

# Intelligent Food Recommendation System Using Machine Learning

Pratiksha Ashok.Naik  
Information Technology  
SDMCET  
Dharwad, India

**Abstract:-** The buying behavior of the consumer is affected by the suggestions given to the items. Recommendations can be made in the form of a review or ranking given to a specific product. Calories consumed by people contains carbohydrates, fats, proteins, minerals and vitamins, and any malnutrition causes severe health problems. In this paper, we propose a recommendation system which is trained on the basis of the recommendations received by the customer who has already used the product. Software recommends the product to the customer on the basis of the experience of the consumer using the same product. Each person has his or her own eating patterns, based on the preferences and dislikes of the user, indicating that personalized diet is important to sustain the success and health of the user. The proposed recommendation method uses a deep learning algorithm and a genetic algorithm to provide the best possible advice.

**Keywords:-** Deep learning algorithm, Genetic algorithm, Optimized Nutrition, Recommendation System, RESTful web services, TESCO database, Web crawler.

## I. INTRODUCTION

The numbers of e-commerce websites have been increasing rapidly in today's world. They have their own recommendation system to be provided to the user or buyer. Many algorithms have been used by different product recommendation system for providing accurate items to the users. But some recommendation system provides access to all people for providing review or rating about the product irrespective of whether the person has purchased that product or not. This project uses both deep learning and machine learning algorithms. Genetic algorithm plays important role in providing recommendation to buyer based on their likeliness. This project has an added feature of custom recommendation provided mainly for the purchasers suffering from any problems such as high blood pressure, heart attack, diabetes etc. Here the nutrition is divided into five types i.e. energy, sugar, proteins, fats and salts. The genetic information of the user or purchaser is always constant but the recommendation of the products is dynamic so as to provide an accurate product that matches with user likeliness over time. Here the TESCO dataset is used to provide recommendation to the users. The reviews are collected from the famous websites such as Amazon, MouthShut.com, and Flipkart for taking the review about

the desired product and then some techniques such as data cleaning, tokenization, frequency computation, product feature frequency is used to get specific words from the set of reviews. Hence, these techniques provide us with clean data that is required in this project. In the user logged in page, the user is imposed with set of questions to categorize them into any nutrition gainers such as salt, protein, sugar, fat etc. Based upon the option marked, the rating is provided to the specific user with one or more nutrition gainers having highest rating with it. Hence based on this the product is recommended to the purchasers likeliness. This technique provides easiest way to sort the user liking products.

Web Crawler implementation is based review collection algorithm which must collect reviews about food products and store them in this application. Questions posed to the user about nutrition remains responsible for generating the health profile for the particular user. Product classification algorithm is responsible for performing data cleaning, tokenization, and frequency computation. Genetic Algorithm must establish the relationship between the product and user. Product buying module must be responsible for purchase of the food products in this application.

## II. METHODOLOGY

The figure depicts the methodology for the project i.e. it provides information about various modules involved in the project

- **Registration:** The customer will be able to register by providing the details like first name, last name, user id, password, Email, Phone No. After all the validations are performed, if user id does not exist then user is allowed to register otherwise registration fails.
- **Login:** This module asks for username and password allowing the user to access the system.
- **Grocery Product Purchase:** This module allows viewing the grocery product and completing the transactions for various categories of product namely biscuit, chocolate, yogurt and noodle. For the transaction to be completed, user will select the product and then provide the respective details to complete the transaction.

- Nutrition based Questioner: This module provides a list of questionnaires to the customer, which is based on the genetic profile like taste of salt, sugar, fat, protein and energy. For future analysis the collected profile is saved.

Collecting offline and online review based on web crawler. This process is responsible for collecting the reviews using a Web Crawler in order to get real time reviews and offline if an offline review has to be submitted. Word Embedding and Deep Learning for Product Classification Training data is fed to this algorithm. Unique words from the training data is found, then it computes the occurrence of the words and generates a matrix of P\*Q word vector where P is number of reviews and Q is the number of unique words amongst all the reviews. Once the word vector is found, later it acts as an input for the classification.

- Genetic Algorithm for filtering: The genetic algorithm is applied on the product classification data
- Recommendations provided to the end user: Based on the high nutrition sorting the recommendation is performed. Hence it provides authentic nutrition details to the customer.

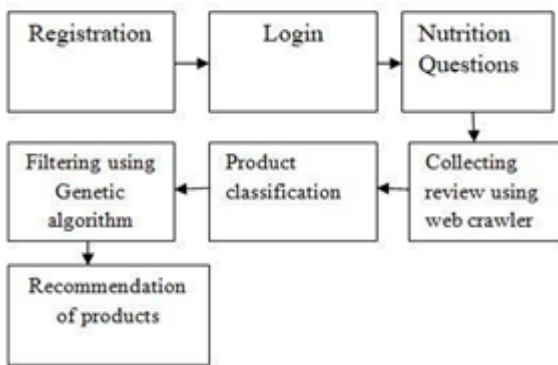


Fig 1:- System Methodology

### III. SYSTEM ARCHITECTURE

Various end points are shown in the above figure. The web container is maintained by Apache Tomcat Server. Here the web.xml allows only the valid request into web container. The user interface is designed with the help of JSP, Angular JS and Ext JS. To implement business services and the entire algorithm RESTful Services are used.

The inputs given are review collection, stop words and keywords. The procedure involves of product buying, word embedding algorithm, product classification, Genetic algorithm for computation and recommendation provided to the user about the product

Input variables consist of stop words, review collection and keywords. The procedure involves Processing of review collection that collects the reviews in offline mode or online mode with the help of web crawler. For performing the classification, the product has to be found, this is done with the help of word embedding algorithm and product classification algorithm. The relationship has to be established between user and the product, this is done with

the help of genetic algorithm. Finally, the recommendation of product is given to the user based upon user health profile.

