COOKBETTER: A Bot for Personalized Recipe Recommendation (Phase-2)

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ABSTRACT

Food is a primary need of all humans. People have always wanted good taste in their food along with the food keeping them healthy. Proper nutrition is essential for optimum nourishment and health of everybody. Lack of time, cooking knowledge, and health problems stop people from receiving this. Multiple ways are tried by people to remedy this issue, but most of these ways make the user compromise on either taste or health. Having proper tools for users to fulfill their food intake should be a given today. So in this paper, we have proposed a system that helps user manage their diet by complete comprehension of their preferences. Along with a proper recommendation of food recipes in accordance to the user's taste, the system targets the improvement of the user's health. Also, users can have ideal recipes suggested to them based on the ingredients they have available.

Keywords

Slack, Cooking, Association

1. INTRODUCTION

People today have very busy schedules, and lead a very hectic lifestyle. This has led to them having increased health concerns. Additionally, time as a resource has become more constrained than ever. Relating the aforementioned factors with everyday meal selection and preparation poses quite a dilemma. With an increased number of people concentrating on balancing body weight, taking precaution towards heart related ailments and maintaining a healthy physique in general, it becomes essential for recipe recommendation systems to consider these preferences at an individual level. "Allrecipes" website with 1.5 billion visits per year and 95 recipe views per second and "Supercook" website with a recipe database of over half a million recipes indicate the popularity of recipe recommendation systems. However, these sites solely depend on the ingredient data that the user inputs ignoring the constraints of health and time.

The culinary domain is extensive and complex which increases the diïňČculty for the Recommendation Systems. The number of ingredients and their possible combinations coupled with the number of techniques to prepare them results in a considerably large amount of data to be handled. As a consequence, user's opinion on food items can vary quite significantly depending on whether they like savoury to sweet, if they have specific allergies, prefer protein to carbohydrates etc. We try to incorporate such preferences, along with a few others into our application. This keeps us akin to our main objective: thrive to provide a more personalized experience to the user.

Another important factor to consider is cultural differences in food habits faced by people. A huge number of food recipes come up once we consider these factors. Many ingredients are unique for the use of a specific culture. Some of these might not have been heard by other cultures at all. But people have always considered variety as the spice of their lives. So getting people involved into trying culinary delights from other cultures is always an attractive prospect. This leads to a challenge, of getting users working with ingredients of which they may not be aware.

1.1 Problem Statement

All the current recipe recommendations systems emphasize on the ingredients and their suitable combinations but with more people putting their focus on health, it becomes a mandate of sort for recommendations systems to consider their health and diet preferences. This is the problem we are trying to bring a solution to in the form a slack bot which uses the Microsoft Bot framework and gives personalized recipe solutions.

1.2 Proposed Solution

Based on this scenario, we have proposed a recipe recommendation method based on the user's food preferences and dietary restrictions.The method first creates the profile of the user based on their health conditions, health goals and allergies they presently have. So for every session that the user begins, he/she is asked for the ingredients they possess and only those recipes that help them maintain their health goals are displayed for them. And this is all done by means of a slack bot for the ease of use. The user will not be required to navigate through a large number of complicated website pages instead the information will be interfaced in form a chat which makes the system quick and efficient. Additionally, we would also get the reaction of the user about the experience they had with the recipe, so that we can op-

timize it for the future use of the recipe with the other users as well.

2. LITERATURE SURVEY

2.1 Methodology

For the purpose of our literature study, we made use of tools: Google Scholar and Google NGram Viewer. We used Google Scholar for searching scholarly literature and ïňĄnding papers relevant to our work. We made use of Google NGram Viewer for charting the frequencies of our search keywords mentioned in the vast amount of books available in the Google Books library.

2.2 Summary of papers

After perusing various research papers, we discovered that a lot of research has been done in the area of recommendation systems, including recipe recommendation, and that there is a growing interest in this ïňĄeld. With the advent of machine learning, it has become possible for the system to learn the preferences of the user and improve the recommendation results. Although most of these papers proposed systems that solved one particular purpose, the methodologies adopted in each were signiïňĄcantly diïňĂerent. Although we gained useful insights from these papers, we decided to try a diïňĂerent method to solve this problem - using chatbots. Plenty of work and research has been done in the sector of recipe recommendation on making the system more exclusive and unique to the user. The Paper by Mino et al.described a method considering the schedule of the user and calculating the intake or release of calories in each event which determined the next meal of the user[1], or the study by Yajima et al. on what a user will consider an easy recipe taking into account numbers of ingredients and seasoning in the recipe and its cooking time[2]. entails the results of their investigation by comparing three main recommendation strategies: content-based, collaborative, and hybrid[3].

