CooNet :A New Recipe Creation Website with Data Visualization

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Introduction and motivation

Flavor pairing is not only an essence of culinary practice, but also a wisdom. Although rooted in personal experience, the booming of cutting-edge technologies has transformed this ancient subject into an emerging research field, Gastrophysics. Several recipe or meal plan searching systems have been developed, such as Yummly, Food.com, and Appetit. However, most of them focus on food and nutrition-oriented data but overlooked the importance of customer-oriented data source. Moreover, hardly any platform aims at providing inspiration on new recipe creation, where rational food pairing and bridging methods are required. Therefore, there is a demand for an interactive recipe recommendation and new recipe creation platform for cooks or cooking lovers, which can pair food ingredients based on both nutrition information and customer rating information, thus providing ideas for new recipe creation.

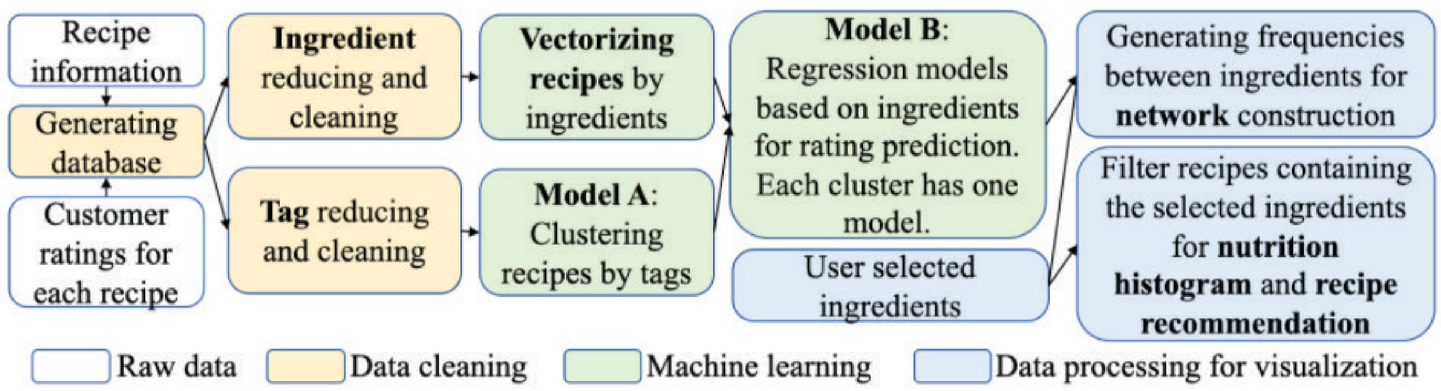
Proposed Method

Our approach features several innovations.

1. the customer rating data of the recipes, which directly reflect if combining several ingredients is tasty or not, is fully utilized to guide the ingredient recommendation and recipe creation.
2. we use regression ML models to dynamically predict the score of the newly created recipe.
3. the recipe tags are used to split the training recipes into several clusters, thus creating several different ML models to achieve more precise prediction. Finally, the ingredient network realizes data visualization, thus enabling interactive and intuitive recipe creation process.

https://coonet.herokuapp.com/

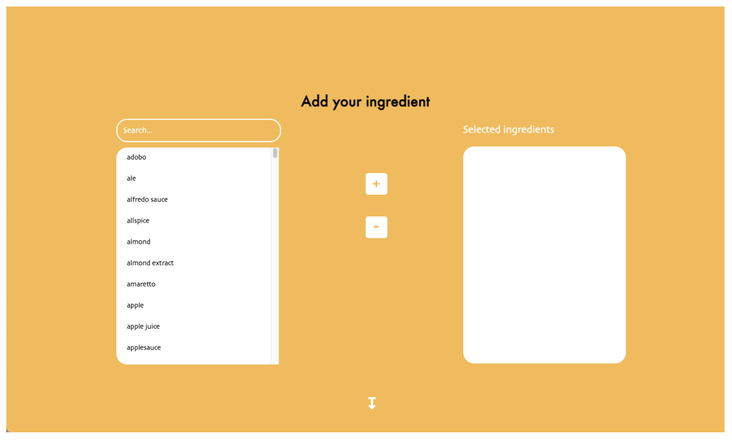
Back-end: data processing and predictive model



Our data is a Kaggle dataset crawled from Food.com (GeniusKitchen) online recipe aggregator.

