



Homemade RecipeBowl

Minor Project Report

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Chandigarh

DECLARATION

We hereby declare that the project work entitled “Homemade RecipeBowl” is an authentic record of our own work carried out at Punjab Engineering College (Deemed to be University), as a requirement of Minor Project for the award of degree of BTech (Computer Science and Engineering), under the guidance of Prof. Poonam Saini (Faculty, Department of Computer Science and Engineering) during August to December 2020.

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Anish Aggarwal, 18103039

CERTIFICATE

This is to certify that the project entitled Homemade RecipeBowl by Ankit Goyal, Krish Garg, Divyanshu Garg & Anish Aggarwal is an authentic record of our work carried out under the supervision of Prof. Poonam Saini, Faculty, Computer Science and Engineering Department, Punjab Engineering College (Deemed to be University), Chandigarh in fulfilment of the requirements as a part of Minor Project for the award of 04 credits in semester 5 of the degree of Bachelor of Technology in Computer Science and Engineering.

Certified that the above statement made by the students is correct to the best of my knowledge and belief.

Prof. Poonam Saini
(Faculty Mentor)
Department of Computer Science and Engineering
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Dated:

ACKNOWLEDGEMENT

We have taken a lot of deliberations in this venture. But it wouldn't have been possible without the help and backing of numerous people. We want to extend our true appreciation and thank them. We take this opportunity to express our profound gratitude and deep regards to our mentor Prof. Poonam Saini for her exemplary guidance, monitoring and constant encouragement throughout the course of this project.

This project truly wouldn't have been possible without her mentorship.

ABSTRACT

Most often, we get into a situation when we want to cook something delicious, however, we are short on ingredients at our home. It also creates a lot of confusion about what to cook with the available ingredients. Further, we might not have accessibility to more ingredients from the nearby market due to various reasons like non-availability or specifically the unprecedented times as Covid which has resulted in shutdowns. Finally, we are bound at home to make the best possible dish from leftover ingredients. Our project aims to make a user aware of the various dishes which can be cooked from the available set of ingredients being input by a user.



TABLE OF CONTENTS

Declaration.....	2
Certificate.....	3
Acknowledgement	4
Abstract.....	5
List of Figures	7
List of Tables	7
CHAPTER 1- INTRODUCTION	
1.1 Introduction.....	8-9
CHAPTER 2- PROBLEM STATEMENT	
2.1 Problem Formulation	10-11
CHAPTER 3- PROPOSED WORK(ALGORITHM/MODEL/APPROACH)	
3.1 Algorithm and Approach	12
3.2 Model.....	12-13
3.3 UML Diagrams	14-16
CHAPTER 4-IMPLEMENTATION DETAILS	
4.1 Web Application	17-21
4.2 Languages and Frameworks Used	22-24
4.3 Analysis of Dataset	25-26
CHAPTER 5- RESULTS AND DISCUSSION	
5.1 Result	26-27
5.2 Discussions	28
CHAPTER 6- TIMELINE.....	
	30-34
CHAPTER 7- CONCLUSIONS AND FUTURE WORK	
7.1 Conclusions.....	35
7.2 Future Work	35
CHAPTER 8- REFERENCES	
8.1 References	36

LIST OF FIGURES

Fig. No.	Description	Page No.
1	Use-Case Daigram	14
2	Class Daigram	14
3	Sequence Daigram	15
4	State Daigram	15
5	Activity Daigram	16
6	Website Homepage	17
7	Login	18
8	Dashboard	19
9	Feed	20
10	Prediction time	21
11	Neural Network Structure	27

LIST OF TABLES

Table. No.	Description	Page No.
1	Accuracy over different hyperparameters	28

CHAPTER 1

INTRODUCTION

1.1 Introduction

Our project aims to make a user aware of the various dishes which can be cooked from the available set of ingredients being input by a user. There may be times when a person desires new, delicious, healthy or maybe presentable cuisines and above all, it necessarily is homemade as the possibilities to get one from outside might be restricted like in the recent pandemic period (Covid-19). An optimal solution to this could be the design of an application wherein the user will be capable of exploring and preparing several new dishes which include those ingredients. Therefore, a system could be designed that could actually take ingredients as the input and generates the best-matched recipe from an exhaustive list of most matching recipes.

1.1.1 Web Application

A web application is an application that is hosted and delivered over the Internet and the World-Wide-Web. The advantage of such an application is that it can be accessed from anywhere and is an anytime application- i.e., it is always available, regardless of the location of the user or other factors. A web application can be used to efficiently deliver functionality to the end user without burdening their systems. Processing can be done on the server to prevent data and memory leaks. There are many frameworks, languages, tools and paths to create a web application. Homemade RecipeBowl uses React, JavaScript, CSS, AJAX for the front-end and Flask, a Python framework, for the server-side scripting needs.

1.1.2 What is Homemade RecipeBowl

We aim to make a user aware of the various dishes which can be cooked from available set of ingredients or an input image given by a user.

Thus, systems like this never get their place in real life. We've developed a Recipe Generation model by applying Neural Network on it. The tools used for developing the project are Python, React, CSS, JavaScript & Flask.

- A dynamic website incorporating machine learning techniques.
- Search options:
 - Search by Ingredients
 - Search by food image
 - Search by cuisine
- Output: self generated recipes
- It is a recipe generator system and not a recommender system!!!
- An additional feature for sharing food related content in the form of posts.



CHAPTER 2

PROBLEM STATEMENT

Problem Statement Formulation

A lot of times, we are in a situation when we want to cook something delicious but we are short on ingredients at our home and we are confused about what to cook with the ingredients we have. We might be in a situation where either we don't have any means to get ingredients from the market, or we are bound to stay at home. Just as we did in this COVID-19 pandemic situation, where we stayed in our homes for months in complete lockdown. We feel helpless in such a situation.

In such a situation we keep on searching for recipes that match our ingredients online, but hardly get any results and that too takes a lot of time, and ultimately we return to our kitchen disappointed. There's a need for a system that could actually take ingredients as the input and give us the list of most matching recipes that could help us make delicious food at our homes.

