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BON VIVANT: AN ARTIFICIAL INTELLIGENCE COOKING APP

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Abstract: **All the ingredients have chemical compounds. The combination could be 10 to the power 15 and these combination are unique combination. The app allows users to discover unusual flavour combinations and ingredient substitutions. The background for this project is the hypothesis of food pairing which states that combination of ingredients sharing same chemical flavour components produce delightful delicacies. Recipes are recommended based on user's flavour preference and nutritional requirement. . Bon Vivant is a cooking recipe app based on Flavour Network and Principles of Food Pairing [1]. It allows users to discover unusual flavour combinations and ingredient substitutions**

Keywords: *ingredients, recipe, food pairing, flavor network, nutritional requirements*

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I INTRODUCTION

Web provides us amazing facility of sharing knowledge and searching any information from any corner of the world. Recipe websites are good examples of knowledge sharing platforms. One finds millions and trillions of recipes online. Recipes sites flourish as people are keen on sharing their recipes, from family recipes that had been passed down for generations. With too many ingredient pairings and recipes available online people often find it difficult about how to start and what to use and whether it fits their nutritional requirements. Also, if one is lacking a certain ingredient, can a substitute be found among supplies at hand.

Thus, finding a recipe that not only satisfies individual's nutritional requirements but also takes into consideration their flavor preference and provide ingredient substitutions is a colossal task and this is where our proposed system kicks in. Bon Vivant is an interactive platform that allows users especially molecular gastronomy geeks to discover flavor pairings based on flavor compound analysis. Ingredients, recipes, regional cuisines and flavor compounds, can be mapped, to enable users explore surprising flavor combinations or ingredient substitutions. One can experiment with mapping flavor profiles within the context of a given cuisine through combinatorial analysis. For example, "ginger" in Italian cuisine and "ginger" in Indian cuisine both have varied ingredient combinations. The system combines user's flavor preference with user's body requirements and suggests recipes. One can make healthier food choices satisfying your taste buds.

II LITERATURE SURVEY

A. Food Pairing

In 1992, chefs Heston Blumenthal and Francois Benzi introduced the food pairing hypothesis. The hypothesis states that ingredients sharing common flavor compounds taste well together [2]. In 2011, a group of scientists extended their research over this food pairing concept. Scientists Yong-Yeol Ahn, Sebastian E. Ahnert, Albert-László Barabási and James P. Bagrow [1] in order to analyze the impact of flavor compounds on ingredient combinations introduced a network-based approach. The outcome of their approach proved that Western cuisines were more inclined towards the hypothesis of food pairing than compared to the East Asian cuisine

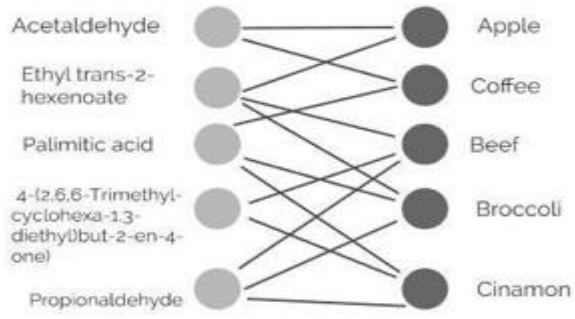

Figure 1. Bipartite Network

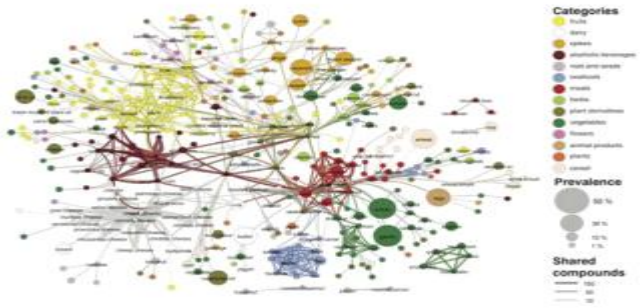

Figure 2 Flavor Network

Also, Lav R. Varshney, Kush R. Varshney, Jun Wang, and Daniel Myers [3] compared the Modern European recipes with the Medieval European recipes and came to a conclusion that Medieval cuisine tend to share more compounds than the modern cuisine.

