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Machine Learning Technique used to Online Food Ordering and Recommendation

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Abstract. This website aims to order food inside the campus of colleges. Order processing system is developed using HTML (Hypertext Markup Language) as front end and SQL (Structured Query Language) at back-end. Planning is done by identifying the problems faced by students & faculties inside the campus. This website allows to quickly and easily manage an online menu and end users will find it easy to choose . Food ordering system reduces manual work. Also the recommendation system using Machine Learning will help the end users to choose from a wide variety of food and cuisines with much ease. This website will help college canteens and students both. There are many functionalities of this website like: To store records, Control orders and services, Billings Order recommendation using Machine Learning. The user requirements are analyzed to identify the needs of the end users. Database is planned with care to oblige development in future. Easy to use structures have been intended for information section. Why ML? ML will help the system to predict automatically without any human intervention as needed by traditional diagnosis systems.ML can be supervised / unsupervised. But we will be only trying to find a solution using supervised learning. Keywords – Machine Learning, Recommendation The first sentence of the Abstract should follow the word "Abstract." on the same line. The abstract should be clear, descriptive, self-explanatory and no longer than 200 words. It should also be suitable for publication in abstracting services. Do not include references or formulae in the abstract.

Keywords: Automated Food Ordering System, Dynamic Database Management, Machine Learning, Smart Phone

1. Introduction

Online Food requesting framework is an interaction wherein one can arrange different food varieties and drinks from some neighborhood eatery and lodgings using web, just by sitting at home or any spot. And the order is delivered to the told location. The reason for this undertaking is to build up a framework that can be utilized to change the conventional requesting framework that as of now executed in dominant part of the business. Many is storing all of their data in manual way. They have huge number of customers daily. So because large numbers of customers, they need the help of some features so they can maintain and stores accurately. For managers it is difficult to view the tables, orders, kitchen, reception and the counter simultaneously.

They need full-fledged software to maintain their day to day transactions, orders and also regular update on records, cash transactions, daily staff reports, customers feedbacks etc. The main aim is to built this project is to help college students and faculties . This website will help them during their hectic schedules in college.Consider the main aim of this website through a small example A student wakes up for her 8:00 a.m. class, but not in time to make breakfast or swing through the dining hall. Before she rolls out of bed, she uses her smartphone to place an order for coffee and a breakfast sandwich at a café on campus. While she's walking to class, her food is being prepared, and the delivery person is standing on the place where she marked the location to meet. This is how this website will work. The online ordering trend is exploding and for good reason.

2. Advantages of Project

- Accommodating for understudies: Online food Ordering framework will help undergrads and resources likewise in their timetables.
- Easy to understand: Online Food Ordering System is an easy to use project in light of the fact that the Food Ordering Record and looking from classes is exceptionally basic, quick and information is gotten. The UI of the task is basic. Request reports of the framework can be effectively produced. Client can produce the report of a specific date and period. In this manner they can get conveyance status of clients and get data about the thing is being requested.
- Less administrative work: Online Food Ordering System requires less desk work. In this undertaking all record is brought straightforwardly into the PC and reports can be produced through a tick. In this manner it saves time. As information is straightforwardly gone into PC so there is no compelling reason to accomplish any desk work.
- PC administrator control: Online Food Ordering System is worked by the staff individuals and one administrator so there is no way of administrative errors. Information taking care of and recovering in this framework is simple. So the work should be possible on schedule.

3. Literature Review

3.1. Machine Learning Algorithms

Generally speaking, Machine learning algorithms are of 3 types,

- Supervised Learning – In this, we have algorithms, which already have some independent variables / predictors, using which, algorithms are made which map

user inputs to (known) outputs. In other words, as per Wikipedia, "Supervised learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. It infers a function from labelled training data consisting of a set of training examples." Some examples of supervised learning algorithms include Linear regression, decision tree,random forest, KNN, Logistic regression.

– Unsupervised learning – Unlike Supervised learning algorithms, unsupervised learning algorithms are more concerned with categorizing data, rather than predict finite stuff. These are only provided with the independent variables/predictors without any known/possible outputs. The machine is expected to find underlying pattern in the data on its own. To advance in easier terms, for a n tested space x1 to xn, genuine class names are not accommodated each example, subsequently known as learning without educator.Types include – Association, Clustering, and dimensionality reduction.

– Reinforcement Learning – In this, the machine/algorithm works on the idea of rewards and penalties. The agent learns to reach the goal in uncertain/complex scenario. Using trial and error, its aim remains to maximize rewards and reach the goal. Here too, no extra information is given to the algorithm, and it's left to the agent to decide steps and ways to minimize penalties and maximize rewards.

