A Project Report on

Recipe Recommendation System

Submitted in partial fulfillment of the requirements for the award of the degree of

Bachelor of Engineering

in

Computer Engineering

by

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Under the Guidance of

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Approval Sheet

This Project Report entitled ***"Recipe Recommendation System"*** Submitted by ***"Sayali Bangale"(18102056), "Aditi Haspe"(18102013)***is approved for the partial fulfillment of the requirenment for the award of the degree of ***Bachelor of Engineering*** in ***Computer Engineering*** from ***University of Mumbai***.

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Date:

CERTIFICATE

This is to certify that the project entitled ***"Recipe Recommendation System"*** submitted by ***"Sayali Bangale" (18102056), "Aditi Haspe" (18102013)*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Computer Engineering***,to the University of Mumbai,is a bonafide work carried out during academic year 2021-2022.

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Acknowledgement

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Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

In this project, we propose a recipe recommendation system employing image recognition of food ingredients.

It is a web application that either performs image recognition on the uploaded images and recommends recipes that contain the recognized ingredients or recommends recipes based on the ingredients that the user selects.

The recommendation system uses the labels of the identified images to display a list of recipes that contain most of the identified ingredients.

Contents

Chapter 1

Introduction

There are several cooking apps or websites available today that are used to find recipes based on some keyword, like the name of the food ingredient or type of cuisine, etc. These apps are mindful of the needs and interests of their users, but they fail at identifying their user's constraints, i.e., a limited number of food ingredients. In such cases, users find themselves shopping for ingredients or they decide to substitute the missing ingredient with something else. To help users avoid such adjustments, image recognition can be employed to identify food ingredients that are already available at their disposal and recommend recipes based on those ingredients. The user can also just select ingredients from a list of ingredients and recipes would be recommended respectively. The main objective of the proposed system is to assist users to decide what they can cook with the available resources. We intend a user to use our system not only at home while cooking but also during grocery shopping. By putting the images of the ingredients, users will immediately build a plan or have an idea of what they will be cooking that week, based on our recommendations.

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Chapter 2

Project Concept

2.1 Objectives

- The objective of the project is to build a web application that would recommend different recipes to the users based on the ingredients that the user provides.
- Users can upload an image or can just type the ingredients and based on the ingredients a delicious recipe would be recommended to the user.

2.2 Literature Review

- We are referring to a research paper published under IEEE in 2019.
- The paper aims at recommending recipes to users based on the input they provide to the application.
- We use content-based filtering which enables us to recommend recipes to people based on the attributes (ingredients) the user provides.
- CNN is used for classification of input images that the user provides.

2.3 Problem Definition

- It is always a tough task for many people to decide what to prepare for their meals, be it breakfast, lunch, or dinner.
- And even if they finalize a dish, the next problem that some of them face is the lack of the necessary ingredients required for the dish. Then what most of them do is either replace it with something similar or switch to some new dish.
- Also, many busy working professionals and bachelors find it difficult to prepare meals as they have limited ingredients and time constraints as well.
- So the best solution to the above-mentioned problems is to build an application which could recommend different recipes based on the ingredients they have so that they could eat dishes of their choice and also save time on searching for the recipes.

2.4 Scope

- There are many people who need an application to suggest recipes with the food ingredients that are available to them.
- For this we are building a web application that will take ingredients as input from the users either as images or as text.
- There are many people who don't have the knowledge of various ingredients.
- So they can upload an image of the ingredient. We will be taking a recipe dataset to test and train the model for recommendation.Front-end consists of user login along with the recommendation system.

2.5 Technology Stack

- Machine learning :-Train the ingredient recognition model using Convolutional neural network(CNN) Train the recipe recommendation model using Content Based Filtering Algorithm.
- Programming language :- Python Used for building machine learning model, Used for building a code to recommend the recipes. Python used to build web applications (front - end)
- Google Colab
- Dataset:- Recipe Ingredients dataset from Kaggle. Epicurious-Recipe with rating and nutrition dataset from Kaggle

2.6 Benefits for Environment and society

- Working professionals and bachelors can save time on searching for recipes based on the ingredients they have. Instead, they can just upload the images of the ingredients that they have or either select from the ingredients listed and directly would be able to try the recipes recommended by the model.
- Even normal people can try different types of delicious recipes based on ingredients that they already have or can buy ingredients from the market and straight away check for the suggestion of recipes based on the ingredients they just bought.