- **What already exists:**

- Recipes-by-name search system
- Recipes recommender search system



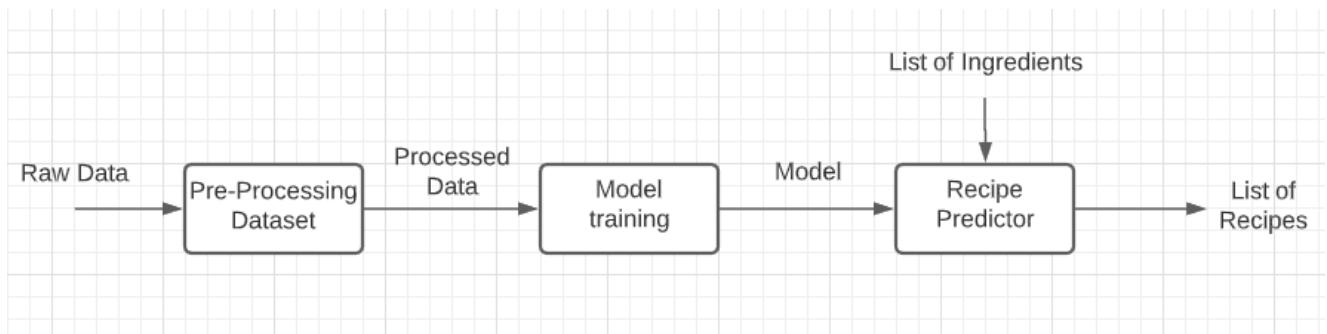
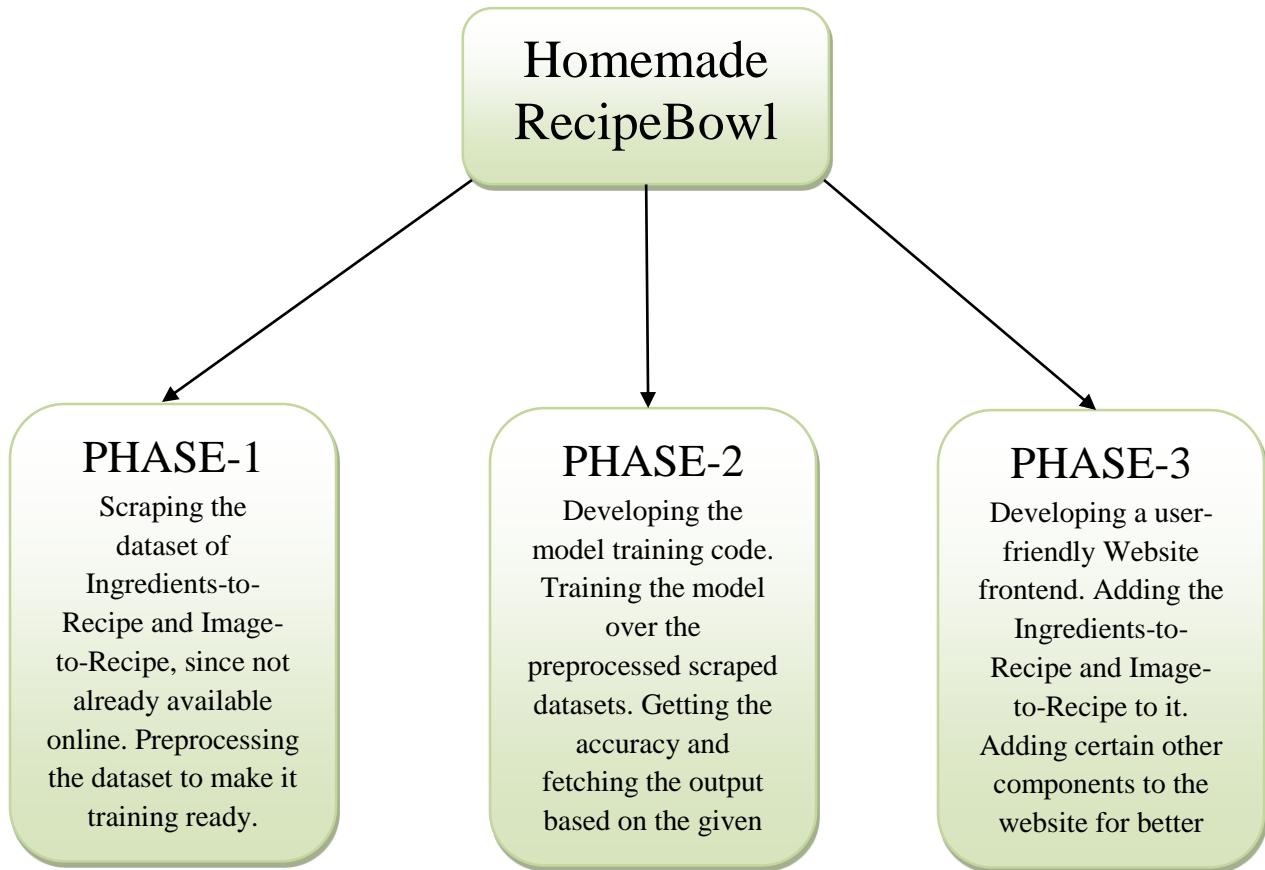
- **Existing Problems:**

- No Recipes-by-Ingredients search system
- No Recipes-by-Images search system
- No Ingredients-Recipe and Image-Recipe datasets.

- **Our Contribution:**

- Scrapped Ingredients-Recipe and Image-Recipe datasets.
- Training Image-to recipes model using Convolutional Neural Network
- Recipe generator using character-level RNN text generation ML technique.

Following is our approach divided into different phases about the solution of the problem.



Fetching Recipes

CHAPTER 3

PROPOSED WORK

(ALGORITHM/MODEL/APPROACH)

3.1 Algorithm & Approach

1. Scrap Dataset from given websites:
 1. All Recipes
 2. Epicurious
 3. Food Network
2. Preprocessing Dataset:
 1. Filtering out incomplete recipes and converting the dictionary to string.
 2. Add stop words after recipe title, ingredients and instructions.
 3. Fixing the length of recipes by removing too large recipes and padding the smaller ones with a special character. Finally left with 100212 recipes.
3. We have used character level RNN's where we have first vectorized the input dataset into numbers and then converted them into a Tensorflow dataset for final training.
4. Then we split up the dataset into batches of 64 and final started the training.
5. We have applied different Deep learning:
 1. Optimizers: Adam, RMSProp & SGD(Stochastic Gradient Descent).
 2. Learning rate: varying from 0.005 to 0.001
 3. Loss Function: sparse_categorical_crossentropy & categorical_crossentropy

We were able to successfully achieve a best accuracy of 93.20% using RMSProp Optimizer, sparse_categorical_crossentropy as the loss function and 0.0005 as the Learning Rate.

3.2 Model

The system we have built will be used for generation of recipes from the given set of input and thus also requires proper designing. The Design requirements for the project are:

3.2.1 Knowledge Requirement for Modelling

- a) Knowledge of Web Development: To develop the registration process and the recipe generation process, the knowledge of Web Development was required. The team has knowledge of Web Development, and has used RecipeBowl uses React, JavaScript, CSS, AJAX for the front-end and Flask, a Python framework, for the server-side scripting needs & finally SQLite as the database.
- b) Knowledge of Deep Learning: Since the application required designing a model which could help generate recipes, the knowledge of Deep learning was required. Our team had knowledge of Neural networks, and our application specifically used RNN's(Recurrent Neural Network) and CNN's(Convolutional Neural Network).
- c) Knowledge of UML Diagrams: Knowledge of UML diagrams was essential to create the different types of models which is an essential component of Software Engineering.

3.3 Modelling the Architecture

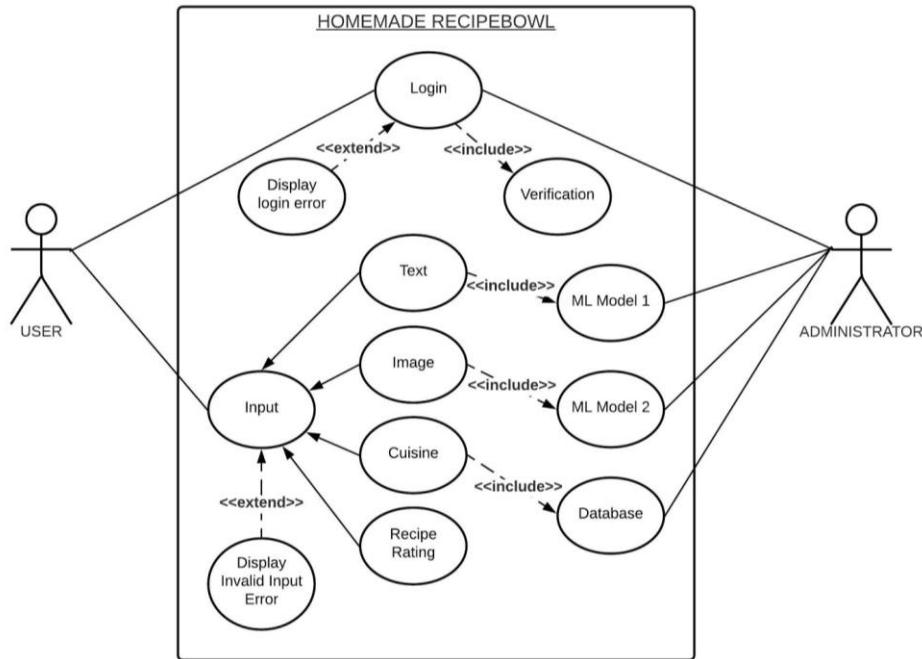
- a) Server: The system requires servers to process applications and to host databases, to and from which the querying is done. For development purposes the team has used their local machines.
- b) Web Hosting: The application and databases are required to be hosted on the web, to provide anytime access to them. For development, the team has used the localhost to host applications.
- c) IDEs: Since various technologies are being used, specialized IDEs and tools are used for them.
The team has used:

- I. Sublime Text and Atom for Web Development.
- II. Jupyter Notebook for Development of Python Script.

