Omnifood: Nutritional Meal Drop

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***Abstract*— There are many portable applications for weight and diet management available these days. Furthermore, there are few examples of food recommendation systems that provide nutritional information about reasonable food choices to the user. An enormous number of people are extraordinarily busy with their positions, loved ones, and other basic exercises, which doesn't take into account cooking. This could lead a poor diet routine and lasting health consequences. We need to solve this issue by using a web-based methodology. Clients can use our web page to pick their eating routine and food sources they like and dislike, and our computation will make a custom and individual step by step weekly plan. we will guarantee client get all of the enhancements and supplements they need, notwithstanding eating routine they follow. However, we don't stop there. We get together with eateries and other cooking accomplices to truly get ready and convey all dinners from the delivered feast plans to chosen regions. This paper proposes Multinomial Naïve Bayes and this proposed algorithm, classified for food reviews. We created a webpage using HTML5, CSS3, and JavaScript and classified food reviews using machine learning. We executed four different algorithms on our dataset, i.e., Bernoulli Naive Bayes, Gaussian Naive Bayes, Logistic Regression and Multinomial Naive Bayes. In algorithm evaluation, we found the performance matrix i.e., precision, recall and accuracy of Multinomial Naive Bayes was high compared to other algorithms. So, we chose this algorithm for our model.**

Keywords— ***Web Application Development, Food recommendation, Food Ordering System, Machine learning, Food review, NLP, Gaussian Naive Bayes, Sentiment Analysis.***

I. INTRODUCTION

The Omnifood project aims to provide a meal recommendation and delivery system that allows customers to order their favourite food with their favourite ingredients. System that allows users to order their favourite food that contains the ingredients they like. In particular, in cities, there are a huge number of applications for ordering food from various restaurants. Some systems support group orders too, but a user cannot have the option to change the ingredients of something they do not like. This model works well when a user can add ingredients they like and remove those they do not. We will prepare and deliver the food based on the user's preferences. As an example, Swiggy and Zomato can be mentioned, where users can order their favourite food from their favourite restaurants and have it delivered within 30 minutes and They get exact data about restaurants as they give menus, surveys, and evaluations.

Currently, most people are busy with their jobs, which doesn’t leave much time for cooking. Searching for food items daily to eat is a time-consuming process, and they don’t get the option to change ingredients. They may not get all the required nutrients, which might lead to a poor diet. Software like Nutritional Meal Drop could greatly improve the situation. This will produce a customized week plan for every client. On the website, clients can change ingredients, swap entire meals, or even add their own recipes, so that clients get their favourite food with enough nutrients. Users

can place orders and browse food items recommended by the software through a web interface provided by Omnifood. The interface also allows for the creation of a personalised weekly plan for each customer. Omnifood can take care of requests that include things from explicit classes like veggie lovers, non-veggies, and an Gluten free. The framework additionally has an organisation interface where an administrator can follow clients and food items statistics and manage the received orders. The work of the delivery-oriented management system can be accessed on any browsers and on any screen size. This interface is responsive and compatible with all new and old browsers.

II. LITERATURE SURVEY

In this section, we present related literature. Our problem combines two components: restaurant meal delivery and arrival time estimation. This domain has a small amount of work. In Subsection, we present the two most related works, followed by an overview of works on the individual components in Subsections. The work generally firmly associated with our own is that of (2018) Liu et al., (2019) Ulmer and Thomas, and furthermore (2020) Zhu et al. Liu et al. (2018) consider meal conveyance from a single restaurant, from where drivers pick up dinners for a large number of clients. Along these lines, the cost of task choices is uncertain as well. Liu et al. (2018) anticipate the drivers' routes in a data-driven approach.

