IPD REPORT

1. SURVEY CONDUCTED

1.1 Field survey

We conducted a survey of about 40 families (173 people) and the outcome was: only 5 people used recipe apps! There were lots of cases of people having diabetes. These people had to regularly check their sugar level. Out of the 173 people only 17 people were found to use health tracking apps. The survey was conducted among various different kind of families residing in different region and the result obtained was only 5 people used recipe app and that too not on a regular basis out of the 40 families surveyed 35 families were in favour of developing such an app, and agreed to the requirement of such an app.

For the 5th semester, we have begun circulating survey forms. Here we are collecting data to get a general idea of the variety of tastes, diseases, likes, dislikes and various general factors that affect eating habits – age, height, weight, number of hours one puts into physical exercise (daily), can one cook, if yes, does he prepare healthy food or can he just flip burgers and potato wedges; if not, are there family members who cook for him/her, what general locality do they reside in (for people living in central India will hardly eat fish food!), and so on. The survey is going to continue for some time, until we are satisfied that we have collected a dataset that is large enough.

1.2 Literature survey

We read 5 research papers related to recipe apps, examined their implementation and the different technologies they decided to use along with the pros and cons of each.

1. Foodorials[1] - A cooking recipe app, which provides users with tasty recipes with real time searches which are easy to understand and easier to implement.
2. Food Recipe Finder Mobile Applications Based on Similarity of Materials[2] – a smart way to find out how users can make best use of materials available and can help the app remember what the users use the most.
3. A Cooking Recipe Recommendation System with Visual Recognition of Food Ingredients[3] – A unique idea which revolves around the concept of a recommendation system which runs on a consumer's smartphone as a part of an interactive mobile application.
4. Machine Learning[4]: We are going to use machine learning (using Python) in the recommendation system, to give the users mouth-watering recipes for meal-times and snack-times so that our users never have to tire themselves out deciding what they can eat. All of this shall be possible by unleashing the power of Python in the realm of machine learning. As rightly said by "Thia Kai Xin, Python is the swiss army knife of Machine Learning."

1.3 Outcome of survey

After carefully examining the survey, the following points were concluded:

a. Very few people from the survey actually knew that such an app existed (users are oblivious to existence of such apps).
b. We noted a dependence on one person in the family to cook food (in most cases it was the mother!). Such users might not feel the need to consult to an app on a regular basis as they might be aware of all the constraints that are to be looked upon while cooking.
c. Lack of time among people to invest in healthy eating habits.
d. Cooking apps are not that popular among the users irrespective of age, gender or any other unbiased parameters that one might think of.

e. Middle aged and old aged people don't find the idea of cooking apps quite compelling.

*Please note that this survey is the survey conducted in semester 4. The semester 5 survey is currently on-going and we shall publish the findings in the next semester.

2. NEED OF THE PRODUCT

2.1 Explain in detail why the product is needed?

Every now and then there is a discussion at home: what do we make for lunch, dinner and breakfast ? The answer is simple. Instead of tiring their poor brains out, they leave this decision to our app! Another question that often arises when a person in a family has an ailment is that, his or her diet has to be maintained properly and everyone has to eat depending on what they need or what they don't need in their diet. Instead of Googling every time or searching on YouTube and requiring an internet connection which is very time consuming and boring an app would offer great convenience, if recipes and nutritional values according to the needs of family are provided under one roof, then it could be quite beneficial for everyone. The motto of our app is, "O ye of little faith, thou shalt never go hungry!"

2.2 If an extension of existing, then explain drawbacks of the existing

We have Google for everything we wish to 'search'. YouTube has become quite popular too. However, searching every time is quite time-consuming and also requires a proper internet connectivity. There are apps related to recipes and also for diet planning but none of them are under one roof. An additional agony is that all these apps are for individuals and none of them takes care about the family as a whole.

3. PROBLEM FORMULATION

3.1 Problem formulation

It's an everyday issue in households on what to cook for the day. Normal recipe apps do not take care of individual health issues that are quite common for big families, a problem for which a solution is long overdue. We promise to work the kinks out by making this application.