Now, we will explore some commonly used machine learning algorithms:

– Linear Regression – This algorithm is normallyused to predict real values (prices, sales, etc.) based on already available data (continuous variables).Here a relationship is established between all variables, and a best fit line (regression line) is made, addressed by the straight condition Y= a*X + b, where an is the incline, b is a steady catch, and x is an independent variable. Following is a sample plot for some example data.

– K-Means Clustering – It is a simple unsupervised learning algorithm and uses clustering to solve the problem. This algorithm uses the simple method of classifying/clustering data based on a preset number of clusters, based around fixed points. Once clusters are defined, this algorithm takes each data point and allots/associates it to the nearest centroid. Ideally, the fixed points of the clusters are kept as far as possible to avoid ambiguity during association.

At long last, this calculation targets limiting a goal work, here, a squared mistake work.The objective function is

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2$$

$\left\|x_i^{(j)} - c_j\right\|^2$

Where is a picked distance measure between an information point xi and the group community cj, is a marker of the distance of the n information focuses from their separate bunch places. The calculation is made out of the accompanying advances:

- Let X = {x1,x2,x3,… … ..,xn} be the arrangement of information focuses and V = {v1,v2,… … .,vc} be the arrangement of focuses.
- Randomly select 'c' cluster centers.
- Compute the distance between every information point and group focuses.
- Appoint the information highlight the group community whose separation from the bunch place is least of all the group habitats.

Recalculate the new group community utilizing:

Where 'ci' represents the number of data points in ith cluster.

- Recalculate the distance between every information point and new acquired group habitats.
- In the event that no information point was reassigned, stop, in any case rehash from stage 3
- Following is the way an ordinary k methods calculation

Output Look: Fig 3

- K-Nearest Neighbours (KNN) – Is used for both classification and regression. This algorithm assumes that similar/related data is always found close to one another. i.e "Birds of a feather flock together". To successfully execute the algorithm: • Firstly we initialise "K" to a chosen number of neighbours.
  - Then for each data point
  - Calculate the distance (generally Euclidean distance) between query point and current point.
  - Add the distance and index to a sorted list and sort by distances.
  - Choose the first 'k' entries, and the corresponding labels.
  - If regression, then return the mean of selected 'k' labels.
  - If classification, then return the mode of 'k' selected labels.

Following is how KNN output looks for a typical dataset: Fig 4

- Naïve Bayes Classifier – It functions on the theory of mathematics known as the Bayes theorem. The Bayes theorem operates on the conditional probabilities of events (probability of an event, given that some other event has already occurred). We can test different hypotheses using this and deduce conclusions. Bayes' Theorem is stated as:

$$P(h/d) = (P(d/h) * P(h)) / P(d)$$

Where,

  - P(h|d) is the likelihood of theory h given the information d.This is known as posterior probability.
  - P(d|h) is the likelihood of information d given that the theory h was valid.
  - P(h) is the likelihood of theory h being valid (paying little mind to the information). This is known as the prior probability of h.
  - P(d) is the probability of the data (regardless of the hypothesis)
  - The class having greatest likelihood is assessed as the most appropriate class.
  - This is also known as Maximum A Posteriori (MAP).
  - The MAP for a hypothesis is: o $MAP\ (H) = \max\ P((H|E))$
    - $MAP\ (H) = \max\ P((H|E)\ *\ (P(H))\ /P(E))$
    - $MAP\ (H) = \max(P(E|H) * P(H))$ o $P\ (E)$ is evidence probability, and it is used to normalize the result. The result will not be affected by removing (E)

- Decision trees – It is a supervised learning algorithm which is widely used for problems with classification. Decision trees break data continuously into two or more homogeneous collections, To make as separate/separate groups as possible at each division, based on some pre-decided more significant/important variables. It is important to note that while decision trees are relatively easy to understand and use, they are easy to get over-fit.
- Random forests – Decision trees appear to get over-fitted, as already described, and thus need additional adjustments to operate correctly. Random woods are used in order to prevent that. We therefore use a large number of such decision trees instead of using a single decision tree, which decreases entropy and thus increases the accuracy of the prediction made. Random forests minimize and increase errors caused by missing data.