A. Meal Recommender System

This study proposes the development of "Plan-Cook-Eat," a web-based tool that may generate customised eating habit plans depending on a person's needs. Six enlisted nutritionist-dietitians acted as a panel of human master validators, and 24 regular clients served as application testers for the mixed-strategies evaluation. A recommended system for adaptive diet monitoring was recently included by Agapito G. and Calabrese B. [2] (2016). The DIETOS (DIET Coordinator System) framework was offered in this research as a recommended framework for the varied distribution of nutrition substances to work on the personal happiness of both healthy people and people affected by chronic diet-related illnesses. The proposed framework may create a client's wellness profile and provide an individualised nutrient recommendation based on that profile. The profile is created by using dynamic continual questionnaires that are prepared by clinical specialists and gathered by clients. Phatharajan Pholkul (2010) presented A Food Recommendation System Using Clustering Analysis for Diabetic Patients [10]. They proposed a Food Recommendation System (FRS) for diabetic patients based on a food grouping examination. In terms of nutrition and food trademarks, their framework will recommend the right substituted food varieties.

B. Food Ordering and Delivery

Our problem is the combination of nutritional food delivery and sentiment analysis on food reviews. The restaurant meal delivery problem (RMDP) was recently introduced by XU Hongzhen, Tang Bin, and Song Wenlin [4] (2009). This paper shows how to create a wireless food ordering framework by combining wireless communication and online management technologies. It enables wired and wireless data access to the servers and food ordering processes across a wired and wireless integrated local area network via desktops and desktop PCs, as well as mobile devices such as PDAs. Cristina-Edina Domokos and Barna Séra (2018) [3] created an app for ordering food and getting it delivered. The article presents the plan and execution of the product structure. The innovations, tools, and techniques utilised during the development process are also portrayed. An Online Food Ordering System is presented by Abhishek Singh (2018) [8]. A food menu is set up on the web and, according to their desire, clients can essentially put in their request through their proposed framework. Shahirah Mohamed Hatim (2019) [9] presents E-FoodCart, an online food ordering service. Their online portable programme is a student-friendly food-ordering application with a concept and concept similar to that of several existing applications such as Dominos, Swiggy, and Zomato.

C. Food Review Sentiment Analysis

One method of classifying files in order to identify positive and negative criticism is to use sentiment analysis. Customer pleasure is crucial in customer service. A variety of internet reviews, such as on-ride marketing consultants, are currently being written about customer behaviour. A restaurant is a business that requires a higher level of concern for customer service through consistently enhancing customer service. Rachmawan's Implied Naive Bayes Analysis of TripAdvisor Restaurant Customer Reviews Kelly Adi Laksono, Rossa Sungkono (2019), [5]. The findings show that those tactics accurately predict customer replies, and that the Naive Bayes method, with a one-of-a-kind accuracy of 2.9 percent, is more accurate than Text Blob sentiment analysis. Unggul Widod Wijayanto [6] (2018) provided an experimental study of supervised sentiment analysis with Gaussian Naive Bayes. Client audits from Yelp (food sources),

IMDb (movies), and Amazon were used in this review (items). Nourism Islam [7] presented a paper titled Sentiment Analysis on Food Reviews Using a Machine Learning Approach (2021). They improved item review analysis using three cutting-edge machine learning classifiers: SVM, Logistic Regression, Random Forest, and Naive Bayes. Twitter Yelp datasets are used to conduct the testing.

III. PROPOSED METHODOLOGY

We created a website that recommends a personalised weekly food plan to the users with an option to change the ingredients of a food item. Clients can use our web page to pick their eating routine and food sources they like and dislike, and our computation will make a custom and individual step-by-step weekly plan. We will guarantee clients get all of the enhancements and supplements they need, despite the eating routine they follow. However, we don't stop there. We get together with eateries and other cooking accomplices to truly get ready and convey all dinners from the delivered feast plans to chosen regions**.** We also proposed a food review classifier using machine learning that classifies reviews into positive and negative.

A. Web Development

Based on customer priorities, we recommend a personalised weekly plan for each customer**.** By far, most are especially busy with their positions, occupied with their timetable and other huge tasks, which doesn't take into consideration cooking. This could lead to a poor eating routine and enduring wellbeing outcomes. We want to use a strategy to solve this problem. Clients can use our app to select their eating habits and food sources they like and dislike, and our website will create a personalized, week-by-week meal plan for them. But we don't stop there. In selected cities, we partner with restaurants and other cooking partners to actually cook and deliver all meals from the generated meal plans. All this will be packed up into a monthly subscription where users can choose between receiving one or two meals per day, every single day of the month. The smart 365-day food subscription that will get you eating healthy again your personal tastes and nutritional needs.