3.2 Product objectives

We are trying to create a food recipe app for an entire family that takes individual health issues into consideration. It will be perspicacious enough to recommend dishes based on users previously searches.

3.3 Applications of the product

It will be used by almost all sorts of people as it will consider different cuisines and it will help to remove the daily question of "what do we make for lunch today?". It would also help "fitness freaks" by giving them a proper diet, taking in to consideration the nutritional values of the food.

3.4 Novelty

We will have a recommender system that recommends dishes based on previous selections. Another new feature would be that our app will take into consideration health concerns in the family and will make the necessary dietary changes.

3.5 Scope of the project

The project can be fully completed with the end result of a fully functional mobile application that solves a family's eating-related problems.

4. PROPOSED DESIGN

Part 1: The walkthrough

The first page being a prompt for the user to sign-up or login which, after success, would redirect the user to the main interface. The app would have an app-bar on the left, which will contain navigation links to different pages such as "home" which will redirect to the homepage, "browse" to browse different recipes, "stats" which will be an interactive page that shall display a user's cooking history, a user's cooking strategies, and so on. The main homepage shall have several sections like, "see what you cooked yesterday!" and "recommendations curated specially for you" and "recipe of the day" and so on. Each title shall lead to a new page. Another feature of the design would be the search system that enables the user to filter through several different choices like "vegetarian vs non-vegetarians".