3.3 UML Diagrams

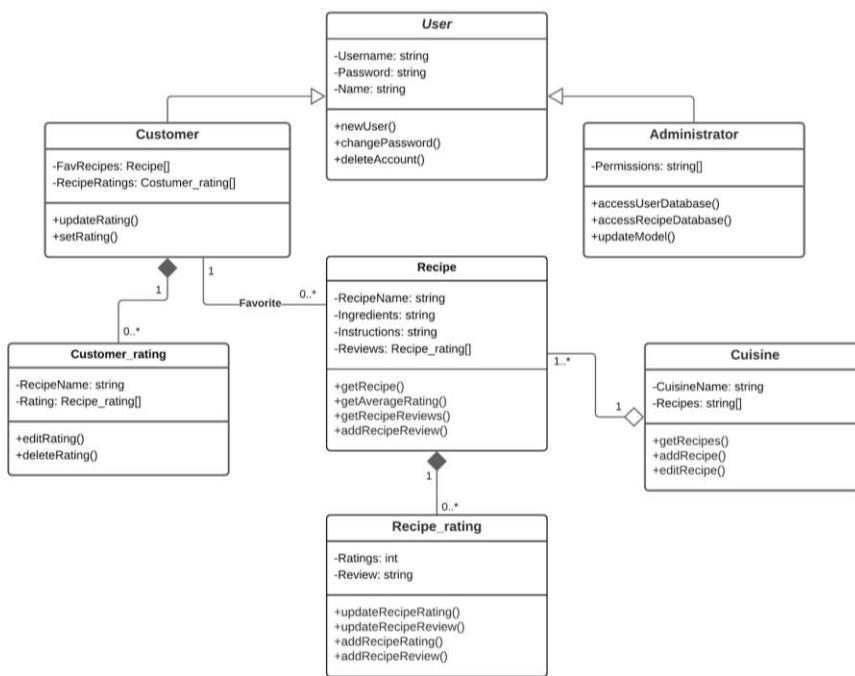
3.3.1 Use-Case Diagram

The use case diagram starts with the doctor logging in and then entering the symptoms values.



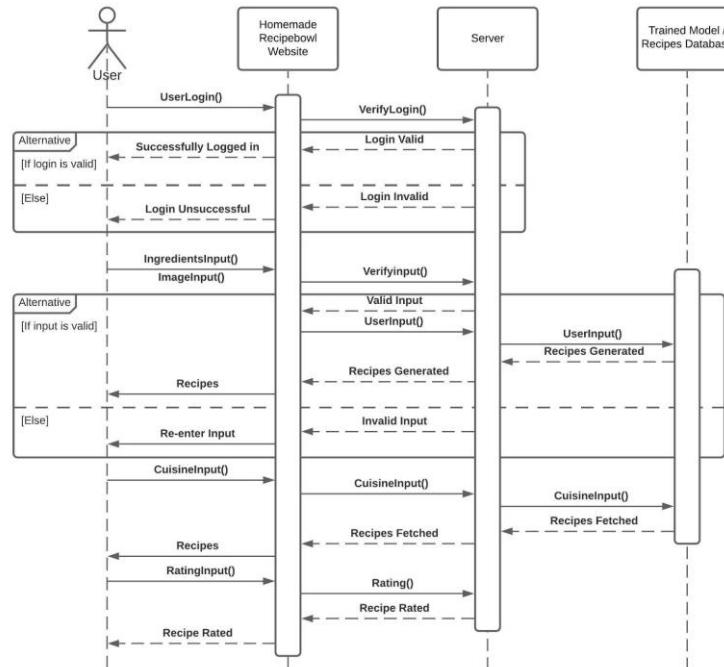
3.3.2 Class Diagram

Shows the various components and interactions of various classes and their associated cardinality.



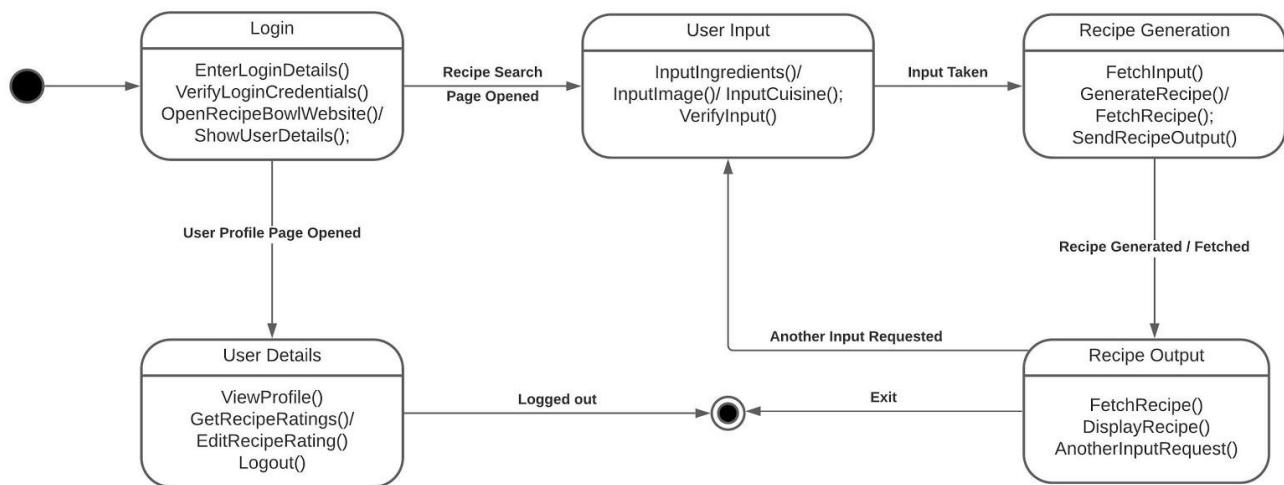
3.3.3 Sequence Diagram

A sequence diagram is a type of interaction diagram because it describes how—and in what order—a group of objects works together.