In this segment, we describe the issues experienced during food requesting and conveyance in light of past research**.** They just recommend the diet plan. Most people are busy with their jobs, which doesn’t leave much time for cooking. Looking for food items day to day to eat is a tedious process. They don’t get the option to change ingredients, and they may not get all the required nutrients, which might lead to a poor diet.

B. Multinomial Naïve Bayes

Multinomial Naïve Bayes is connected with supervised learning, a piece of ML. The flow from static construction to emotional type is depicted in Figure 1. The stream is divided into four sections: the first is data production; the second is stopword development; and the third is feature construction. Each component is separated by two distinct strategies: the use of context vectorizer stopwords and the use of context-based stopwords.

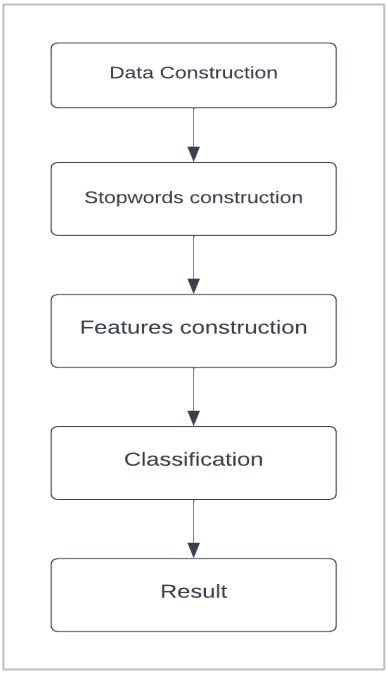

Fig. 1. Research Overview Diagram

a. Data Construction

There is 1 dataset used in this study i.e., Restaurant Reviews dataset. The data set is a food survey of our sites, which include a variety of feasts. We're using a Kaggle data set for training and testing, and the topic is food reviews from our website. Customer reviews and sentiments are included in the collection. In light of the survey sentiment, each dataset has been given a positive or negative name. We can't indicate the number of positive and negative reviews a dataset can contain; it is based on the customers.

b. *Stopword Construction*

Stopwords are words that have no meaning. The inclusion of stopwords lowers the accuracy of the categorization. Stopwords can be removed to improve the final outcome. When we compare the two types of stopwords in this

study, general stopwords and context-based stopwords, general stopwords are derived from current Count Vectorizer characteristics. Context-based fully stopwords are found by searching the dataset for positive and negative ratios. Second, determine if the expression is a stopword or not. One way that might be employed is to calculate the proportion of useful frequencies to the total. Because of the fine repetition, the quality proportion is higher. As seen in Equation (1), the frequency is divided by the entire frequency. Equation (2) is used to eliminate insignificant words so that they can concentrate on the important ones. The sentence "stopword is in the equation or not" can then be completed below. The term "is," for example, cannot be used in this way. It's a word that's employed to express a particular emotion. It's a lot tougher now. It's because the context is uncertain. $Ratio_{positive}$ = positive frequencies / Total (1)

Stopwords{IF $Ratio_{positive}$ >= 0.4 AND $Ratio_{positive}$<=0.6} (2)

c. Feature Construction

This section focuses on creating functions from a CSV overview and optimizing them. To produce functions, we utilized the Count Vectorizer, and to optimize the feature, we used Stopwords. We examine them using two special methodologies at this step. Stopwords and context-based absolutely stop words are used on the Count Vectorizer. The Count Vectorizer is a programmed that turns a document into a frequency representation. Frequency is a good way to figure out how much each attribute weighs. On this test, we utilized the Count Vectorizer Sklearn technique in Python to create functions. The outcome of the possibilities may be vast, and the data may be noisy and unimportant.

d. Classification

In this segment, we executed four different machine learning algorithms on out dataset i.e., Bernoulli Naive Bayes, Gaussian Naive Bayes, Logistic Regression, Multinomial Naive Bayes. For algorithm evaluation we used results of precision, recall and accuracy of four algorithms.

e. Opinion Analysis of Food Reviews utilizing Multinomial Naïve Bayes

We're doing sentiment analysis with Multinomial Naive Bayes. With the advancement of connectivity comes technology that allows for a variety of approaches to interpreting and processing user feedback.