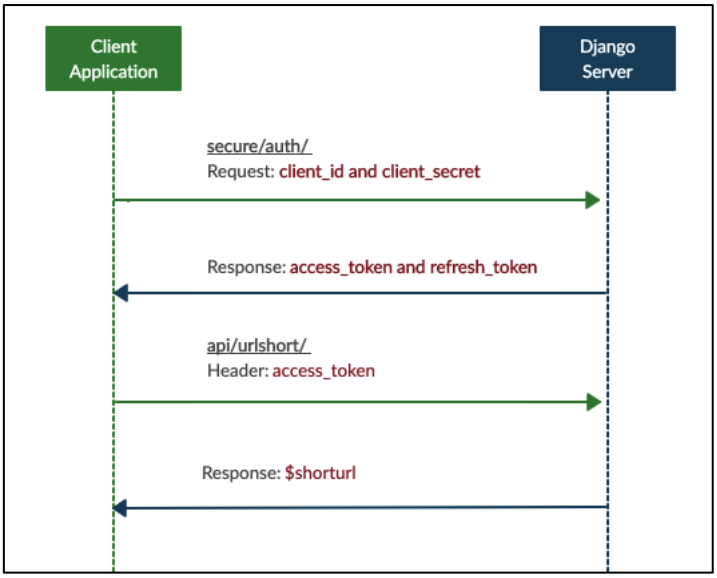
Part 2: The tech stack

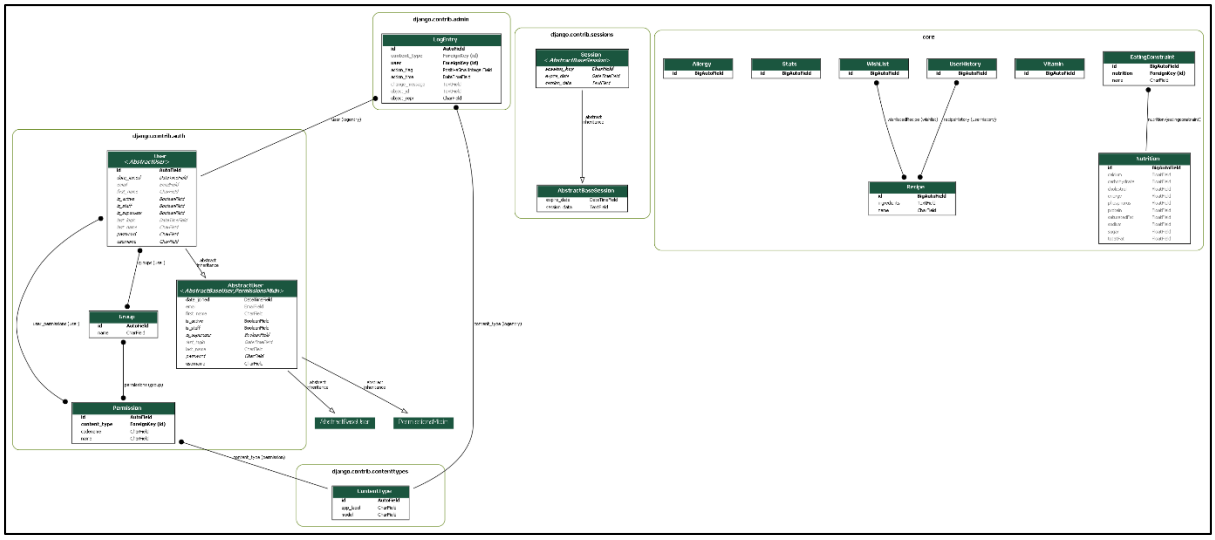
The mobile frontend will be Flutter with a Django backend. The Django backend is a requirement so as to use the recommender system and the Flutter app will ensure that the app will work on both Android and iOS. The database used will be Faunadb. We shall implement the machine learning algorithms using Python's excellent libraries like Pandas, Numpy, Tensorflow. We shall also be using Python's just-in-time compiler, Numba, that shall help us speed up our applications function. We shall also be implementing a lot of caching in our application.

5. IMPLEMENTATION

5.1 Database design

Our application has several requirements, some involving a schema and others falling under the schema-less category . For example users shall be loaded into a schema with multiple foreign keys, connectivity to other users and so on. In other cases, where we merely load a recipe into the database. Hence, we are planning to use the Faunadb database – a database nirvana (as described on their official website) - which completely eliminates operational overheads such as sharding, capacity planning, data replication and scheduled maintenance. Since the exact requirements of the project cannot be adumbrated till we actually make the entire app, we have here a diagram of our user-authentication database that we have implemented as of now.





Our app shall work on a central recipe model, which takes into account nutrition and the vitamins present in a particular food. Some connected database tables include the allergies and eating constraints that might affect a person (we believe that allergy and eating constraint are a nicer way of referring to diseases). Some other aesthetics to make the app more user friendly include stats, wish list, user browsing history, etc.

5.2 Use cases

User Authentication and Registration is a vital part of the app as the recommender system would need to be unique for every user. It also protects the data of all of our users and as we firmly believe that we should be intransigent about privacy.

The nutrition table shall store the nutritional values of a particular food item, while the vitamins table stores different vitamin content of a particular food. The vitamins are stored differently because they can be categorised in an ordinal manner. The allergies and eating constraints are included so that the app can decide to simply not show the items to a user who is suffering from a particular allergy, or constraint – disease. The stats and wish list are simply aesthetics as mentioned before and shall be incorporated as soon as the main product has been created.

5.3 GUI design

The front-end for the project is a Flutter mobile app that uses API calls to the backend for its data. The app starts on the Login screen, for a new user he will go to the Sign-Up screen, after entering the details he will be redirected to the Login Screen. On logging the user will fill the details on the Profile Filling screen. If the user has already a family member on the app he will be using Join a Code if he has no members he will be using Generate a Code for any other members to join in future. After filling details the Home Screen will be displayed where top picks, recommendations will be displayed. User can navigate to Recipes List View through the side bar. The Recipe List View has various filters that can be applied to find a recipe. On clicking on any recipe he will be directed to the detailed view of the selected Recipe. Additional Screens include Wishlist, Profile Screen and Settings.