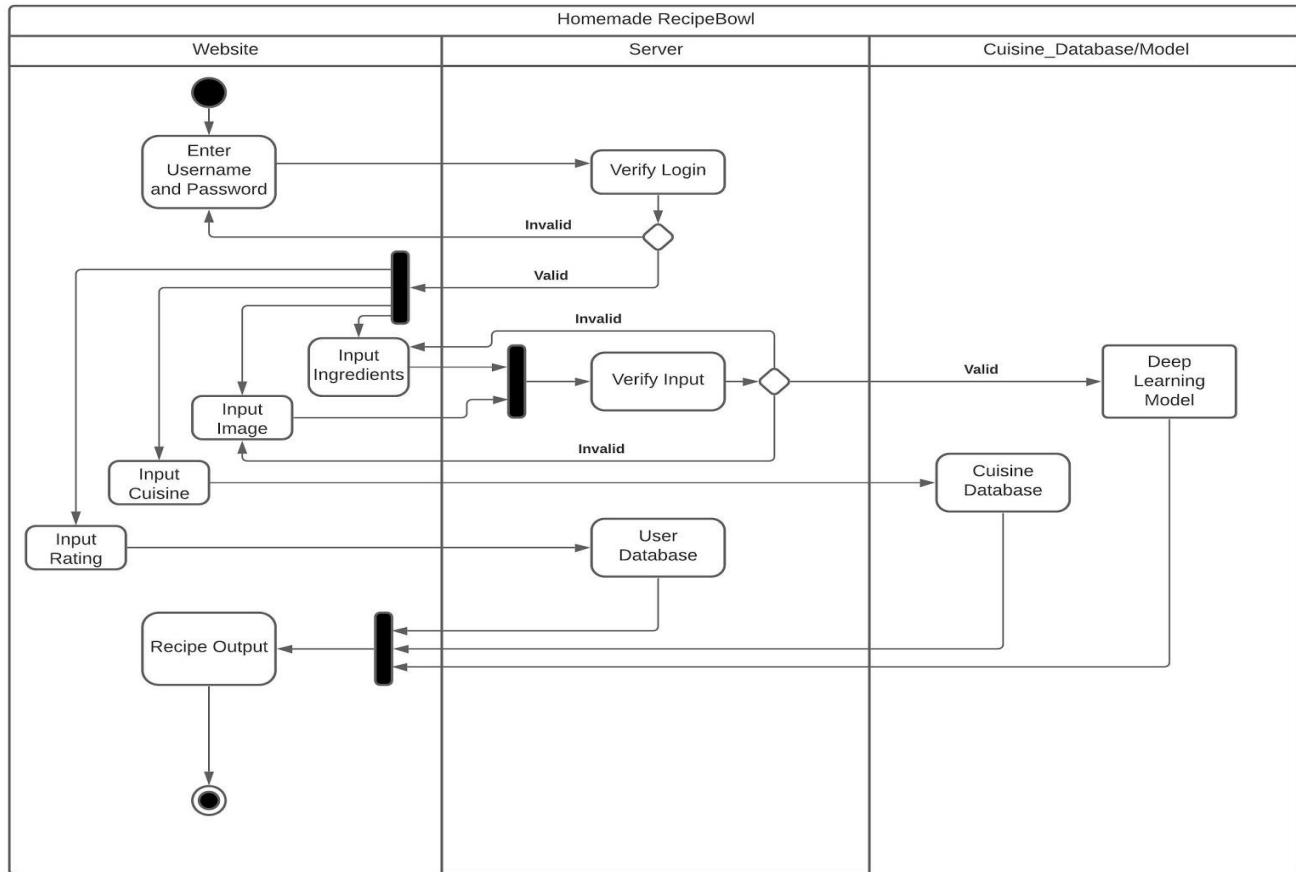
3.3.4 State Diagram

They are behavioral diagrams used to represent the conditions of the system or part of the system at finite instances of time.



3.3.5 Activity Diagram

An activity diagram is a behavioral diagram i.e. it depicts the behavior of a system



CHAPTER 4

IMPLEMENTATION

4.1 WEB APPLICATION

4.1.1 Website Homepage

The website first opens up the homepage, which is the central point of use for the user. There are three options available here: Recipe by Ingredients, Recipe by Image & Recipe by Cuisine.

The screenshot shows the RecipeBowl homepage. At the top, there is a navigation bar with links for Home, Feed, About Us, Dashboard, and Logout. The main header features a large, bold text "Your Ingredients Our Recipes!" over a background image of sliced cucumbers. Below this, a sub-header asks "How do you want to search?" with three buttons: "BY INGREDIENTS", "BY IMAGE", and "BY CUISINE". The page then transitions to a section titled "Features" with three circular thumbnails. The first thumbnail, "Ingredients to Recipe", shows various spices and ingredients. The second, "Image to Recipe", shows a dish on a plate. The third, "Different Cuisines", shows a variety of international dishes. Each feature has a corresponding descriptive text below it.

Features

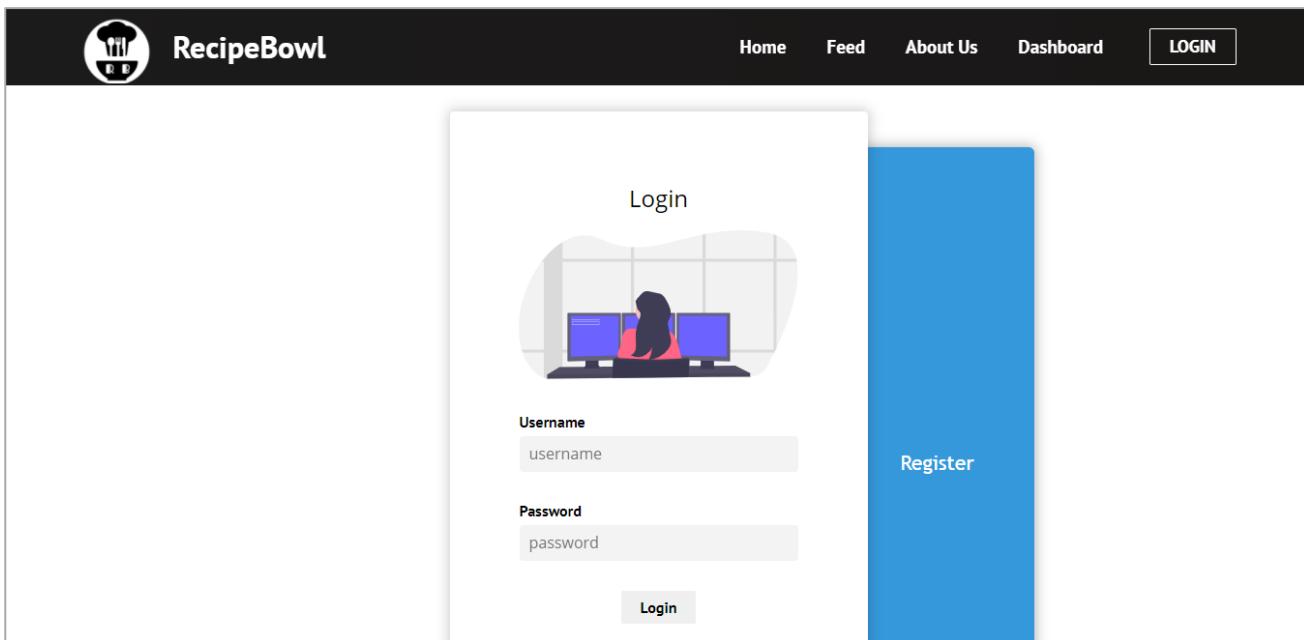
Ingredients to Recipe
Do you have limited ingredients, and don't know what to cook?

Image to Recipe
Do you have an image of a delicious looking dish and want to try it out, and don't know where to start from?