First step we have to calculate prior probability for each class. In our case positive and negative are two classes. Later we have to calculate conditional probability for each word present in that particular class. Fig2 shows the block diagram of Multinomial naïve bayes algorithm.

N_c – no. of reviews belongs to that particular class c

N – Total no. of reviews in training dataset.

count(w,c) – if c is positive class then w is no. of positive words.

count(c) – no. of reviews belongs to that particular class

|V| - vocabulary total no. of words(non-repetitive)

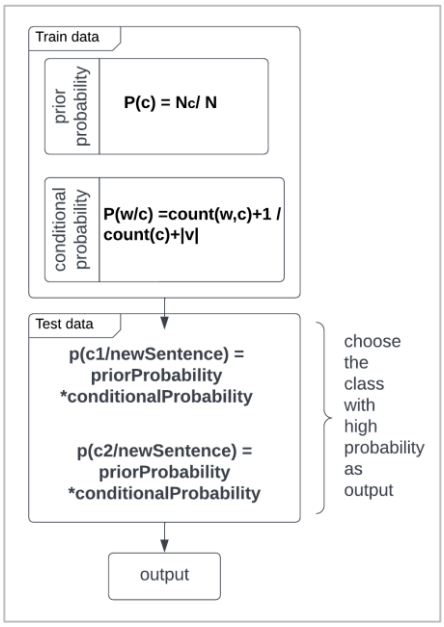

Fig. 2 Block diagram of Multinomial Naïve Bayes algorithm

After calculating probabilities on train data. Now we have to calculate probability of new review belongs to positive class and probability of new review belongs to negative class of test data. If the result of probability of new review for positive class is more than that review is positive review or else review is negative review.

IV. DESIGN AND IMPLEMENTATION

The system is made up of three primary parts: a front end, a back end, and a database that uses Netlify. In this paragraph, we'll go through Omnifood's modular web framework. It is made up of a few autonomous modules that are connected by corresponding interfaces, making it easier to expand the platform to perform new functions by bringing additional components to the agreements. Figure 1 shows the Omnifood architecture. we have mainly 3 modules which are to be discussed, they are: *New User, User, Admin*

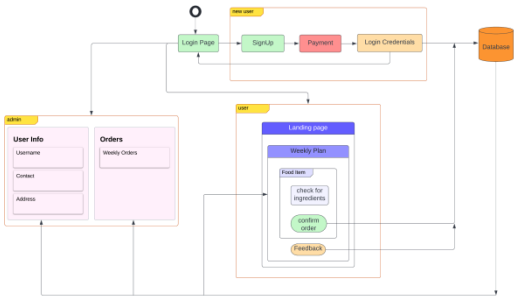

Fig. 3 shows the website block diagram

A. New User Registration

New users have to buy a plan to get login. We have two plans delivering 1 meal per day and delivering 2 meal per day. According to the plan they have to make payment and after that they will receive login credentials through mail id.

B. Old Users

Fig. 4 shows the weekly plan recommendation for a user

Our web application will recommend a weekly plan for each of the client. Each recommended item will show up along with the ingredients going to include in them. User will get an option to remove the ingredients what they don't like from the recommended item or user can change the entire food item on the respective day. Based on the plan they got user can order 1 meal per day or 2 meals per day. They can schedule address and timings and can make a order. Food review feedbacks also accepted from the users.

C. Admin Page

Admin page contains 2 sections, User info – user, details are stored and displayed in this section, Orders – Orders and feedbacks for all the days displayed here.