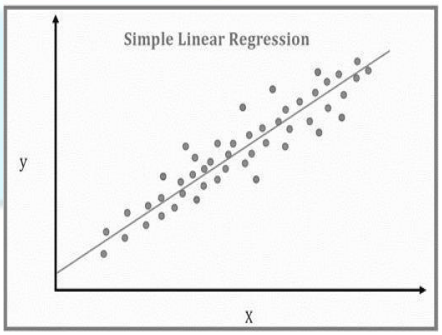


Fig 1 Linear Regression

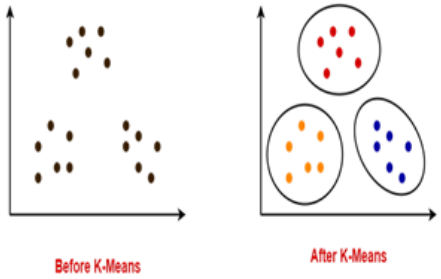


Fig 2 K-Means Clustering

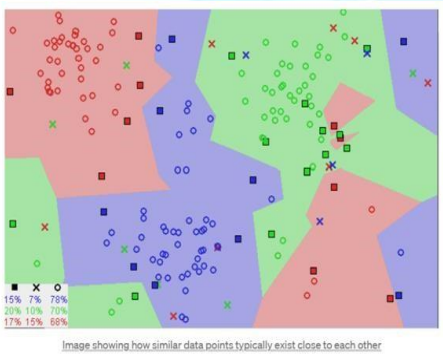


Fig 3 KNN Clustering

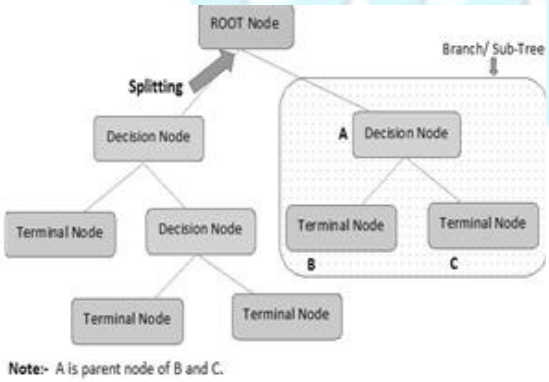


Fig 4 Decision Tree

A food ordering system is proposed that smartly maintains track of user orders. Basically, for our college canteen, we introduced a food ordering system in which users order or make custom food by one click only, and our website also recommends the dish that is common in a specific college canteen store. In the central database, these order information are modified. The owner of the restaurant can easily handle the menu modifications.

Delivery may sound like a nice-to-have, but studies show that delivery of food on campus is now the preferred choice for students. Offering distribution to college campuses helps you to tap the high demand during exam time and during the academic year, without leaving you on the hook during the summer when the orders from the college campuses dry up for huge facility expenditures and staff fees. Many successful delivery-only restaurants recruit most of their college campus employees, enabling them to change their staff and order volume along with the students' return in the fall. Lastly, and perhaps most critically, the distribution of campus food has a profound impact on the capacity of students to learn. When relaxed and able to concentrate, students learn more, and instead of taking time away from learning to visit.Focus on various aspects such as:

- Bring several existing frameworks together.
- They will be restructured and re-focused on these structures.
- In a coordinated way, they will be applied.
- Many components are only process enhancements at minimal cost.

4. Methodology

The simulation first starts with the customer entering his/her credentials (name, ID and password). Once that has been verified, the customer can place an order specifying the quantity of the food required. Now we get a window that displays the order number, customer ID, food name, price and quantity. Once the customer finalizes his/her order, they are redirected to the payment window where the total price is displayed and the customer can select the payment method of their choice and then the customer gets a message of confirmation of order.

The above mentioned simulation flow is with respect to the customer's point of view. Now if you are an admin, you can select the normal login option and enter the admin credentials (email ID and password). Once you enter the admin portal, you get the option of adding food, deleting food or updating food. Any option of choice leads you to the food menu. Once the selected operation is carried out, the end result, i.e, the added food or the updated food list is displayed and if you have deleted a food, that particular food disappears from the main menu.

5. Problem Statement

Many restaurants manually store all of their records. They have a large number of clients on a regular basis. Because of the large number of clients, they need the assistance of these features so that they can manage and store accurately. It is difficult for executives to view the desks, orders, kitchen, reception and the counter simultaneously.

In order to manage their day-to-day transactions, orders and frequent updates on papers, cash transactions, daily staff reports, customer reviews, etc., they need full-fledged software. In the current method, it takes a lot of time to input all the data manually, and there are often possibilities for errors.

5.1. Feasibility Study

We have researched the following key categories of feasibility research in terms of feasibility study and review during the development of the project food delivery system.