B. Recipe Dataset

BigOven [4] provides 350,000 recipes; in REST JSON and XML format. Also access to thousands of photos is available. Search by title, ingredient, keyword, nutritional information is possible. Yummly [5] provides 1 million recipes along with their ratings, ingredients in REST JSON output; Academic plan is available with 30,000 lifetime calls. Yummly API can be easily used to integrate recipes and recipe search into your websites or mobile applications Food2Fork [6] is a socially ranked recipes database with ingredient search functionality. GET and POST calls over HTTP is supported. Responses are JSON formatted. Spoonacular [7] provides 350,000 recipes in UNIREST JSON format; Free hackathons and academic plans are available. Free and collaborative Kaggle's Open Food Facts [8] dataset can be used to collect nutrition value of ingredients and food products. Recipe aggregator sites such as menupan.com, allrecipes.com and epicurious.com can be used to scrap recipe data. Ingredient-compounds dataset and recipe-cuisine dataset is publicly available on Yong-Yeol Ahn [1]. The data can be characterized as –

1507 Ingredients
1107 compounds
36781 edges in I-C network

C. Estimated Energy Requirements

In order to measure dietary intake of user's which satisfies their daily nutrition goals, a widely accepted and known Estimated Energy Requirements(EER) equation [9] can be used. Based upon user's gender, age, weight, height and level of physical activity consistent EER can be determined. EER is calculated as:

1) For men 19 years and older

$EER = [662 – (9.53 * Age)] + PA * [(15.91 * wt) + (539.6 * ht)]$

TABLE 1 PHYSICAL ACTIVITY (PA) FACTORS FOR EER EQUATIONS

	Men	*Women*	*Physical Activity (PA)*
Sedentary	1.0	1.0	Typical daily living activities
Low active	1.11	1.12	Plus 30-60 minutes moderate activity
Active	1.25	1.27	Plus ≥ 60 minutes moderate activity
Very Active	1.48	1.45	Plus ≥ 60 minutes moderate activity and 60 minutes vigorous or 120 minutes moderate activity

2) For women 19 years and older

$EER = [(354 – (6.91 * Age)] + PA * [(9.36 * wt) + (726 * ht)]$

where wt= weight, ht= height and PA = Physical Activity Factor.

Physical activity level(PAL) [10] is used to describe and account for user's physical activity habits. We can get daily nutrients goals for a particular user by the calorie level accessed [11]. Using these statistical methods, we can calculate user's daily nutrition requirements.

D. Recipe Recommender

The goal of a recommender system is to provide recommendations to users for products as per their interest [12]. For example, suggesting movies on Netflix or recommending books on Amazon [13]. The domain and characteristics of data available determines the design of such recommendation engines. Based on how recommendations are made, recommender systems are usually classified into the following categories [14]:

1) Content-based recommendations: Recommend items based on user's past preferences.

2) Collaborative recommendations: Items are recommended to users based on the items liked by people having similar taste and preferences as that of user.

3) Hybrid approaches: It is combination of collaborative and content-based methods.

III COMPARISON BETWEEN EXISTING SYSTEM & PROPOSED SYSTEM

A. Existing System

There are colossal of recipe websites and apps available online where one can get tons of suggestions and search results in a single click. Most of these are simple recommender systems that recommends recipes based on rating and comments. These systems provide basic functionalities to users such as exploring various cuisines, dish types, uploading recipes, commenting and so on. It is observed that most of these lack the significance of being

unique which might set them apart from others. To elaborate the idea of existing system, two apps are considered, namely

1. *Cookpad*: Cookpad recipe app allows a user to search recipes from a vast collection of recipes. App provides recipes from Indian chefs which can easily be made at home. App has a wide range of cuisines from which the user can select their recipe. Step by step illustration of the recipes is given. Cookpad provides categorized search for the user based on titles, ingredients and cuisine type. Well instructed and stepwise recipe cooking procedure is provided.
2. *Allrecipes:* Allrecipes dinner spinner is an app which provides fascinating recipes from the chefs. This app is a review analysis-based system and recommends the user recipes according to the reviews and interests of the user. Optimized and improved search options. To choose multi-cuisine options based on the keywords and ingredients. Step by step illustration of the recipes is provided. The application also grants the user to take a glimpse through Chefs profiles.