D. Database

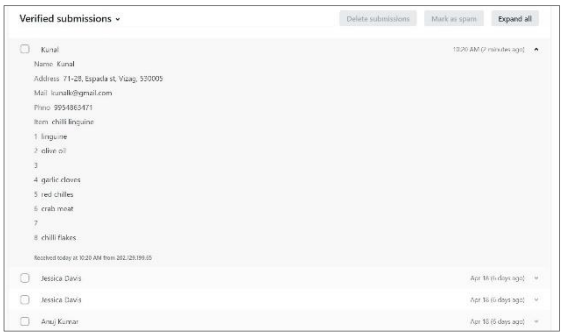

Fig.5 shows the received orders from users.

We used Netlify platform to deploy our site and to store order made ordered by user. We stored these details by collecting order details through html forms. We can also download these orders and feedbacks as a CSV file.

E. Experimental Results

We executed four different machine learning algorithms on out dataset i.e., Bernoulli Naive Bayes, Gaussian Naive Bayes, Logistic Regression, Multinomial Naive Bayes. For algorithm evaluation we used results of precision, recall and accuracy of four algorithms

From fig6 we can see that accuracy of Gaussian Naive Bayes is 69%, precision is 64% and recall is 84%. when come to confusion matrix 300 reviews in test data, gaussian naive bayes algorithm classified 82 negative reviews correctly and 125 positive reviews correctly and classified 70 positive reviews as negative and 23 negative reviews as positive.

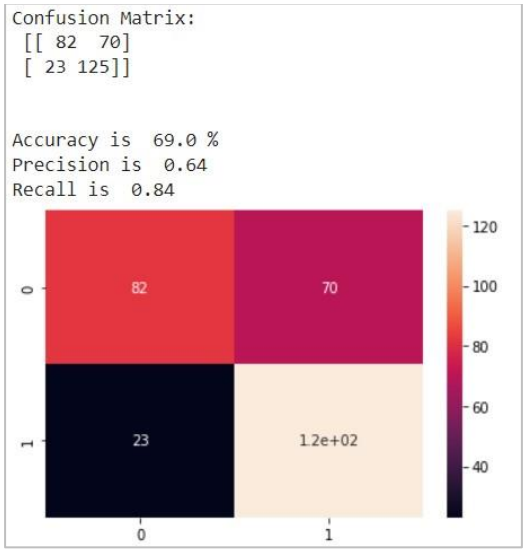

Fig. 6 displays the Gaussian Naïve Bayes confusion matrix

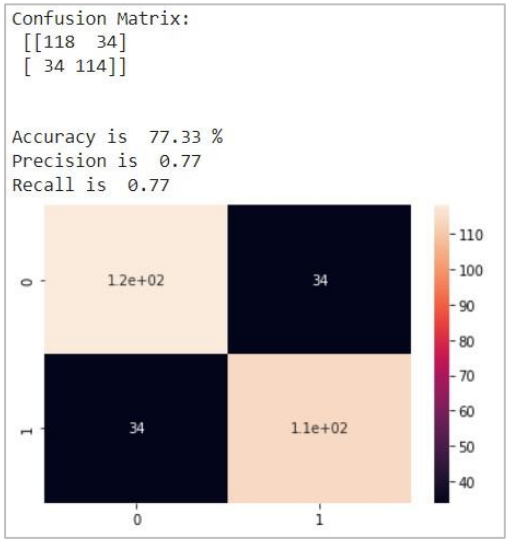

Fig. 7 displays the Multinomial Naïve Bayes confusion matrix

From fig7 we can see that accuracy of Multinomial Naive Bayes is 77.33%, precision is 77% and recall is 77%. when come to confusion matrix 300 reviews in test data, gaussian naive bayes algorithm classified 118 negative reviews correctly and 114 positive reviews correctly and classified 34 positive reviews as negative and 34 negative reviews as positive.