In 2011, Ueda et al proposed a personalized recipe recommendation system based on the user's preference[4]. This system is personalized in the sense that it recommends recipes that are similar to recipes the user has browsed in the past, in terms of ingredients. While this is a good way of personalizing the recommendation system, we have chosen to prioritize the user's health conditions and dietary restrictions over past preferences. In 2012, Kuo et al investigated a menu planning mechanism based on user-speciïňĄed ingredients[5]. This experiment obtained positive results for the eïňĂectiveness of a recommendation system based on ingredients.

2.3 Results of n-gram viewer

We chose the following keywords for our study: recommendation system, personalized recommendation and chatbot. The frequencies of mentions of these keywords in books published between the years 1900 and 2018 are shown in Figure 1. This time frame was chosen as there was either negligible or no mentions of our keywords in books prior to 1900. We observed that the concept of recommendation systems was written about as early as 1902, and has been on a steady increase since 1992. However, we can see that personalized recommendation has only been mentioned since 1992, and has the least number of mentions among all our keywords. This indicates the need for further research and works on this subject. We found that chatbots, although researched upon ever since the 1960s by MIT professor Joseph Weizenbaum, have been popular in books only since 1996. We observed that the work on chatbots increased rapidly since then, hitting a peak in 2003.

3. USER STUDY

4. PROJECT ARCHITECTURE

In this section we have shown the architecture of the existing project. The model is shown in figure 1. In figure 1 we can see that the project uses Slack for creating application bots. Users use slack and chat with slack bot to interact with the application. Users use slash commands to enter into recipe recommendation function. At this point users will have to put in the filters he/she intends to use for the desired recipe. The bot then puts the desired request to the database. When the request is processed the user will receive step by step instructions on how to cook the recipe.

The database connected to slack bot comprises of integration of a recipe database with the application which sorts out all the filters for the recipe recommendation in database for rendering the results to get personalized recipe recommendation for the user. The application uses MySQL and Amazon Web Services for all the database applications purposes. User initially needs help to fill up a form which will create the basis of recommendation module will set up. User also has the option to negate these presetting and search for a recipe he desires by just typing its name. User can also search for recipes based on parameters like Time Constraint, Occasion or ingredients presently available to the user.

The two factor recommendation setup takes in global parameters Health, Allergies, Restrictions and Goal. These parameters are one time fill ups and are applied by default while user searches for a recipe. Here, health is if the user is healthy or suffers a disease like diabetes or not. Restrictions include dietary habits like vegan, non-vegetarian, etc. Goal indicates what user wants to achieve with the diet like reduce weight.

The second layer is the session filter which includes local parameters like time taken to cook, occasion, type of food, ingredients, etc. Here, occasion includes suggestion recipe for Halloween, Diwali, etc. Type of food corresponds to cuisine of choice of user. Ingredients indicate the list of available ingredients by the user.

All these parameters together constitute in fetching a recommended list of recipe for the user. The application is hosted on Amazon AWS. A cloud server has been used to provide account reliability and security. AWS has been chosen over other cloud services because of the features offered like auto scaling, elastic load balancing.

5. IMPROVEMENTS

5.1 Accuracy

5.1.1 Association on ingredients to get more relevant recipes

Currently the implemented system is restricted to the data injected in the database and suggests the recipe based on the ingredient and other requirements provided by the user