B. Proposed System

Bon Vivant is an interactive platform that allows users especially molecular gastronomy geeks to discover flavor pairings based on flavor compound analysis. Ingredients, recipes, regional cuisines and flavor compounds, can be mapped, to enable users to explore surprising flavor combinations or ingredient substitutions. Bon vivant app claims to satisfy individual's nutritional requirements. Stepwise illustration for recipes from regional cuisines. Recommendations based on the nutritional requirements and flavor network. A user can elect for a healthier lifestyle. This app also provides ingredient substitution and thrives to grant the user a better and healthier recipe.

Table III Existing System V/S Proposed System

Existing System	*Proposed System*
Existing system does not integrate the concept of flavor pairing.	Proposed system is an interactive platform that allows users to discover flavor pairings based on Flavor compound analysis.
Recipes apps like All recipe dinner spinner suggests recipes based on the ratting and comments.	Bon Vivant takes into preference as well as nutritional Requirements to suggest recipes.
Existing system doesn't provide ingredient substitution	Proposed system provides Ingredient substitution.
Existing system uses keywords of recipe names or ingredients to search for recipes	Our proposed system uses clustering to decide which recipes are similar to each other; compound and flavor network are really convincing.

B. System Architecture

The Figure shows the block diagram of the system which explains the working of our system. It also gives small glimpses of the system for a better understanding of workflow. Designing details for a proposed system is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. This could be seen as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. When we design our proposed system, we take into consideration how do we want our system to look, how do we design the modules and components of the system

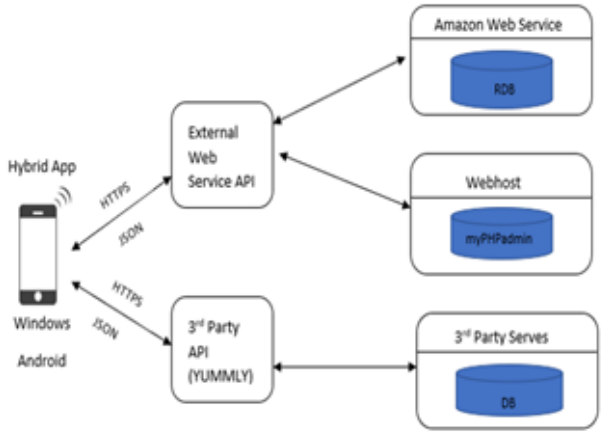

***Figure 3: System* Architecture**

IV METHODOLOGY

Bon Vivant methodology provides the study or description of methods that are used by the users.

Working Phases of Bon Vivant:

Phase1: Login

This phase allows the user to login into the app and carry on the further the activities. Login is done to authenticate and authorize the user's identity.

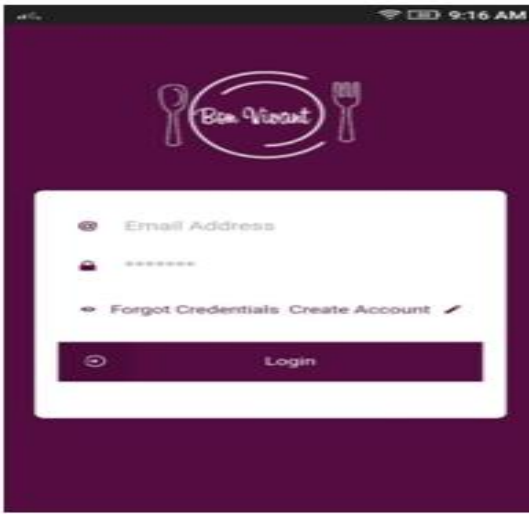

Figure 1: Login Page

Phase 2: Home Page

Phase 2 is the Home page of the system. It allows the user to select from two categories. Phase 2.1: Ingredient pairing In this phase user will select the ingredient of their choice and click on pair it. As a result, there will be a list of this search a list of ingredients and a graphical representation is obtained.