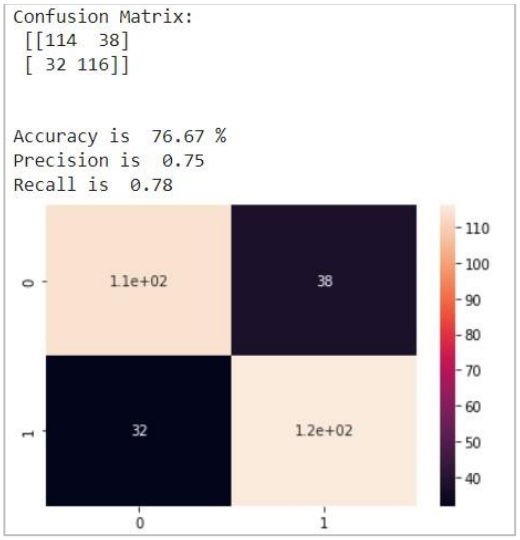

Fig. 8 shows the confusion matrix of Bernoulli Naïve Bayes

From fig8 we can see that accuracy of Gaussian Naive Bayes is 76.67%, precision is 75% and recall is 78%. when come to confusion matrix 300 reviews in test data, gaussian naive bayes algorithm classified 114 negative reviews correctly and 116 positive reviews correctly and classified 38 positive reviews as negative and 32 negative reviews as positive.

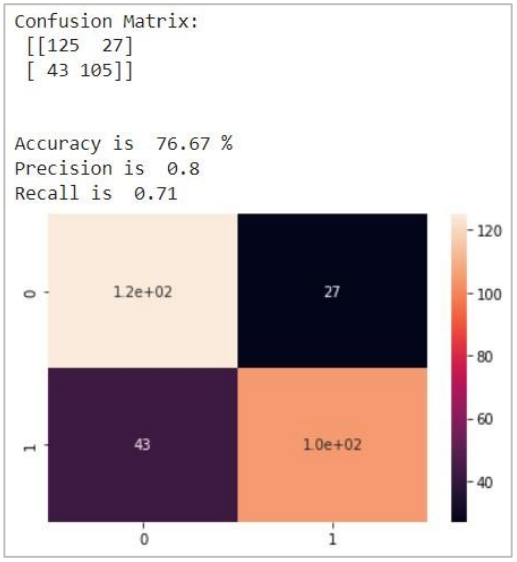

Fig. 9 shows the confusion matrix of Logistic Regression

From fig9 we can see that accuracy of Gaussian Naive Bayes is 76.67%, precision is 80% and recall is 71%. when come to confusion matrix 300 reviews in test data, gaussian naive bayes algorithm classified 125 negative reviews correctly and 105 positive reviews correctly and classified 27 positive reviews as negative and 43 negative reviews as positive.

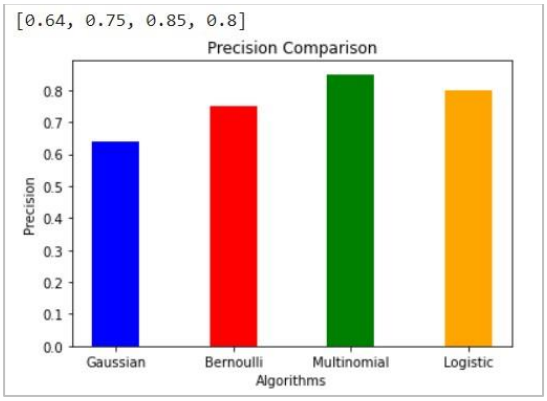

Fig.10 displays the precision comparison between four algorithms

From fig10 precision of Gaussian Naive Bayes is 64%, precision of Bernoulli Naive Bayes is 75%, precision of Multinomial Naive Bayes is 85%, precision of Logistic Naive Bayes is 80%. When compared to the other three methods, the Multinomial Naive Bayes algorithm has higher precision.