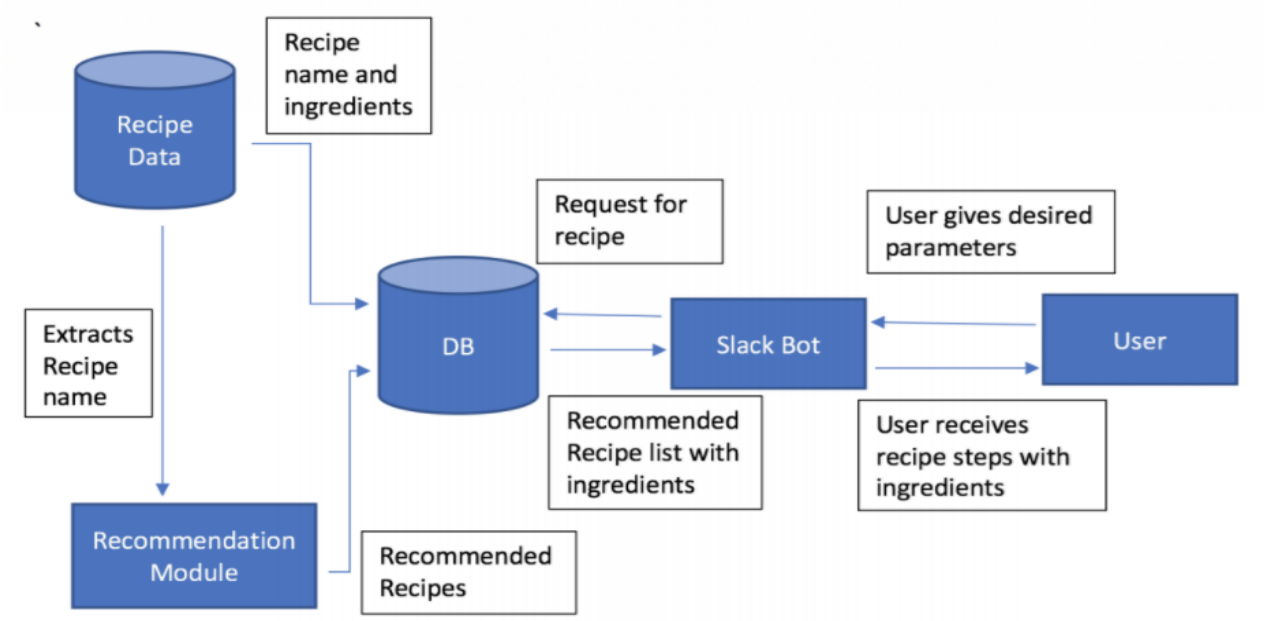

Figure 1: Project Architecture.

which are then queried in the database along with the personalized parameters to give the recommended recipe to the user. Though this implementation works with the small data set, it will fail for the large data-set. So to improve the accuracy of the system and broaden the range of recommendation system, we will find the potentially interesting and relevant relations between the ingredients in the recipes using descriptive data mining method, known as the association rules mining. To explain our approach let us consider an example where X and Y are sets of ingredient from two different recipes and a recipe that contains all ingredients from X also tends to contain all ingredients from Y, then we can define a association rule i.e. X -> Y in association rules mining. We will be using support and confidence criteria of the association rule to build the knowledge base. Where, The confidence is the ratio between the number of recipes that have true values for all ingredients in X and Y and the number of recipes that have true values for all ingredients in X and support of an association rule is the ratio of the number of recipes that have true values for all ingredients in X and Y and the number of recipes in our database.

We will implementing Apriori association rules algorithm and will be doing experiments with the different values of the minimum support and minimum confidence to find the values of support and confidence which maximize the information that can be retrieved from the different rules. Moreover, to represent analytical results of the rules achieved, we will be using graph-based visualization technique.

The above analysis will help us to see how the ingredients are combined in different recipes. The information will be very important for recipe recommendation as we need to broaden the range of our recommendation system.