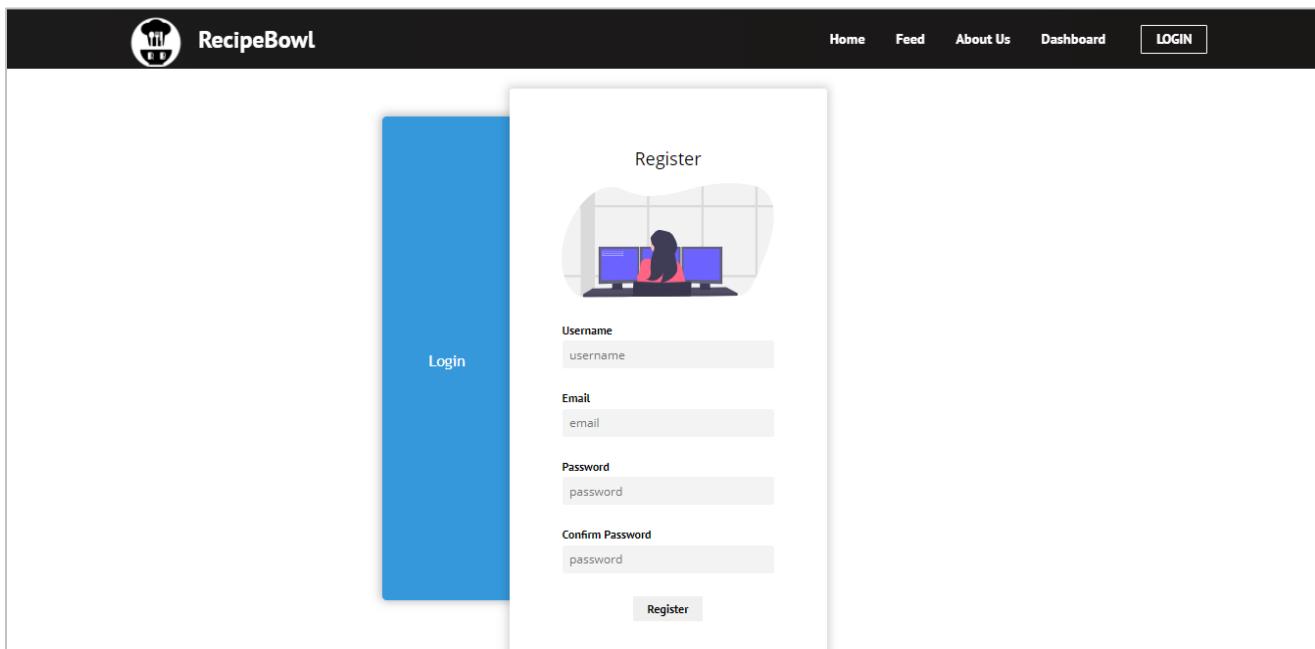
Different Cuisines
Do you want to try out delicious recipes of your favorite Cuisine?

4.1.2 Login

The user can login with his Username and Password.



Also, they can sign up or register if they don't have an account already.



4.1.2 Dashboard

After user login, we can open the dashboard. Here the user can change the profile picture, change password, change bio, and view his/her favorite Recipes and his/her posts.

The screenshot shows a user profile on the RecipeBowl website. At the top, there's a navigation bar with a logo, "RecipeBowl", and links for "Home", "Feed", "About Us", "Dashboard", and "LOGOUT". Below the navigation is a large, scenic image of snow-capped mountains under a pink and purple sunset sky. In the center of the page is a white rectangular box containing a circular profile picture of a young man with dark hair, wearing a striped sweater. Below the picture, the username "ankit_0301" is displayed, followed by the email "goyalankit3129@gmail.com" and the location "Chandigarh, India". There are "Change Password" and "Change bio" buttons at the bottom of this box. A message from the user reads: "Hey there! I am using RecipeBowl. RecipeBowl is the best Recipe generation website to get the most tasty recipes within seconds."

The screenshot shows two main sections: "My Favorites" and "My Posts". The "My Favorites" section features a thumbnail of a dish (Vegan Indian Curry with Cauliflower and Lentils) with the text "Added to Your Favorite Recipes" and a small red heart icon. The "My Posts" section shows a detailed recipe card for the same dish. The recipe title is "Vegan Indian Curry with Cauliflower and Lentils". The "INGREDIENTS" section lists various vegetables and spices. The "INSTRUCTIONS" section provides a step-by-step guide to cooking the dish, mentioning the use of oil, onion, ginger, garlic, coriander, cumin, turmeric, red lentils, vegetable stock, cauliflower, coconut milk, carrots, green beans, cilantro, lemon juice, salt, and pepper. The card also includes a "PÉC EXPLORE INNOVATE EXCEL" logo at the bottom.

4.1.3 Feed for Sharing your Ideas, recipes and many more in the form of Posts

Now here's something which made our project even more interesting. As you all must have seen feed in all social media platforms, we thought why not to add the same in our website, but in a different context. Here, people can share food related memes, recipes, images, and can also comment on one-another's post. A Random recipe is also shown in the feed using an API.

RecipeBowl

Home Feed About Us Dashboard **LOGOUT**



ankit_0301

My Posts My Profile My Favorites Change Password

Random Recipe

Beef and Oyster pie
Category: Beef



what's on your mind?



krish_garg 17/12 2:27 PM

I participated in an online cooking competition named "Chef at home" and I came First. This was the dish I made. Its name is choco-vanilla scoops with logs. Its ingredients are Sugar, marigold biscuits, choco powder, baking powder, curd.



Comments ^

 Write a comment. 

ankit_0301 Would love to try it out someday 😊 😊 😊

anish_aggarwal Congratulations Krish🔥 Mouth watering 😊

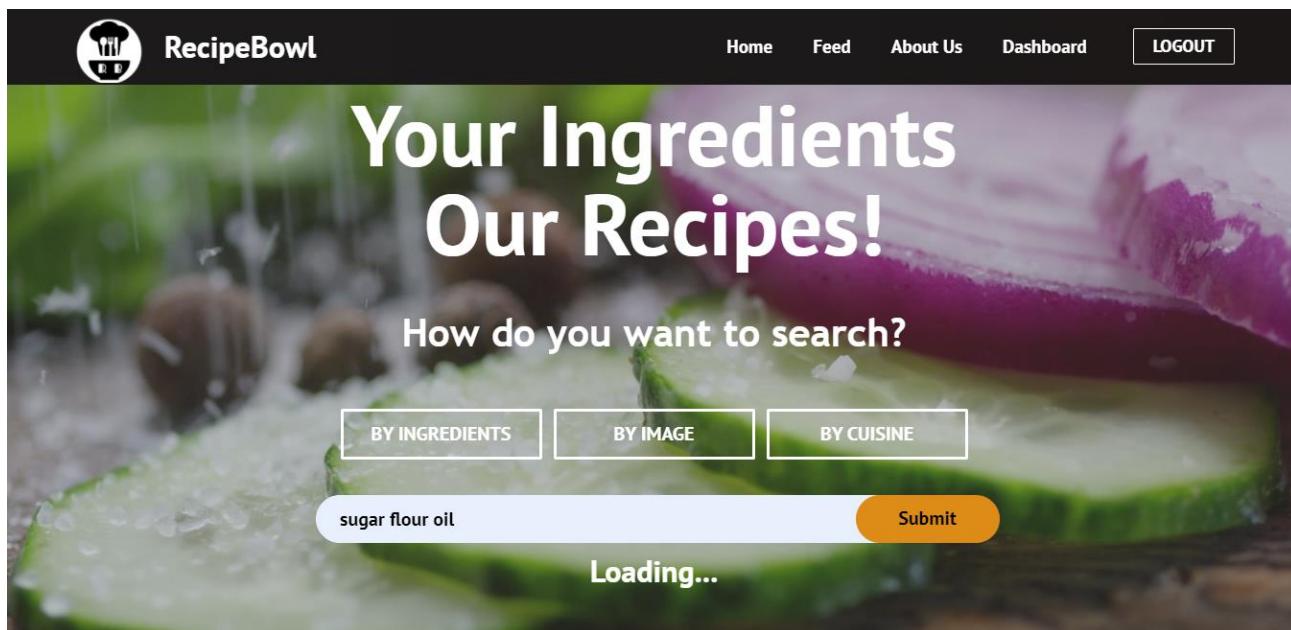
 dv_1301 17/12 2:23 PM

To Lose Weight:

- Reduce the number of calories you eat daily. Eat smaller portions—don't "upscale" your meals at fast-food restaurants.
- Follow the dietary guidelines above.
- Eliminate all sugar-added drinks from your diet. You can drink 100% fruit juice, unsweetened, but limit servings to one or two a day.