5.4 Modules implementation

The backend used for the authentication is the Django Rest Framework with Token authentication. The frontend is a native mobile flutter app. We have hosted the API on pythonanywhere. The database used for the current implementation is sqlite, for the basic development, although we shall be migrating to Faunadb soon.
We also have added the following API endpoints in our app.

```
GET localhost:8000/api/
GET localhost:8000/api/{id}
GET localhost:8000/api/detail/{id}
GET localhost:8000/accounts/login
GET localhost:8000/accounts/signup
GET localhost:8000/accounts/forgot-password-email
GET localhost:8000/accounts/forgot-password-reset
```

The first endpoint gives a list of all recipes. The second endpoint gives a specific recipe as an image queried by id. The third endpoint gives information of a particular recipe, queried by id, in json format. The data is being fetched from the Spoonacular recipe and food API (https://spoonacular.com/food-api[5]). The fourth and fifth endpoints are for logging in and signing up respectively while the sixth endpoint is for entering one's email if they have forgotten the password and the seventh one is a link to reset it.

6. EXPERIMENTATION & RESULTS

6.1 Datasets / Tables

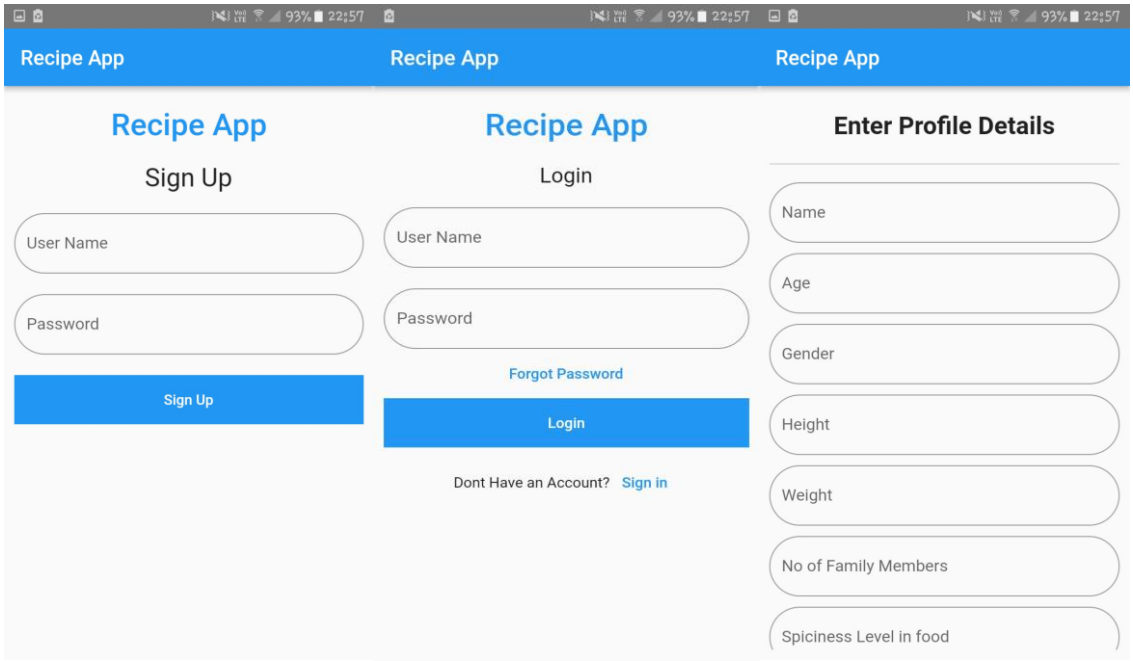
The following models exist in our database:

- A User Model.
- Recipe Model
- Nutrition Model
- Eating Constraints Model
- Vitamin Model
- Allergy Model
- Stats Model
- Wishlist Model
- User History Model