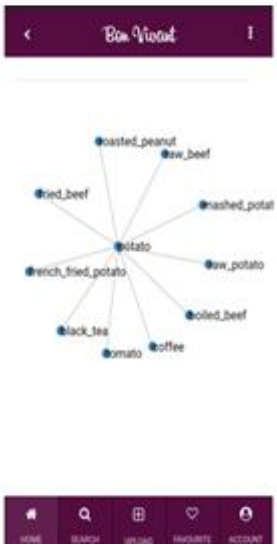

Figure 2: Home Page ***Figure 3: Home Page Graph***

Phase 2.2: Ingredient Paring

In this phase user can map ingredient to cuisine. The graphical output of this search will be as shown in figure x. this graph is obtained by the visualization algorithm Tidier Drawings of Trees (Reingold-Tilford). The graphical output of cuisine-ingredient pairing is a list of pairings and a two level graph of cuisine pairing and suggested ingredients.

Figure 4: Home Page ***Figure 5 Home Page Graph***

Phase 3: Search Page

Phase of this app is the search page. This page allows user to select from the already existing options and also allows user to search recipe of their choice. Search page along with search bar for querying and also for selecting from available options.

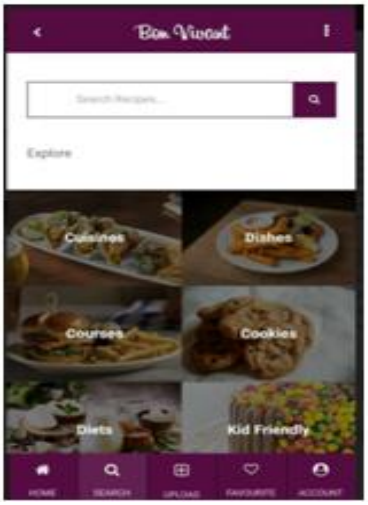

Figure 6: Search Page

Phase 4: Upload Recipe

In phase 4, a user can add their own created recipes and upload them. A user can add/ upload their own recipe. Just by adding some information and the details of the recipe.

Figure 7 : Upload Recipe

Phase 5: User Profile

In phase 4, user account page is displayed. All details of user's like, user's favorite recipes and also the user profile.

Figure 8 : User Profile

Phase 6: Recipe Recommender

In phase 6, recipes are recommended based on the flavour and nutritional preference of the user and BMI ration of the user.

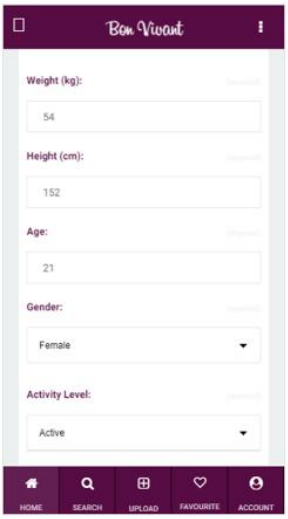

Figure 9:BMI Calculator

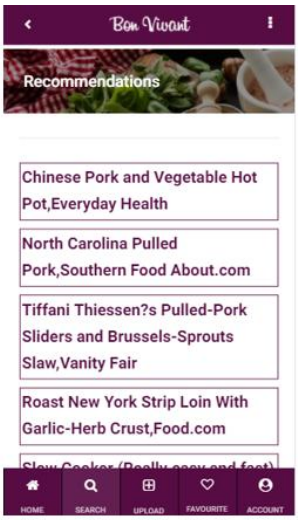

Figure 10: Recommender Recipes

V CONCLUSION

In this system, we have presented a way to analyze information which is obtained from extraction of real time data. This proposed system will help user to discover unusual flavor combinations and ingredient substitutions. The proposed system will enable ingredient pairing and also ingredient cuisine pairing. It allows user to discover unusual flavor combinations and ingredients substitution. Recommender system enable user to select recipes based on the weight, height, age, gender and activity level of the user along with the flavor preference of the user. User can also upload the recipes created by them and make them available for all the users of Bon Vivant. One can make healthier food choices satisfying their taste buds. Lastly, we hope that this kind of system could contribute to the evolution of Food Science.

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