4.1.4 Prediction Time

Now let's give ingredients input to the website and get the generated recipes as output.



After getting the desired results:

Recipes

sugar flour oil Pulled Pork and Vegetables

INGREDIENTS:

- 1/2 teaspoon ground cinnamon • 1/2 cup cold butter, cut into cubes • 1/2 teaspoon ground coriander • 1/4 teaspoon ground cloves • 1/4 teaspoon ground cardamom • 1/4 teaspoon ground cayenne pepper • 1 teaspoon ground cumin • 1/2 teaspoon ground cloves • flour • 1/4 teaspoon ground cinnamon • 1 tablespoon chopped fresh chives • oil • sugar • 1/8 teaspoon ground cloves

INSTRUCTIONS:

- Preheat oven to 350 degrees F (175 degrees C). Grease a baking sheet. • Combine 1 1/2 cups water, rice flour, sugar, baking powder, and salt in a large bowl; mix until dough comes together. Transfer to a bowl. Cover bowl with plastic wrap and refrigerate until flavors combine, about 1 hour. • Preheat oven to 400 degrees F (200 degrees C). Line a baking sheet with parchment paper. • Mix oats, brown sugar, cinnamon, nutmeg, cloves, and salt together in a large bowl. Add buttermilk, egg, and vinegar; mix until batter is smooth. Pour into the prepared loaf pan. • Bake in the preheated oven until golden brown, about 40 minutes. Cool until easily handled, about 10 minutes. • Combine mango, pumpkin seeds, cinnamon, cardamom, cinnamon, and nutmeg in a small bowl. Sprinkle with salt and pepper. Stir in butter, cinnamon, and nutmeg. Season with salt and pepper. • Preheat oven to 350 degrees F (175 degrees C). Grease a 9x13-inch baking dish. • Mix oats, brown sugar, cinnamon, cloves, and nutmeg together in a large bowl. Add buttermilk, egg, cinnamon, ginger, nutmeg, ginger, cloves, and salt; stir to combine. Spread over pie crust. • Bake in the preheated oven until top is golden brown, about 1 hour. Remove from oven and cool for 15 minutes. • Combine 1 cup water, 1/2 cup water, and 1/2 teaspoon salt in a saucepan; bring to a boil. Reduce heat and simmer until apples are tender, about 10 minutes. Drain and rinse under cold water. • Melt butter in a

sugar flour oil Deluxe Concenta

INGREDIENTS:

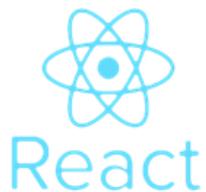
- 1/2 cup chopped fresh mint • 1 tablespoon vegetable oil • 2 small shallots, minced • 1 (3 pound) beef tenderloin • 1 tablespoon peanut oil • 1 teaspoon salt, or to taste • flour • 2 cloves garlic, chopped • 4 cups water • 1 tablespoon sriracha sauce • 4 scallions, chopped, or more to taste • 1 jalapeno pepper, minced • 1 teaspoon brown sugar • 2 (14 ounce) cans sliced black olives, drained • sugar • oil

INSTRUCTIONS:

- Heat 1 teaspoon oil in a skillet over medium heat; cook and stir garlic until fragrant, about 3 minutes. Stir salmon into the skillet; cook until seeds are lightly caramelized in spots and become fragrant, about 5 minutes. Stir in onion, ginger and jalapeño; cook and stir until softened, about 5 minutes. Add quartered pepper, red pepper and reserved juice. Bring liquid to a boil; reduce heat and simmer until flavors combine, about 5 minutes. • Combine cabbage, tarragon, and red chile peppers in a bowl; stir to blend. Season sauce with salt. Drizzle over dressing and stir to combine. Cover the bowl with plastic wrap and refrigerate until flavors combine, about 20 minutes.

4.2 LANGUAGES AND OTHER TOOLS USED

4.2.1 React & CSS



React (also known as React.js or ReactJS) is an open-source, front end, JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React makes it painless to create interactive UIs. It designs simple views for each state in your application, and React will efficiently update and render just the right components when your data changes. Styling of all pages has been done with the help of CSS. It manages its own state, then compose them to make complex UIs.

4.2.2 Flask



Flask is a lightweight WSGI web application framework. It is designed to make getting started quick and easy, with the ability to scale up to complex applications. Flask supports extensions that can add application features as if they were implemented in Flask itself. Extensions exist for object-relational mappers, form validation, upload handling, various open authentication technologies and several common framework related tools.

4.2.3 BeautifulSoup

Beautiful Soup is a Python package for parsing HTML and XML documents. It creates a parse tree for parsed pages that can be used to extract data from HTML, which is useful for web scraping.



4.2.4 Tensorflow



TensorFlow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper libraries that simplify the process built on top of TensorFlow. TensorFlow is an open source library for fast numerical computing. It was created and is maintained by Google and released under the Apache 2.0 open source license. The API is nominally for the Python programming language, although there is access to the underlying C++ API.

4.2.5 SQLite



SQLite is an in-process library that implements a self-contained, serverless, zero-configuration, transactional SQL database engine. SQLite is the most widely deployed database in the world with more applications than we can count, including several high-profile projects. SQLite is an embedded SQL database engine. Unlike most other SQL databases, SQLite does not have a separate server process. SQLite reads and writes directly to ordinary disk files. The database file format is cross-platform - you can freely copy a database between 32-bit and 64-bit systems or between big-endian and little-endian architectures. These features make SQLite a popular choice as an Application File Format.

4.2.6 Sublime Text

Sublime Text is a shareware cross-platform source code editor with a Python application programming interface (API). It natively supports many programming languages and markup languages, and functions can be added by users with plugins, typically community-built and maintained under free-software licenses.

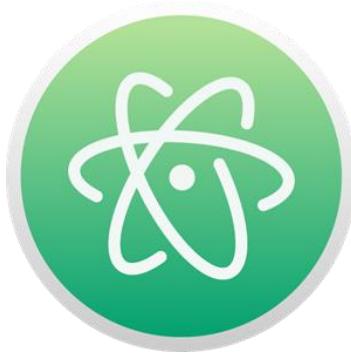


4.2.7 JUPYTER NOTEBOOK



The Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text. Uses include: data cleaning and transformation, statistical modeling, data visualization, machine learning, and much more. We used Jupyter Notebook for writing code, compiling it and getting the results in modern fashion.