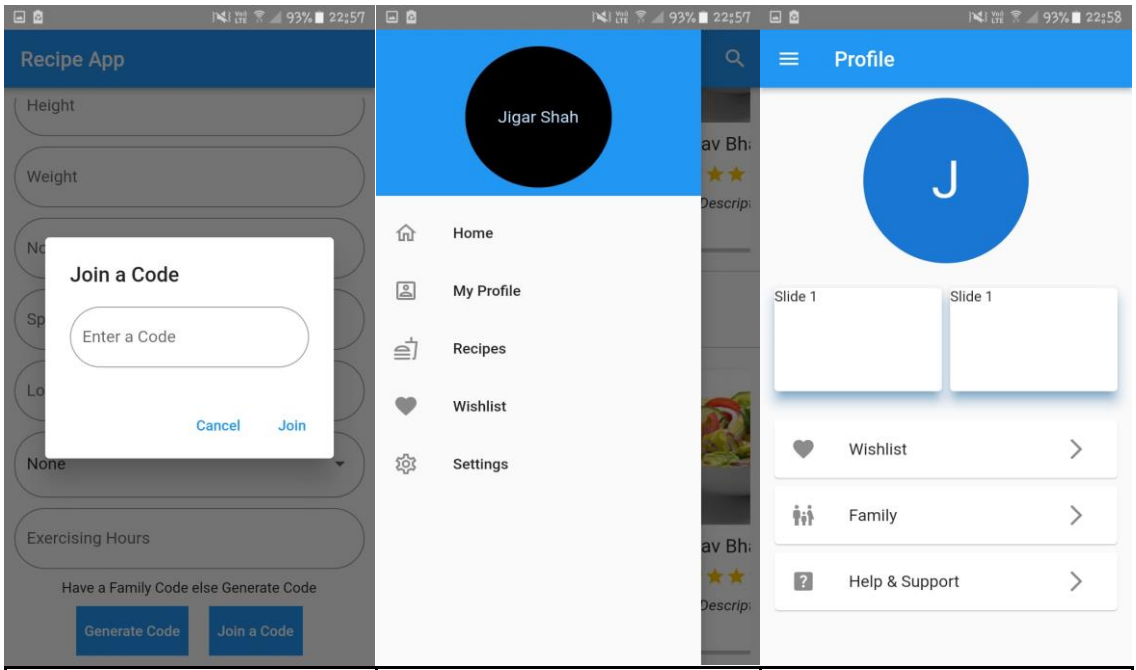
6.2 Test cases

The models pass all the API test cases. An external API, Spoonacular recipe and food API (https://spoonacular.com/food-api) has also been queried to get data to display in the application.