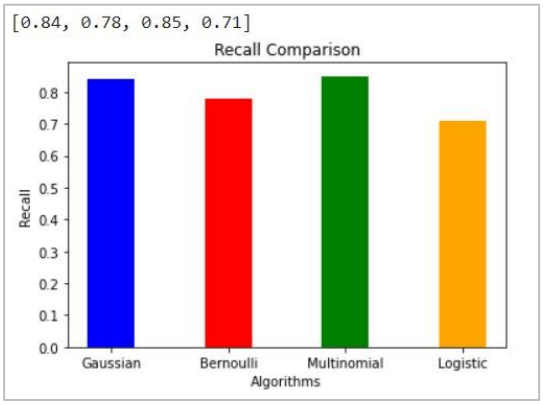

Fig.11 displays the recall comparison between algorithms

From fig11 recall of Gaussian Naive Bayes is 84%, recall of Bernoulli Naive Bayes is 78%, recall of Multinomial Naive Bayes is 85%, recall of Logistic Naive Bayes is 71%. When compared to the other three methods, the Multinomial Naive Bayes algorithm has higher recall.

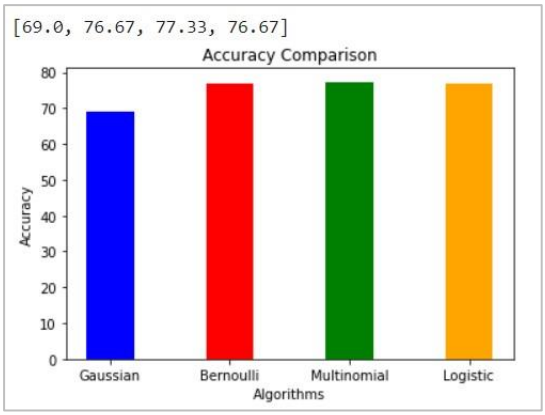

Fig.12 displays the Accuracy comparison between four algorithms

According to fig12, the efficiency of Gaussian Naive Bayes 69 percent, Bernoulli Naive Bayes 76.67 percent, Multinomial Naive Bayes 77.33 percent, and Logistic Naive Bayes 76.67 percent. As a result, the Multinomial Naive Bayes algorithm is more accurate than the other three algorithms.

When compared to the other three classification algorithms, we can see that Multinomial Nave Bayes does so well in all test parameters. So, for our model we choose Multinomial Naïve Bayes classification algorithm.

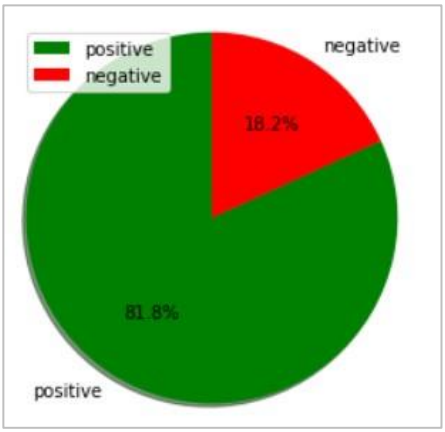

Fig. 13 shows the positive and negatives reviews percentage given by users

We used Multinomial Naive Bayes and used our client's food reviews as test data, dividing the results into positive and negative reviews and visualising the proportion of each class contained in the test data using Matplotlib. So as a result, it assists admins in perusing just negative reviews, allowing them to further develop their business while saving time.

V. CONCLUSION AND FUTURE WORK

This paper proposes Multinomial Naïve Bayes and this proposed algorithm, classified for food reviews. We created a webpage using HTML5, CSS3, and JavaScript and classified food reviews using machine learning. We executed four different algorithms on our dataset, i.e., Bernoulli Naive Bayes, Gaussian Naive Bayes, Logistic Regression and Multinomial Naive Bayes. In algorithm evaluation, we found the performance matrix of Multinomial Naive Bayes was high. So we chose this algorithm for our model. This project entails A software solution has been developed as part of the Omnifood project to assist users who are busy with

their occupations. Our website allows customers to order one or two meals every day. The administrators can control the menus, customers, and orders. The delivery process is aided by the web application: couriers are immediately alerted of new orders and can take deliveries upon acquiring all the essential information. New functionalities arose as extra enhancement opportunities during the development cycle:

- An interface that allows restaurant operators to manage their offers directly.
- After making an order, the consumer should be able to display a notification with a delivery estimate.
- A mobile device version.
- Integration of Google Maps into the app to guide delivery people from their actual place to the pickup location.
- Customers use a standalone smartphone application to place orders.

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