4.2.8 Atom



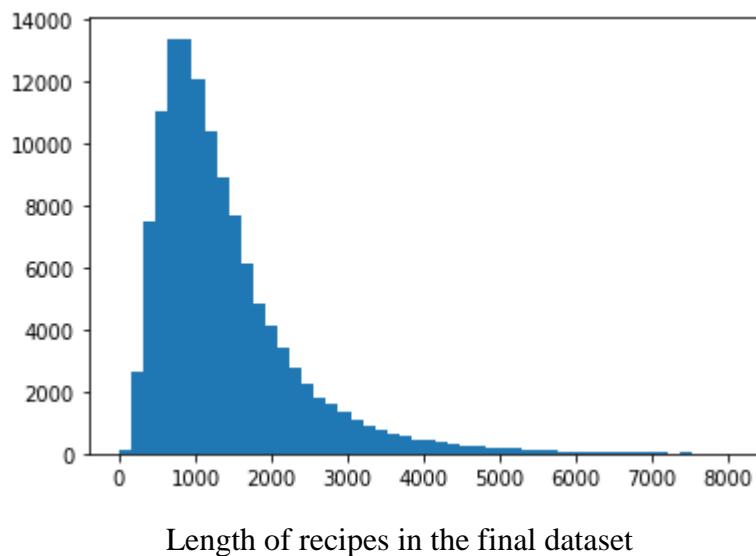
Atom is a free and open-source text and source code editor for macOS, Linux, and Microsoft Windows with support for plug-ins written in JavaScript, and embedded Git Control, developed by GitHub. Atom is a desktop application built using web technologies. Most of the extending packages have free software licenses and are community-built and maintained. Atom is based on Electron (formerly known as Atom Shell), a framework that enables cross-platform desktop applications using Chromium and Node.js. It is written in CoffeeScript and Less.

4.3 ANALYSIS OF DATASET

1. Ingredients to Recipe:

Datasets were scraped from the given three websites:

- Epicurious
 - All recipes
 - Food Network
- a. Total number of raw examples: 125164
 - b. Dataset size AFTER removing incomplete recipes 122938
 - c. Dataset size AFTER filtering out very large recipes and fixing it's length: 100212



2. Image to Recipe:

Datasets were scraped from the given website:

- ChefKoch (why? Because has multiple images for many single recipes)

Scraped around 3 lakh+ Recipes and 7 lakh+ images.

3. Cuisine to recipe:

Datasets were scraped from the given website:

- All Recipes – Cuisine to Recipe

Scraped around 500-1000 recipes for 17 famous cuisines of the world.

- African
- Asian
- Australian
- Canadian
- Chinese
- European
- French
- Indian
- Italian
- Japanese
- Korean
- American
- Mediterranean
- Mexican
- Eastern
- Thai
- USA



CHAPTER 5

RESULTS AND DISCUSSION

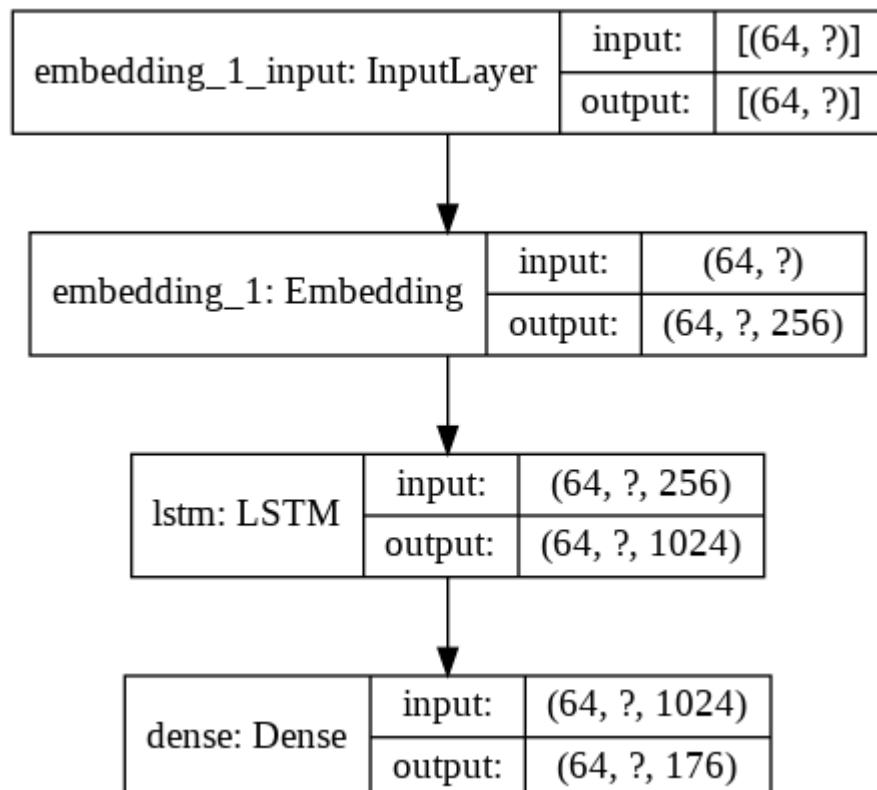
5.1 RESULTS

1. Ingredients to Recipe:

The results achieved so far are:

We trained and tested our model on DGX GPU using docker and Teamviewer. We tried retrieving the model over three optimisers, i.e. Adam, RMSProp and SGD(Stochastic Gradient Descent). Besides this, we did hyperparameter tuning by changing the Learning rate and the number of steps per epoch. Finally, we succeeded in achieving an accuracy of 93.20% using RMSProp as optimizer and 0.0005 learning rate.

The Following is the structure of the neural network trained:



We have applied different Deep learning:

1. Optimizers: Adam, RMSProp & SGD(Stochastic Gradient Descent).
2. Learning rates: varying from 0.005 to 0.001
3. Loss Functions: sparse_categorical_crossentropy & categorical_crossentropy

We were able to successfully achieve a best accuracy of 93.20% using RMSProp Optimizer, sparse_categorical_crossentropy as the loss function and 0.0005 as the Learning Rate.

Optimizer	Epochs	Early Stopping	No. of Steps	Learning Rate	Accuracy (*100 %)	Loss
Adam	20	-	1500	0.001	-	0.24
RMSProp*	20	18	700	0.001	0.93	0.19
RMSProp	500	21	1500	0.001	0.927	0.225
Adam	500	41	1500	0.001	0.9296	0.2201
Adam	20	-	1500	0.0005	0.9249	0.2367
Adam	500	45	1500	0.0005	0.9311	0.2156
RMSProp	20	-	1500	0.0005	0.9275	0.2278
RMSProp	500	44	1500	0.0005	0.9320	0.2128
SGD	Model didn't learn, very high loss, very less accuracy(<60%)					

- Batch Size = 64
- Loss Function = sparse_categorical_crossentropy

Note:

RMSProp*

VERY LARGE FLUCTUATIONS IN THE LOSS OVER CONSECUTIVE EPOCHS, SO NOT PREFERABLE

2. Image to Recipe:

The results achieved so far are:

We trained and tested our model on DGX GPU using docker and Teamviewer. We tried retrieving the model over two optimisers, i.e. Adam & RMSProp. Besides this, we did hyperparameter tuning by changing the Learning rate and the number of steps per epoch. Finally, we succeeded in achieving an accuracy of 93.32% using Adam as optimizer and 0.0005 learning rate.

5.2 DISCUSSION

Through this project, we have made a system that has the potential to generate recipes out of the given set of ingredients. Also, this project has the potential to get implemented in different parts of the world helping users with making delicious recipes at their disposal.

Also, the image to recipe feature can be widely used to help generate the recipes of the most delicious looking recipe images.