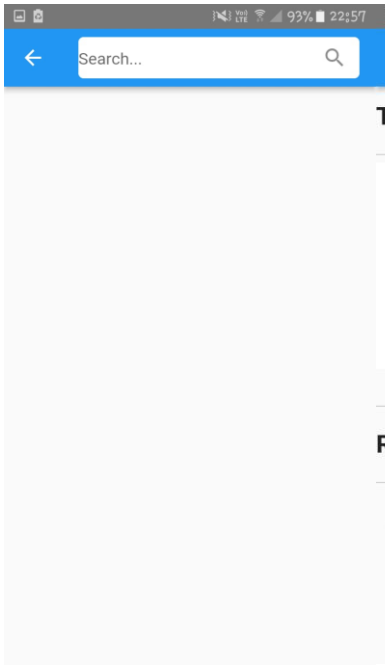
6.3 Results



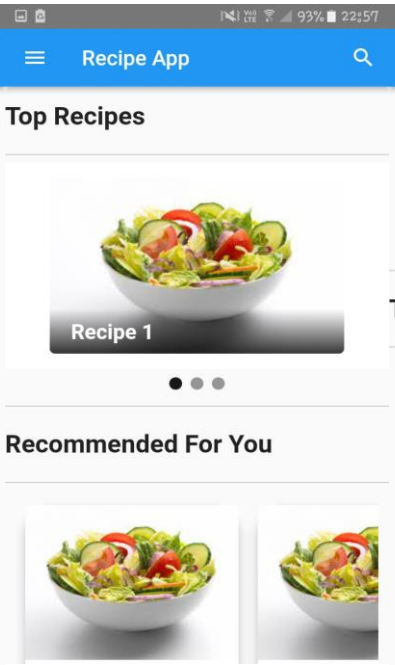
Sign Up	Login	Entering Profile Details



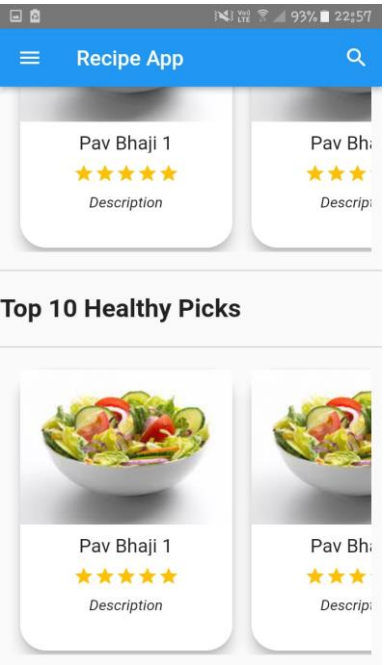
Join a family	App Bar	Profile Page



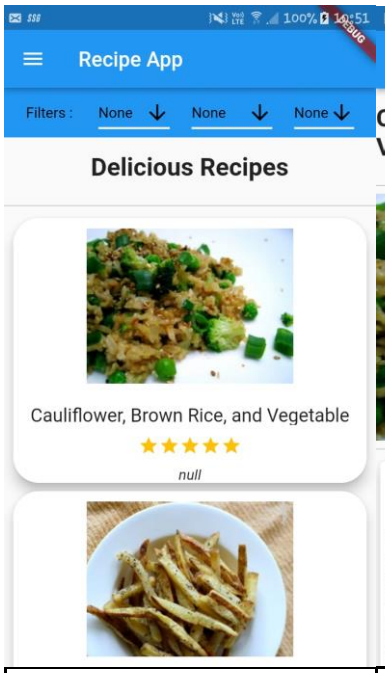
Search Bar



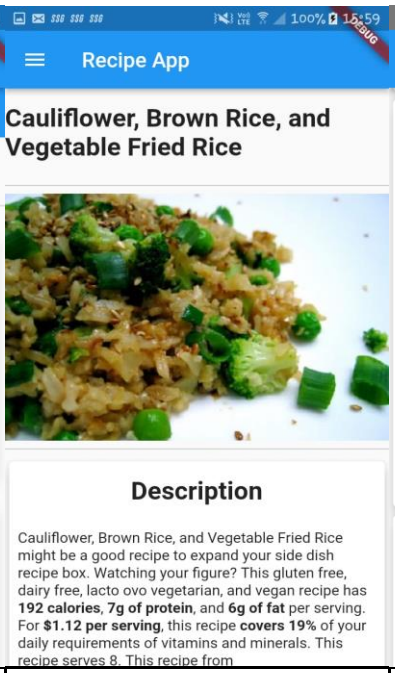
Personal Recommendations



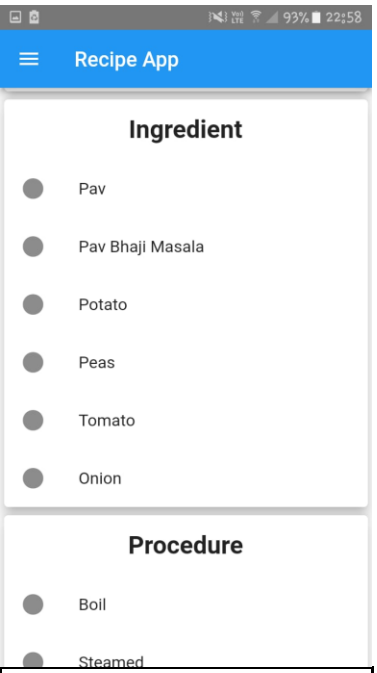
Top Healthy Picks



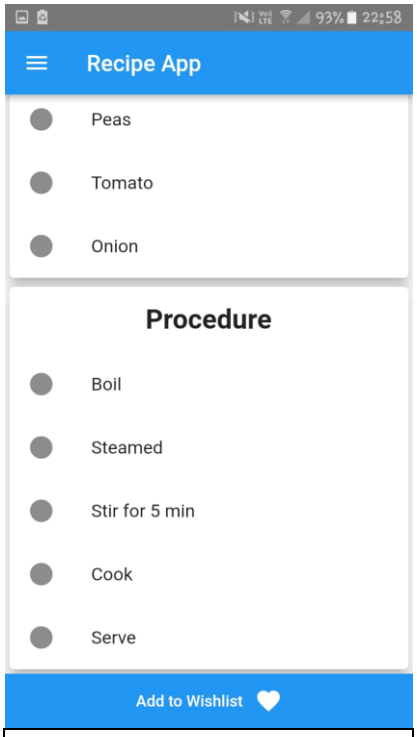
Recipe List



Recipe – Individual



Ingredients



Procedure

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4. [3] (PDF) A Cooking Recipe Recommendation System with Visual Recognition of Food Ingredients (researchgate.net)
5. [4] Introduction to Machine Learning and Its Basic Application in Python by Pinky Sodhi, Naman Awasthi, Vishal Sharma :: SSRN
6. [5]https://spoonacular.com/food-api

Personalized Recipe Recommender System

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***Abstract*—Many people have a daily question of what to prepare today for meal, this document provides a solution to this question with the help of a recommender system based on the users choice and keeping his ailments in consideration. The platform is a mobile application where the user can get recommendations of recipes as per the data entered by him/her. We researched and took into consideration the existing apps and have tried to overcome their shortcomings and drawbacks. Data from API is filtered and analyzed and then provided to the user. Through this project a platform where food can be prepared by anyone depending on his choice, taste, physical work, ailments etc is created which would help a large amount of food makers.**

***Index Terms*—food recommender system, healthy eating, dietary constarints, recipe, machine learning**

I. Introduction

Unhealthy eating is a major public health burden that may be reduced in part by helping people select healthier dietary choices. However, picking appropriate food to eat implies complex decision making processes, including being aware of healthy options and choosing among them. With people growing increasingly familiar with interacting with machines in their everyday life, one solution to overcome this issue and help people to make healthier choices is to develop health-aware food recommender systems. One of the most important challenges for such a system is to deliver accurate and personalized recommendations to their users. Although most of the popular recipes found on Internet are