5.2 Usability

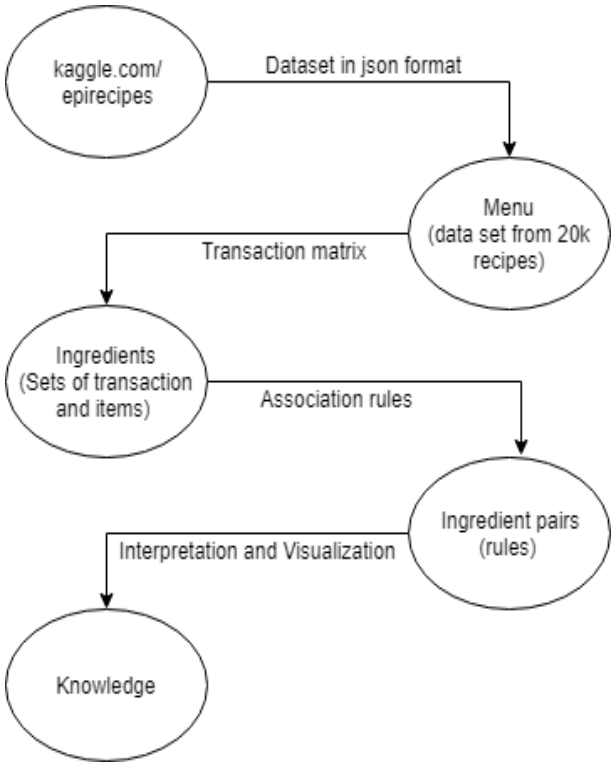

Figure 2: The knowledge discovery process.

5.2.1 Multiple input formats rather than filters.

The chatbot currently uses drop down menus and buttons as the input medium for the required information. While these drop down menus can be helpful in maintaining a clean

interface, it increases the user effort required to provide some key words. A better technique for input in this case would be an input from a text box. While chatting with the bot, the users can enter the list of ingredients separated by comma whenever the bot asks them to. It saves a lot of effort of opening the drop down menu and selecting an option.

We are planning to allow user to provide the required information by entering text in the textbox. The input string will then be parsed by our parsing algorithm and a list of required data, such as the list of ingredients or dietary restrictions, will be obtained and stored in the database. After this change, we believe that the user experience will improve. Our plan still includes the buttons in the UI because their ease of use as an input measure for a binary choice is unchallenged.

5.2.2 *Upgrading the UI*

The UI of the current application looks cluttered because of a large number input tools (drop down menu, buttons) and display texts in a small. We plan to increase the readability by providing a more cleaner UI which will be obtained by removing multiple things that currents are displayed on the screen at once. One of these space consuming yet not so user experience improving thing is the dropdown menu. We plan to remove these menus and change the input technique to help the user achieve the task that they want to do in minimal effort.

5.2.3 *Saving the preferences*

This application has been designed to make the users provide inputs whenever they want to use it. This can be a very tedious task for someone if they use this application frequently. This application should be smart enough to save the preferences of the users and use these preference while making recommendations or while filling any input. These choices are likely to stay the same but in case there needs to be a change in them, the user will be provided with an option to update them.

5.2.4 *Making list of favorite recipes*

Every time a user uses this application to get a personalized recommendation of the recipe, they should be asked if they liked the item they cooked or not. If they did, then they should be provided with an option of adding that particular recipe to their list of favorite recipes.

The list of favorite recipes should be accessible form the chatbot so that, if the user wishes, he may pull up a recipe from this list and not ask the bot to recommend some recipe.

5.2.5 *Recipe ranking - Rating of recipe*

On "epicurious" website, users can rate each recipes by 0-5 scores, leave reviews and answer yes or no to "Do you want to make it again?" question. We would like to use the review scores and "make it again" rate to sort the search recipes. Moreover, we want to to make a personal rating system that the user can sort their favorite recipes to optimize the search result.

5.2.6 *Short description*

Whenever a user uses the bot for recipe recommendation, they are provided with links to the recipe page on a website. The user is then required to visit that website to see the recipe. This becomes a tedious task which leads to bad user experience.

We plan to change this by providing a short description of the recipe to the user. It will help the user to know the ingredients and the time required to make that particular dish. This information can save a lot of time for the user as it does not involve visiting a website for each of the recommended recipe.

6. DATA SETS

Recipes data is obtained from the website Epicurious. Epicurious is a website which provides recipes, their rating, nutritional content, and categories. The data for Epicurious website was downloaded from the kaggl website. We used the ïňĄle epi r.csv for the table âĂŹdataâĂŹ in our database. The column names in that ïňĄle represent ingredients, nutritional content (calories, fat, etc.), and categories (dessert, breakfast, etc.). We extracted the ingredients from the column names and created a table âĂŹingredientsâĂŹ in our database, to display the list of supported ingredients to the user in a select drop-down list. We also created a table 'personalize' which stores the dietary and health restrictions for each user. The current user's user ID is obtained from Slack and stored as the primary key in this table, along with his ailments, allergies, weight goals, diet restriction

7. EVALUATION

8. CONCLUSION