- Operational Feasibility: This is the indicator of how well the project during the operating process can benefit the client and the service provider.
- Technical Feasibility: The feasibility of a given technological solution and the availability of technical resources are evaluated. Technical feasibility deals specifically with the dilemma of whether or not the proposed method or technology is actually feasible.
- Economic feasibility: It is the measure of cost effectiveness of a project, called as cost benefit analysis.

5.2. Merits of proposed System

The online ordering trend is exploding and for good reason. Below are a list of benefits and advantages that you gain from using such a system

- It is going to help college's students and faculties a lot.
- Online ordering system helps in saving time of students and faculties.
- Making and keeping an incredible looking menu that will drive your clients to

arrange from you each time they see it is a lot less complex and altogether less expensive (or even allowed) to fabricate and keep up.

- There is no bottleneck with staff availability slowing down order taking. These benefits have a tremendous impact on your store efficiency which will lead to greater sale.
- nline ordering system is only one click away.
- Your eatery probably won't be open every minute of every day, except your internet requesting framework definitely is.

Flow diagram:

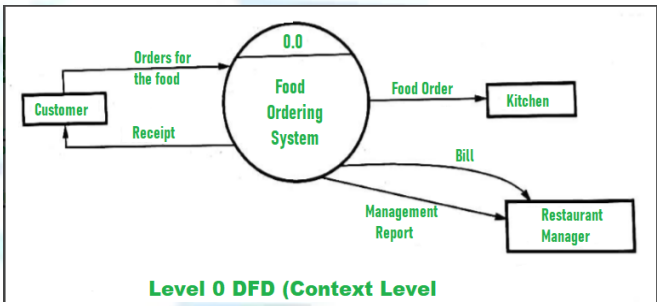
Food Ordering System is a form of software that enables restaurant managers to handle and accept orders put over the Internet or in the restaurant. Let's use DFD to find out how the food ordering system functions (Data Flow Diagram). Below is the DFD for the Food Ordering System.

Different levels of DFD for Food Ordering System are seen here, such as Level 0 DFD, Level 1 DFD, and Level 2 DFD.

Level 0 DFD –

The system's input and output are shown at this level. With input and output at this stage, the system is developed and built all over the world.

- Recommendation system helps customer to
- reorder their favourite things, not needing to wait in a line and no errors in their orders.
- Clients can arrange rapidly or can set aside an exceptionally long effort to choose. Not, at this point an issue for you. Changing the concentration from disconnected requesting to internet requesting implies less problem on taking care of uncertain calling customers and the staff time lost all the while.
- Easy to handle customers.



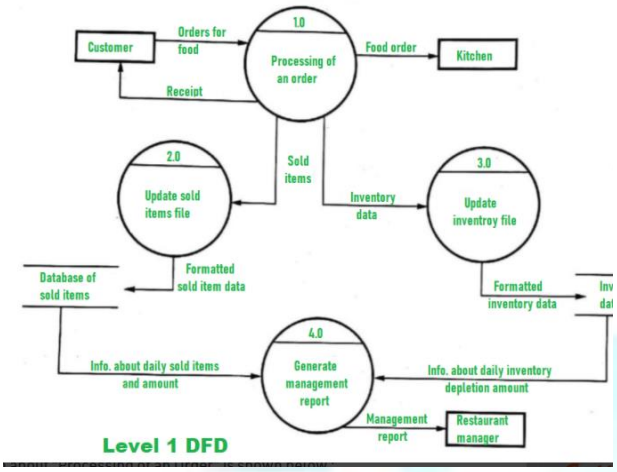
Level 0 DFD (Context Level

- Food order is input as the customer's order for food.

For further processing the order, the food order is passed to the kitchen.

Level 1 DFD –

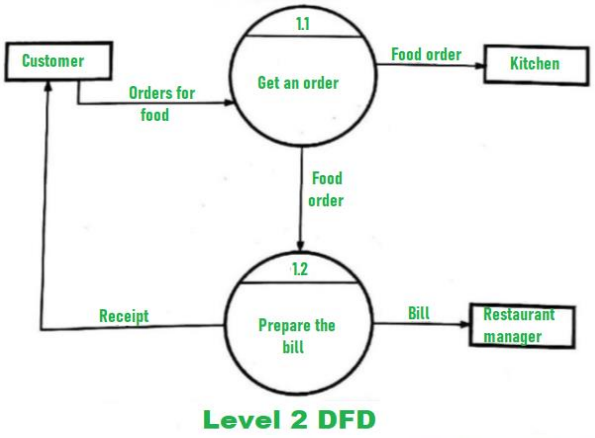
Phase 1.0 is in charge of handling the order at Level 1 DFD. Processes 2.0, 3.0, and 4.0 reflect the housekeeping tasks involved in food. The list of items that are available 'in-stock' should be maintained by keeping the inventory data (describes the records of datasets s) and accurate information about regular sold items should be available to establish and report management.