unhealthy as defined by the United Kingdom Food Standard Agency (FSA), significant effort has been put recently into optimizing food recommendation algorithms and try to reconcile users' preferences with healthy recipe recommendation. By analyzing people's eating behavior, authors in found that the fat and calorific content of a recipe were the best rating predictors for people interested in eating healthy. However, this information is not always available, and research has shown how hard it is for people to infer the healthiness of a recipe simply from its picture, even when the recipe has been categorized as healthy. Based on these findings, it becomes important to build systems that not only recommend healthy and personalized recipes, but that also precisely display how healthy these recipes are. In this paper, we describe our app that would recommend healthy and customized recipe's for the whole family while considering any dietary restrictions. While there are many recommender systems and apps that target individuals, there are very few that consider groups.

II. Model

To investigate our research questions, our first step was to collect a recipe dataset we could use to build our recommender system.

We plan to use the spoonacular API from spoonacular.com as they have analysis of 2600+ ingredients, 5000+ recipes, 90000+ products and 115000+ Menu Items with information about nutrients, conversion, substitutions and price data. For each recipe, we collected: its title, image link, list of ingredients and quantities, preparation steps, preparation and cooking times, number of servings, nutritional information, portion size, price per serving, health score, aggregate likes and similar recipes.

III. Need for the product

Every now and then there is a discussion at home as to what do we make for lunch, dinner and breakfast ? Instead of tiring their poor brains out, they leave this decision to our app! Another question that often arises when a person in a family has an ailment is that, his or her diet has to be maintained properly and everyone has to eat depending on what they need or what they don't need in their diet. Instead of Googling every time or searching on YouTube and requiring an internet connection which is very time consuming and boring an app would offer great convenience, if recipes and nutritional values according to the needs of family are provided under one roof, then it could be quite beneficial for everyone and our app aims to do this.