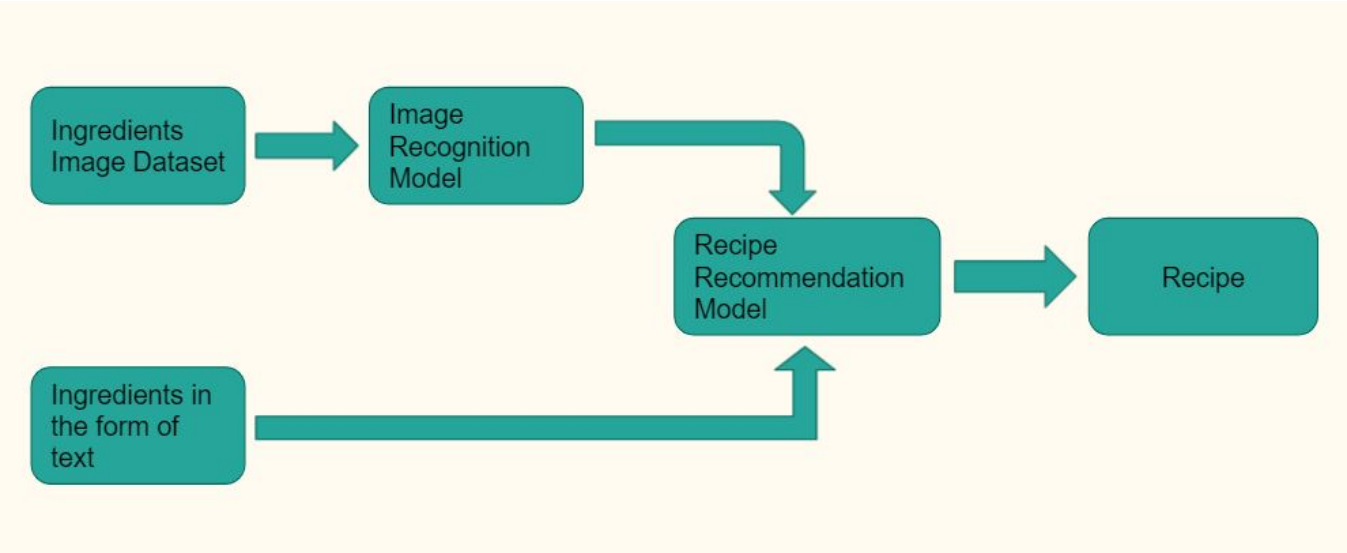
Chapter 3

Project Design

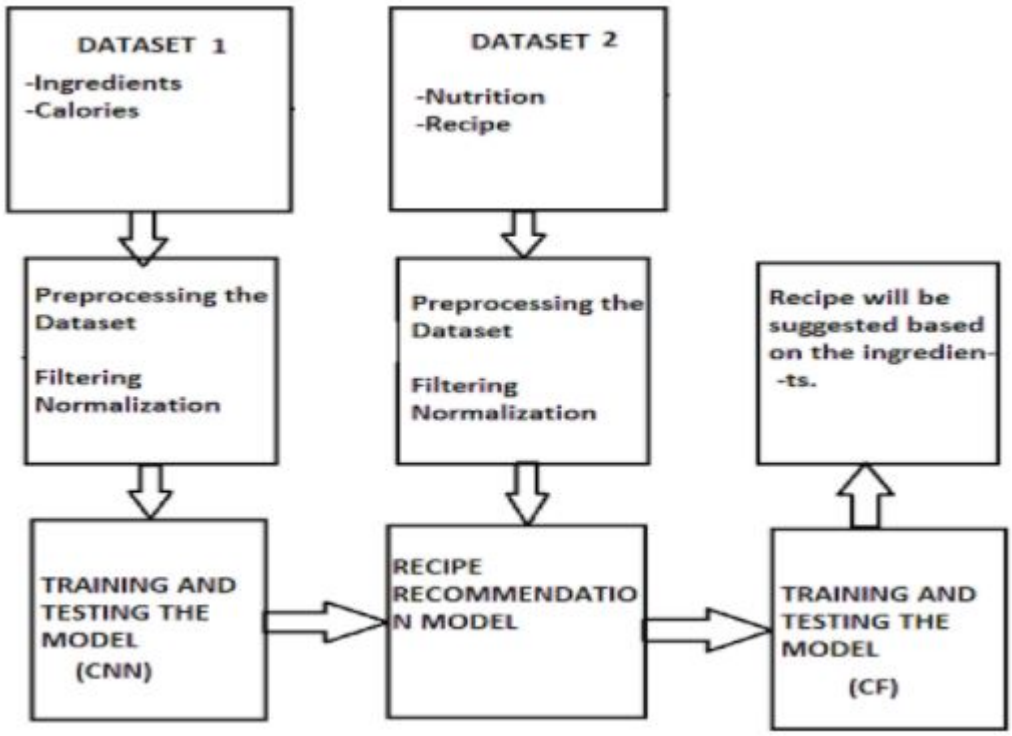
3.1 Proposed System

- We will be developing a website for our project.
- The website would have a user login page wherein the user would be able to login and search for recipes.
- After logging in the user would be able to give the inputs of the ingredients he/she has in the form of either text or images.
- The model would then identify the ingredients and suggest a suitable recipe from the dataset provided.

3.2 Design(Flow of Modules)



3.3 Class Diagram



3.4 Module-1

Convoluntional Neural Network

- Convolutional Neural networks are specialized deep neural networks which can process the data that has input shape like a 2D matrix.
- Images are easily represented as a 2D matrix and CNN is very useful in working with images.
- CNN is used for extracting features from the image which is used for classifying the images
- CNN consists of some basic layers comprising of hidden layers and fully connected layers where hidden layers are used to extract and learn the features of training images and fully connected layers are used for classification of the image.
- CNN performs convolution on the input data using filters (or kernel) in convolutional layer. This is done to extract the features from the input.
- Each convolutional layer is followed by pooling layer which is used to reduce the dimension of the images while preserving the spatial invariance. This in turn reduces the amount of computation cost in the whole CNN network.

3.5 Module-2

Content Based Filtering Algorithm

- CBFA is an algorithm that performs item recommendation based on the content of the item and the user's preference
- Content-based recommendation methods basically consist in matching up the attributes of an object with a user profile, finally recommending the objects with the highest match.
- We will be using content-based filtering which enables us to recommend recipes to people based on the attributes (ingredients) provided..
- In this system we will be using cosine similarity to find out the similarities between recipes and user input.
- After finding the similarity we will be proving the result to the user.

Chapter 4

Planning for next semester

- Building the ingredients recognition model.
- Building the recipe recommendation model based on the ingredients recognized.
- Developing a website for the same.