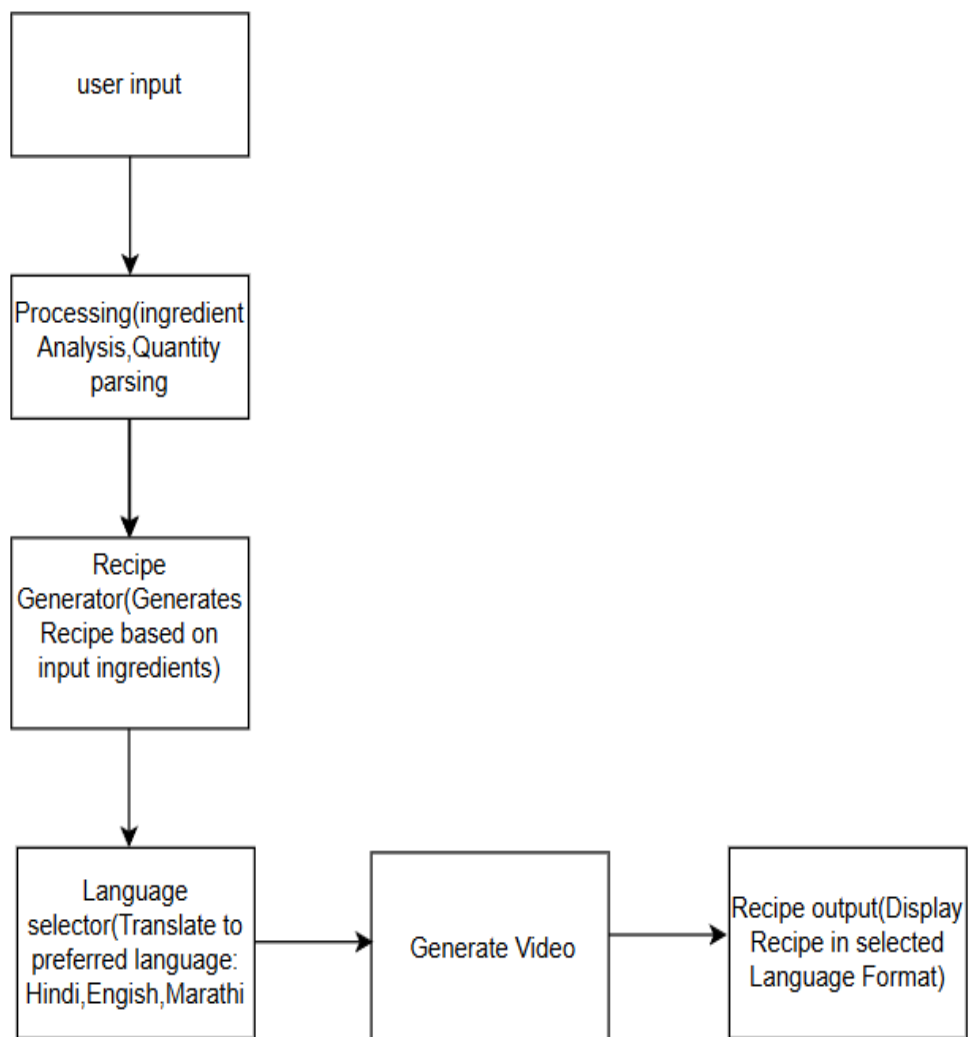## Block Diagram

Chapter 4

Block Diagram

Block Diagram:

Figure 4.1: Block diagram

CHAPTER 5

System Design
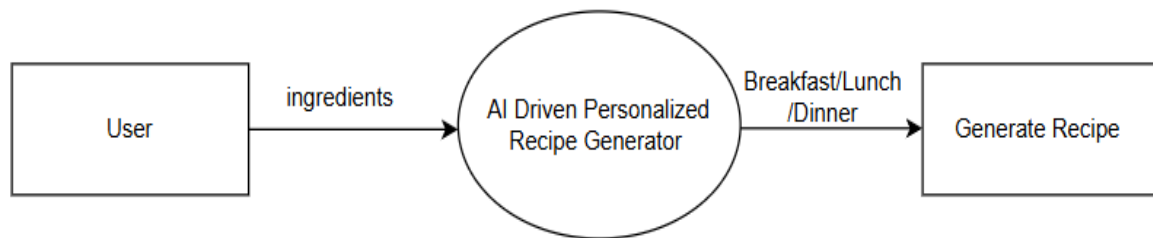
Chapter 5

System Design

DFD:
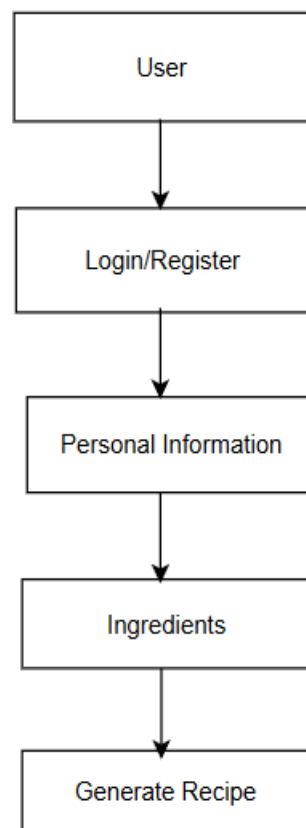

Figure 5.1: Level 0 Data flow diagram

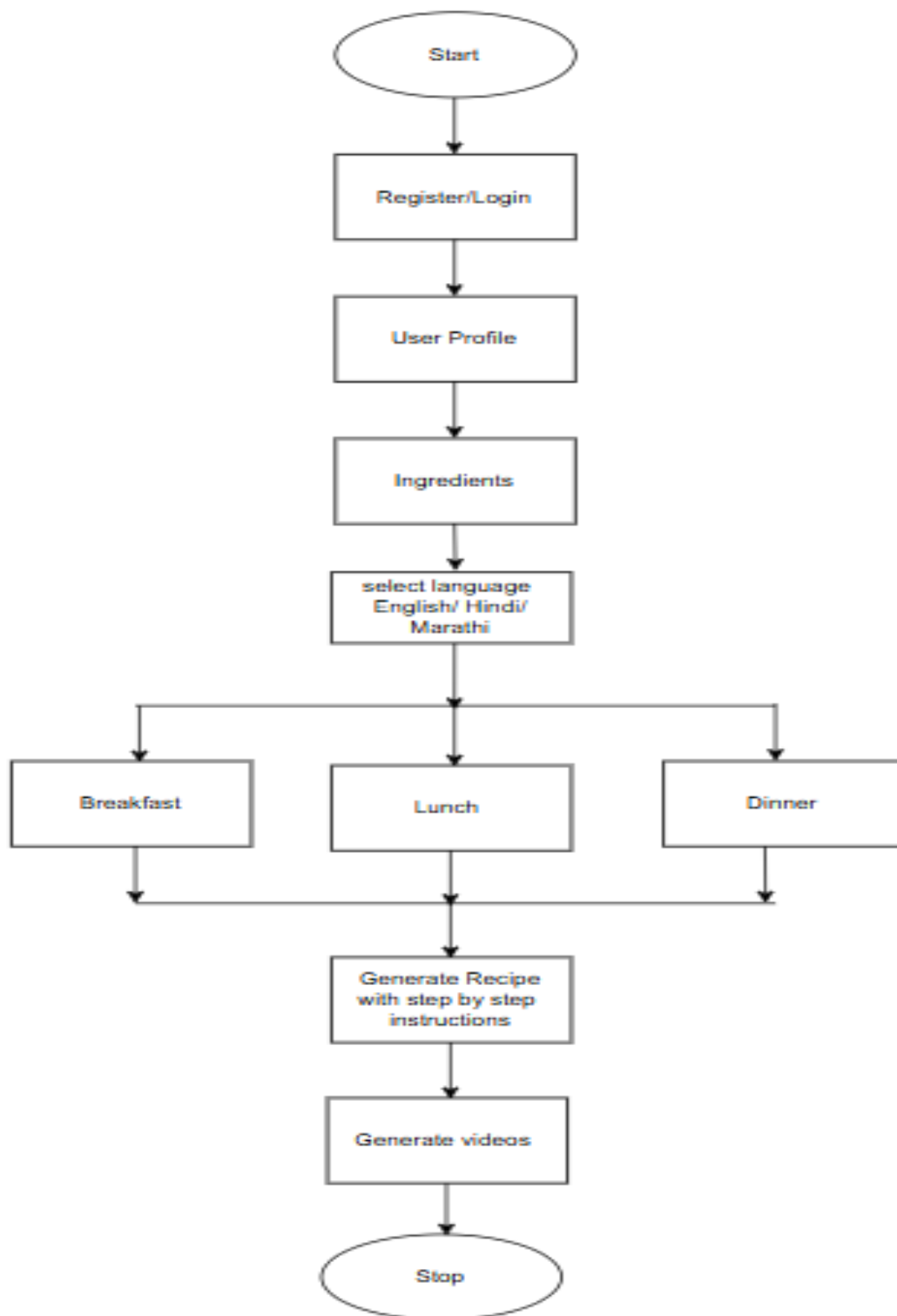Figure 5.2: Level 1 Data flow diagram

Flow Diagram:

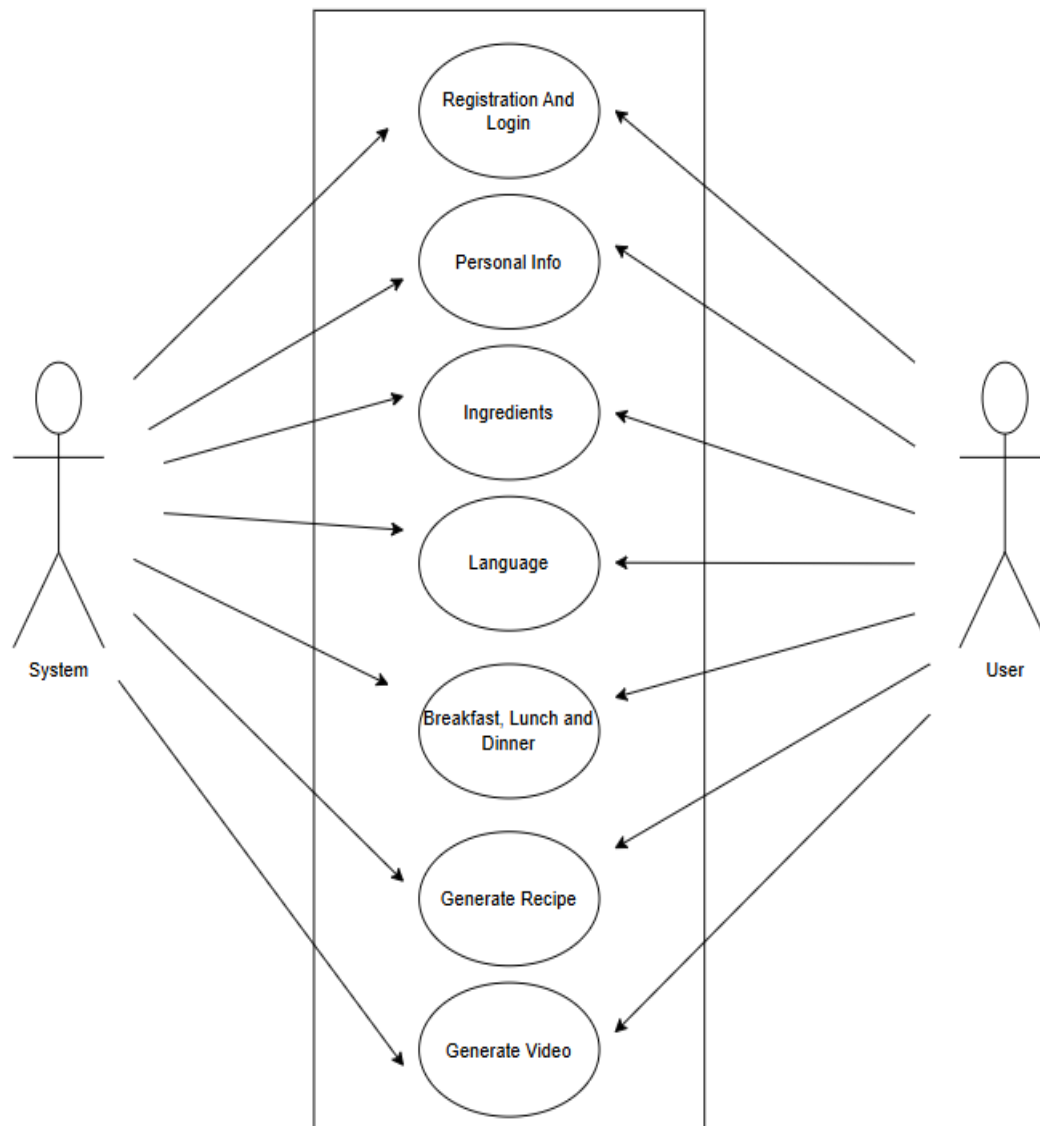Figure 5.3: Flow diagram

UML Diagram:

Figure 5.4: UML diagram

CHAPTER 6

Software Development

Chapter 6

Software Development

Problem statement:

The system focuses on delivering personalized recommendations by suggesting recipes tailored to each user's unique preferences, dietary restrictions, and the ingredients they have on hand. This ensures that users receive relevant and achievable meal ideas that align with their tastes and health goals.

Additionally, it aims to simplify meal preparation by providing clear, step-by-step instructions, along with helpful cooking tips to guide users through the process. This approach enhances user experience by making meal preparation both easy and enjoyable, regardless of culinary expertise.

Proposed work**:**

The development of the AI-driven recipe generator follows a structured process, starting with research and development through literature reviews and user surveys to understand user needs. In the system design phase, the architecture is planned, and intuitive UI/UX designs are created. Data collection involves building a diverse recipe database while allowing users to input preferences and available ingredients.

Algorithm development focuses on machine learning models for personalized recommendations and nutritional analysis. A prototype is developed and tested with users for feedback, leading to iterative improvements based on insights gathered. Once refined, the system is deployed on web and mobile platforms, supported by a targeted marketing strategy. Post-launch support ensures ongoing user assistance and regular updates. Success is measured by evaluation metrics like user engagement and the system's impact on cooking habits and health outcomes.

Future Scope:

1. **Smart Kitchen Integration:** Integration with IoT-enabled appliances and voice assistants for seamless, real-time cooking assistance.