Also, As you all must have seen feed in all social media platforms, we thought why not to add the same in our website, but in a different context. Here, people can share food related memes, recipes, images, and can also comment on one-another's post.

CHAPTER 6

Timeline

Week 0 (28 July 2020 - 9 August 2020)

Team formation and Mentor Selection:

- Team Member Formation.
- Choosing the field/technology of interest after a series of meetings with the team members.
- Selecting the appropriate mentor best suited for the technology to be used.

Week 1 (10 August 2020 - 16 August 2020)

Project Idea Discussion and Synopsis Drafting:

- Decided on three project ideas:
 - A gaming project which uses physical movement detection for moves in the game. This would collaborate exercise with gaming.
 - Personal voice assistant software and hardware for blinds to detect the objects around.
 - Platform for generating recipes based on given set of ingredients. This was influenced by the cooking trend during lockdown situation.
- Finally, we decided to take up the third idea, as we found it to be a more practical and useful idea. And also it was feasible according to our knowledge and skill set.

Week 2 (17 August 2020 - 23 August 2020)

Discovering Project Requirements:

- Looking onto the existing work in this related field, if done.
- Deciding the further contributions we can make.
- Looking for availability of datasets for training purposes of our models to be able to predict the required output.

- Looking for platform to perform high end computations like web scraping and machine learning model training
- Developing a user interface through which the user can access all the functionality easily and innovatively.

Week 3
(24 August 2020 - 30 August 2020)

Exploring datasets and websites for scrapping (if required):

- Looked up for the existing datasets on the internet.
- Found one nearly exhaustive dataset by MIT, but the access was not public, wasn't accessible.
- Could not find any other dataset related to the Recipe name along with ingredients and instructions.
- Created the Github Repository for the project - Homemade Recipebowl (Currently the repository is private)

Week 4
(31 August 2020 - 6 September 2020)

Scraping Websites:

- Shortlisted three websites suitable for ingredient-recipe dataset:
 - Epicurious
 - All Recipes
 - Food Network
- Developed the code for scraping in python.
- Scraped the websites using the BeautifulSoup module in python.

Week 5
(7 September 2020 - 13 September 2020)

Designing UML Diagrams:

- Use Case Diagram
- Class Diagram
- Sequence Diagram
- Activity Diagram
- Statechart Diagram

Deep Learning Course:

- Took a brief overview of the deep learning specialisation on Coursera by Andrew NG.
- Also referred to some online articles and tutorials regarding NLP.

Week 6 (14 September 2020 - 20 September 2020)

Started developing the RecipeBowl Website:

- Started developing the website's front end using the React Framework
- Website Layout designed before the start of actual implementation by team discussions and brainstorming.

Week 7 (21 September 2020 - 27 September 2020)

Writing code for training the model:

- Drafted code in python using Google Colab for model training on input ingredients and giving recipes as the output.

Week 8 (28 September 2020 - 4 October 2020)

Training and Testing of the Model:

- Trained the deep learning model over 20 epochs on Google Colab.
- Tested the model and retrieved the output from the model.
- Requested Prof. Poonam Saini for PEC's DGX GPU access for further training as it was not feasible on Google Colab due to limited resources(13 GB RAM).

Week 9 (5 October 2020 - 11 October 2020)

Training the model on DGX's GPU:

- Trained and tested our model on DGX GPU using docker and Teamviewer and extracted the following models:

Optimizer	Epochs	Early Stopping	No. of Steps	Learning Rate	Accuracy (*100 %)	Loss
Adam	20	-	1500	0.001	-	0.24
RMSProp*	20	18	700	0.001	0.93	0.19
RMSProp	500	21	1500	0.001	0.927	0.225
Adam	500	41	1500	0.001	0.9296	0.2201
Adam	20	-	1500	0.0005	0.9249	0.2367
Adam	500	45	1500	0.0005	0.9311	0.2156
RMSProp	20	-	1500	0.0005	0.9275	0.2278
RMSProp	500	44	1500	0.0005	0.9320	0.2128
SGD	Model didn't learn, very high loss, very less accuracy(<60%)					

RMSProp*

VERY LARGE FLUCTUATIONS IN THE LOSS OVER CONSECUTIVE EPOCHS, SO NOT PREFERABLE

Week 10

(12 October 2020 - 18 October 2020)

Developing the RecipeBowl Website backend and Integrating with front end:

- Developing the website's backend using the Flask framework of python.
- Started integrating the frontend and the backend.
- Continued with the frontend of the website.
- Updated the Project SRS according to further scope of the project.

Week 11

(19 October 2020 - 25 October 2020)

Exploring Image-to-Recipe datasets and websites for scrapping (if required):

- Could not get the most diverse MIT dataset from the given portal (portal wasn't working).
- Tried exploring some other websites which could help us with the Image to Recipes training process.
- Chefkoch (has multiple images for many single recipes)
- Started the scraping of the dataset.

Week 12

(26 October 2020 - 1 November 2020)

Completed scrapping and started preparing model training code:

- Completed the scrapping process of ChefKoch website.
- Started development of the model training code using Convolutional Neural Networks(CNNs).
- Continued development of the website by adding new features.
- Started scraping websites to get dataset for Cuisine-to-Recipe.

Week 13-14

(2 November 2020 - 15 November 2020)

Added features like Login page and user dashboard:

- Developed the website's front end using the React framework.
- Added additional features like login page & user dashboard.
- Integrated front end components with each other.
- Integrated front end with image-to-recipe and cuisine-to-recipe feature.

Week 15-16

(16 November 2020 - 29 November 2020)

Added User Favourite Recipes feature and fixed some minor bugs:

- Developed the website's front end using the React framework.
- Added features like favourite recipe bookmark and about us section.
- Fixed minor bugs like automatic page refreshing in Image-to-recipe feature, state update in the React component and many more.

Week 17-18

(30 November 2020 - 13 December 2020)

Developed the feed feature which contains self and other user's posts:

- Created a left panel having shortcuts to jump to components like My Posts, My Favorites, My Dashboard and Change Password.
- Designed the right panel of the feed which contains the posts of the other users along with the current user.
- Added the facility to upload a relevant image along with the text.
- Added a feature to comment on the posts.

CHAPTER 7

CONCLUSION AND FUTURE WORK

7.1 Conclusion

Homemade RecipeBowl is a dynamic website incorporating Deep learning techniques.

- Search options:
 - Search by Ingredients
 - Search by food image
 - Search by cuisine
- Output: self generated recipes
- It is a recipe generator system and not a recommender system!!!
- An additional feature for sharing food related content in the form of posts.

We have made a Web Application, which requires the user to enter the Ingredients, Image or cuisine which then generates delicious recipes for you!

7.2 Future Scope

CURRENT CHALLENGES:

- The Ingredients-to-Recipe generator produces some irrelevant outputs sometimes.

FURTHER SCOPE:

- Getting access of MIT dataset and training the Ingredients-to-Recipe generator to improve it further.
- The Post's feed can be further developed to recommend posts based on user's choices.
- Discussion forum for Q/A among the users.
- Peer to peer direct chat communication.

CHAPTER 8

REFERENCES

- [1]. Discovery of Recipes Based on Ingredients using Machine Learning S. Praveen, M.V. Prithivi Raj, R. Poovarasan, V. Thiruvenkadam, M. Kavinkumar (International Research Journal of Engineering and Technology (IRJET))
- [2]. Forage: Optimizing Food Use With Machine Learning Generated Recipes Angelica Willis, Elbert Lin, Brian Zhang