Finally, a management report can be easily prepared using the amount of daily sold goods and daily inventory depletion. This management report is also sent to the restaurant manager.

Level 2 DFD –

This will show the detailed view about "Processing of an Order".



The above snapshot shows the index page of

Result:

Following are the results that one can draw from this

System:

i.People can successfully order the food using the proposed system.

ii. There will be a lesser requirement of staff at the back counter.

iii. The system will help in reduction of labour cost involved and also reduces the space required to set up cafeterias in the restricted area.

iv. As it is an automated system it is less probable to make any mistakes.

v. The customers can avoid the long queues at the counter, with a reasonable speed of execution and maximum throughput.

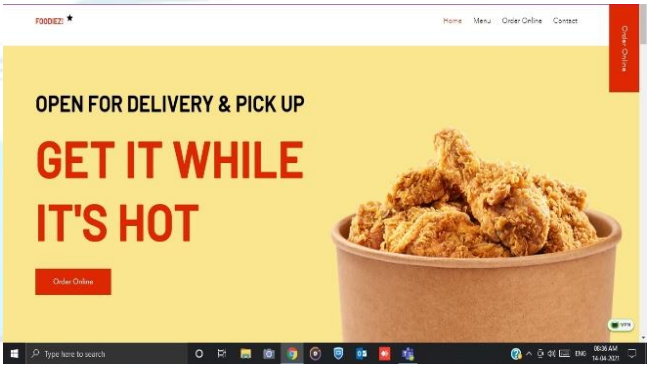
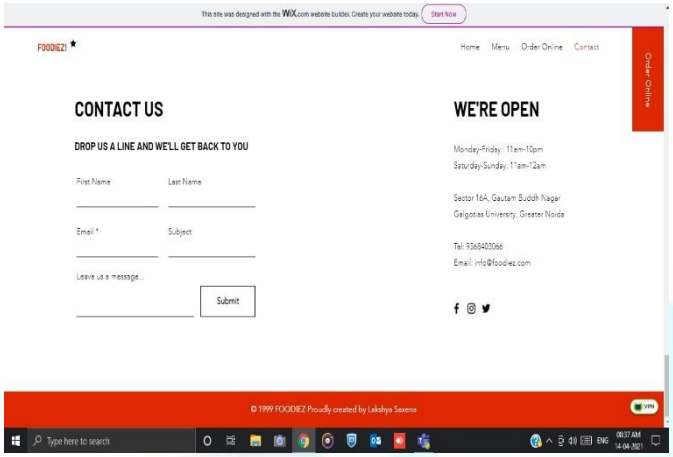


Fig1:- Will show the snap shot of various stages of the food ordering system:

Food Plaza, which provides various navigation buttons

To reach other page.



The above snapshot shows the contact page and

Helps the new user to contact in case of any problem.

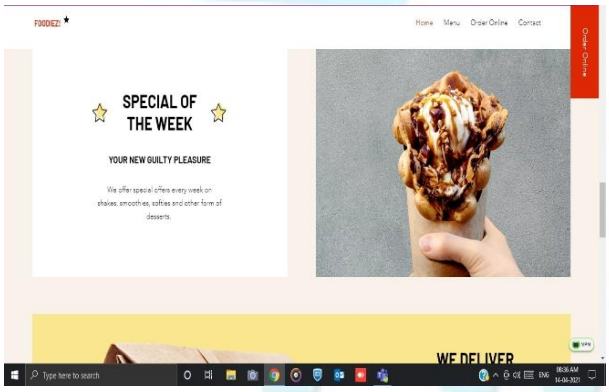


Fig2:- Address and other contact details to help customers reach / order

Fig3:- Special of the weeks - with the help of reviews website will show the specials for the week.

Conclusion:

An online food ordering system is developed where the Customers can make an order for the food and avoid the Hassles of waiting for the order to be taken by the waiter.

Using this application, the end users register online, read the E-menu card and select the food from the e-menu card to Order food online. Once the customer selects the required Food item the chef will be able to see the results on the Screen and start processing the food. This application Nullifies the need of a waiter or reduces the workload of the Waiter. The advantage is that in a crowded restaurant there Will be chances that the waiters are overloaded with orders And they are unable to meet the requirements of the Customer in a satisfactory manner. Therefore by using this Application, the users can directly place the order for food to the chef online.

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