2. **Social & Collaborative Features:** Enabling users to share recipes, meal plans, and create collaborative cooking experiences.

3. **Nutritional & Health Integration:** Syncing with health trackers to provide meal suggestions aligned with users' fitness and health goals.

CHAPTER 7

Troubleshooting / Debugging

Chapter 7

Troubleshooting / Debugging

Data Quality Issues

Issue: Inaccurate, incomplete, or outdated recipe data leading to irrelevant or incorrect recipe suggestions.

Poor Recipe Recommendations

Issue: The system provides irrelevant or unsuitable recipe suggestions.

UI/UX Problems

Issue: Poor user experiences due to confusing design, long load times, or lack of accessibility.

Platform-Specific Bugs

Issue: Platform-specific issues, such as crashes, UI layout problems, or device incompatibility.

CHAPTER 8

Conclusion

Chapter 8

Conclusion

In conclusion, the development of AI-based recipe generators holds significant promise for revolutionizing the way people discover, prepare and enjoy food. Through advanced algorithms and machine learning techniques, these systems can offer personalized recipe recommendations, assist users in meal planning and grocery shopping and provide step-by-step guidance during the cooking process.

However, while AI-powered culinary assistants offer exciting opportunities, several challenges and considerations must be addressed. These include ensuring the accuracy and reliability of recipe recommendations, accommodating diverse dietary preferences and restrictions and maintaining user privacy and data security.

Moreover, the success of AI-based recipe generators ultimately depends on their ability to enhance the overall cooking experience for users. This involves not only providing practical assistance but also fostering creativity, exploration and enjoyment in the kitchen.

CHAPTER 9

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