The above diagram illustrates review collection, stop words and training words that act as input. Offline Review Collection is responsible for collecting the reviews from the end user. Collection of the reviews from the web URL and XPath is accomplished by web crawler. Unwanted words are removed from the review i.e. stop words and special symbol with the help of data cleaning algorithm.

After data cleaning, tokenization process has to be accomplished. Conversion of statements into list of words is called as tokenization. Now the redundancy has to be removed by providing a weight factor for each token. This process is called as frequency computation. Classification of the product has to be rendered using word embedded matrix. Hence product classification procedure has to be followed. To generate the health profile of a specific user, the user has to answer the list of questions related to food namely salt, sugar, energy and fat. The relationship between the user profile and nutrition factor is established with the help of genetic computations. To obtain list of products, the recommendation are used. Hence this outputs list of products to the authentic user.

#### ➤ Java Language:

Java is an object oriented, robust programming language. (.java) is the extension given to the java file. When compiled it is converted automatically into (.class) class format. Compiler then compiles the source code and then converts it into (.class) class extension. This file now consists of byte code that is fed to the Java Virtual Machine (JVM). As this JVM can run on any machines such as Linux, Windows, Unix with the byte code format of our source code. Hence Java language is called as platform independent i.e. it follows WORA (Write Once Run Anywhere) Architecture.

#### ➤ Architecture of Java Language :

Main components of Java Programming Language are Java Runtime environment (JRE), Java Virtual Machine(JVM) and Java Development Kit(JDK). JDK consists of javac i.e. Java compiler etc. JDK can be used to only develop or write the code but it cannot be used to execute the code. JDK and JRE are both physical entities. JRE is used to execute the code as it contains JVM in it. JVM is a logical entity.

#### ➤ Spring Framework:

Spring Framework is used for generating the java application. Concepts of Spring Framework are (MVC) Spring Model View Controller,(JDBC) Spring Database Connectivity etc. Instead of manually creating the object, We can use Spring IOC to automatically generate the object.

#### ➤ Spring MVC Framework:

Spring MVC Framework is a model that represents business logic operation and the data which is responsible for representing presentation logic. Controller acts as an

intermediate between model and view. Controller receives the input and it demands model and view to change accordingly.

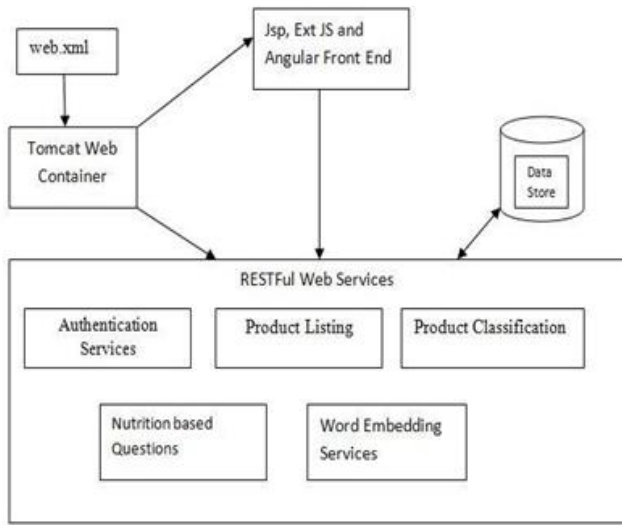


Fig 2:- System Architecture

**IV. RESULTS**

➤ The following are the steps followed:

The request is taken from the web browser. The request will be sent to web container and validated against the web browser. The request is then forwarded to dispatcher servlet. Taking the input from dispatcher servlet and performing the basic validations is done by controller class. If the basic validations are successful, then error messages are sent back else the control moves to step5. The delegate class is responsible for taking input from controller and gives it to service and then take results and sends it to controller. The Service class will execute the algorithms and the business logic and takes help of either single DAO class or multiple DAO classes to complete the job. The DAO is responsible for communicating with MYSQL.

Fig 3:- Registration

The above snapshot depicts the registration page which can be used by new users. The registration page asks the user to enter first name, last name, password, email id, country, state and city. Finally, the user is registered with the application and can use the application for knowing the likeliness of products.

Fig 4:- Sample List of questions

The above snapshot depicts the nutrition questionnaire that is shown to the user whenever the user wants to check his/her likeliness of products.

Based on the questions the user answers he/she will be given some score. These scores will be used to detect the feature of content present in the product like sugar, salt etc.

Nutrition value		
USER ID	FEATURE	SCORE
ABC	sugar	7

Fig 5:- Feature Points

The obtained features are used to recommend the products to the user.



Fig 6:- Products recommended

## V. CONCLUSION

In this project, by including web crawler algorithm, the admin will be able to collect the reviews online. The sequence of deep learning algorithms such as data cleaning, tokenization, frequency computation, product classification is used for classification of products. The customer is allowed to log in with valid credentials and based on questions asked about nutrition intake, using genetic algorithm, the recommendations are provided. Hence, it becomes easy for the user to know about the current intake of nutrients and based upon it, the user is recommended with certain products. Hence, this system is responsible of providing valid products to the user. The recommendations are provided based on user likeliness.

## VI. FUTURE SCOPE

The system for now provides recommendations to the user based upon their likeliness and also the system provides custom recommendation for the user having any genetic issues such a heart problem, diabetes, hypertension etc. Further this project can be extended to add more categories of products so as to provide solutions about recommendation to variety of users liking products with unique nutrition gainers. This project can also be amalgamated with social media to collect the reviews related to the product.

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