Our back-end model contains two parts.
Model A is a clustering model based on the recipe tags. Tags are used to narrow down the range of recipes used for recommendation.
Model B is a group of similar regression models based on recipe ingredients, which is used to predict the score of ingredient combinations for ingredient recommendation.

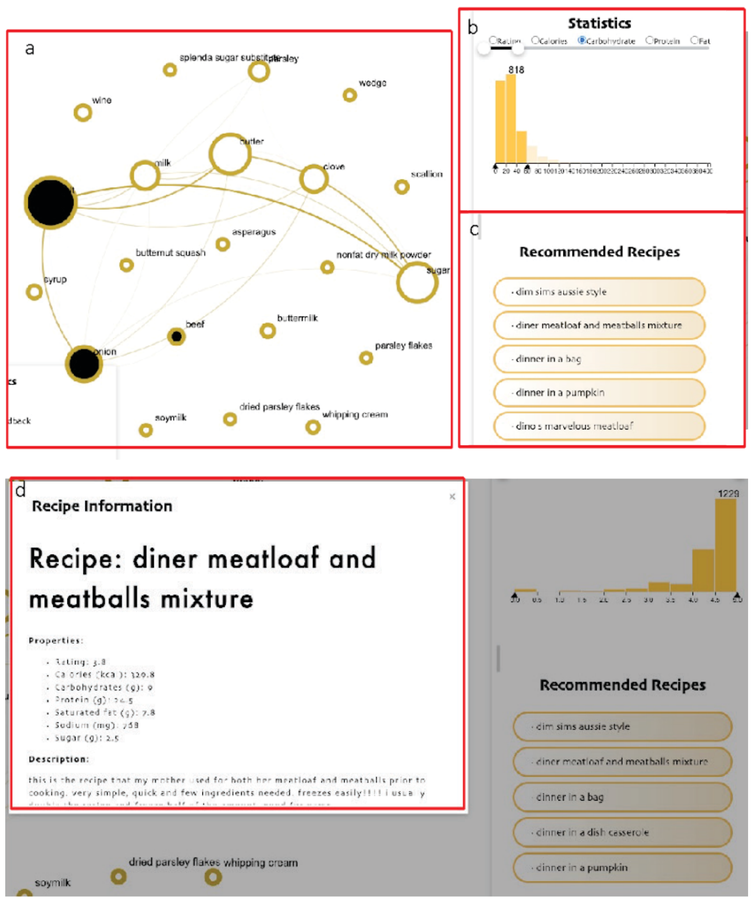
Front-end: user Interface design and web application construction



WELCOME | INGREDIENT LIST | RECIPE TAGS

The controller of the web application was implemented using the python application, Flask. Heroku was used to publish the web application. Since the memory quota is limited to 100mb, we slide the dataset into 3 files and read them one after another to prevent exceeding memory quota.

Experiments and Evaluation



After several food ingredients and recipe tags are selected, a food ingredient network is generated.

The statistics (Figure b) shows the rating and nutrition histogram of all recipes that containing all selected ingredients (black ones in the network).

The Recommended Recipes shows the top 5 recipes that fall into the user specified range in the statistics graph (Figure c).

The detailed information of that recipe pops up after clicking on one recipe, a window (Figure 3d).

Updations on the new recommended ingredients, statistics, and recommended recipes takes place by clicking on one of the white nodes in the network

Evaluation of prediction algorithm

To determine the accuracy of our algorithm, we will randomly divide the recipe dataset into two parts, 80% of recipes will be used as training dataset and 20% as test dataset. From our experiment, xgboost gives the uniformly lowest RMSE among all the model candidates, around 0.9, and the normalized RMSE is about 0.18.

We designed a user experience survey to find out how well our web app CooNet meets user's needs. Overall, users are generally satisfied with CooNet, but the functionalities and recommendation algorithms need further improvements.

Conclusion and Discussion

In this project, we successfully constructed a web application, CooNet, for recipe recommendation and creation. We achieved the three main goals for this work. Improvements in database size, predicative algorithm, and user interface of the web application as well as the functionality and stability of the connection API are of requirements based on our user feedback investigation.