IV. Proposed Design

The first page being a prompt for the user to sign-up or login which, after success, would redirect the user to the

main interface. The app would have an app-bar on the left, which will contain navigation links to different pages such as “home” which will redirect to the homepage, “browse” to browse different recipes, “stats” which will be an interactive page that shall display a user’s cooking history, a user’s cooking strategies, and so on. The main homepage shall have several sections like, “see what you cooked yesterday!” and “recommendations curated specially for you” and “recipe of the day” and so on. Each title shall lead to a new page. Another feature of the design would be the search system that enables the user to filter through several different choices like “vegetarian vs nonvegetarians”.

V. Tech Stack

Flutter

Flutter is Google’s Mobile SDK to build native iOS and Android apps from a single codebase. When building applications with Flutter everything towards Widgets – the blocks with which the flutter apps are built. The User Interface of the app is composed of many simple widgets, each of them handling one particular job. That is the reason why Flutter developers tend to think of their flutter app as a tree of widgets.

Django Framework

Django is a Python-based web framework that allows you to quickly create efficient web applications. It is also called batteries included framework because Django provides built-in features for everything including Django Admin Interface, default database – SQLlite3, etc. When you’re building a website, you always need a similar set of components: a way to handle user authentication (signing up, signing in, signing out), a management panel for your website, forms, a way to upload files, etc. Django gives you ready-made components to use and that too for rapid development.

Django Rest Framework

Django REST Framework is a wrapper over default Django Framework, basically used to create APIs of various kinds. There are three stages before creating a API through REST framework, Converting a Model’s data to JSON/XML format (Serialization), Rendering this data to the view, Creating a URL for mapping to the viewset.

Database Implementation

Our application has several requirements, some involving a schema and others falling under the schema-less category . For example users shall be loaded into a schema with multiple foreign keys, connectivity to other users and so on. In other cases, where we merely load a recipe into the database. Hence, we are planning to use the Faunadb database – a database nirvana (as described on their official website) - which completely eliminates operational overheads such as sharding, capacity planning, data replication and scheduled maintenance. Our app shall work on a central recipe model, which takes into account nutrition and the vitamins present in a particular food. Some connected database tables include the allergies and eating constraints that might affect a person (we believe that allergy and eating constraint are a nicer way of referring to diseases). Some other aesthetics to make the app more user friendly include stats, wish list, user browsing history, etc.

Frontend Implementation

The front-end for the project is a Flutter mobile app that uses API calls to the backend for its data. The app starts on the Login screen, for a new user he will go to the Sign-Up screen, after entering the details he will be redirected to the Login Screen. On logging the user will fill the details on the Profile Filling screen. If the user has already a family member on the app he will be using Join a Code if he has no members he will be using Generate a Code for any other members to join in future. After filling details the Home Screen will be displayed where top picks, recommendations will be displayed. User can navigate to Recipes List View through the side bar. The Recipe List View has various filters that can be applied to find a recipe. On clicking on any recipe he will be directed to the detailed view of the selected Recipe. Additional Screens include Wishlist, Profile Screen and Settings.

API Endpoints developed

The backend used for the authentication is the Django Rest Framework with Token authentication. The frontend is a native mobile flutter app. We have hosted the API on pythonanywhere. The database used for the current implementation is sqlite, for the basic development, although we shall be migrating to Faunadb soon. We also have added the following API endpoints in our app.

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GET localhost:8000/api/detail/id
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GET localhost:8000/accounts/forgot-password-email
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The first endpoint gives a list of all recipes. The second endpoint gives a specific recipe as an image queried by id. The third endpoint gives information of a particular recipe, queried by id, in json format. The data is being fetched from the Spoonacular recipe and food API (https://spoonacular.com/food-api[5]). The fourth and fifth endpoints are for logging in and signing up respectively while the sixth endpoint is for entering one’s email if they have forgotten the password and the seventh one is a link to reset it.

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