A Project Report on

Grocery Recommendation System

Submitted in partial fulfillment of the requirements

in

Computer Engineering

by

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Approval Sheet

This Project Report entitled ***"Grocery Recommendation System"*** Submitted by ***"Asmita Shelke" (17102005), "Chirag Sable" (17102019), "Gaurav Samant" (17102050)*** is approved for the partial fulfillment of the requirement in ***Computer Engineering*** from ***University of Mumbai*** .

Prof. Rahul Ambekar

Guide

Prof. S.H.Malave

Head, Computer Engineering Department

Place: A.P.Shah Institute of Technology, Thane
Date:

CERTIFICATE

This is to certify that the project entitled ***"Grocery Recommendation System"*** submitted by ***"Asmita Shelke" (17102005), "Chirag Sable" (17102019), "Gaurav Samant" (17102050)*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Computer Engineering***, to the University of Mumbai, is a bonafide work carried out during the academic year 2020-2021.

Prof. Rahul Ambekar
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Prof. S.H.Malave
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Place: A.P.Shah Institute of Technology, Thane
Date:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that We have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Contents

1. Project conception and initiation

1.1 Abstract

In this project we are planning to make a web application which will include a search engine like structure. In this search engine you can search for any particular product, For example: Dettol Hand-wash. You will get options of the stores in your locality selling Dettol hand-wash along with the retail price at each store. This system will make it easier for us to locate the same item available at a cheaper price at our nearest stores. Moreover, using recommendation system which will be implemented based on Market Basket Analysis Algorithm, will help recommend the customers about other similar products which are of better quality, healthier options for food products or cheaper alternatives. This system will help customers to get good deals on products and also not compromise on the product they are looking for.

1.2 Objectives

- Making ordering groceries easy and convenient.
- No need to compromise on brand user prefers for any product.
- Recommending user related items to the ones purchased by user.
- Recommending user healthier alternatives.

1.3 Literature review

Full stack web development – Development of both client and server software using front end HTML, CSS, JQuery and backend using SQL Database.

Recommendation system – We plan to build a recommendation system for the grocery application using collaborative filtering. Collaborative Filtering is the most common technique used when it comes to building intelligent recommender systems that can learn to give better recommendations as more information about users is collected.

Dataset- To experiment with recommendation algorithms, you'll need data that contains a set of items and a set of users who have reacted to some of the items. While working with such data, you'll mostly see it in the form of a matrix consisting of the reactions given by a set of users to some items from a set of items.

1.4 Problem Definition

Online grocery shopping becomes more and more popular in recent years.
To facilitate the purchase process, many online stores provide a shopping recommendation system for their consumers. So far, the generic recommendation systems mainly consider preferences of a consumer based on his/her purchase histories. Here we focus on providing the above including recommendation system which compare the same products, but from different shops in the vicinity.

1.5 **Scope**

This project is a web application, but it can be modified to be a android application which will make the process of ordering groceries easier. Moreover, better models of recommendation can be implemented which can improve the accuracy and provide relevant recommendation to the users. The application can be developed in a way where the user can subscribe to certain products, and these products will be added to the cart on a monthly or quarterly basis automatically.

1.6 **Technology stack**

The technology stack used for the project will be :

- HTML
- CSS
- JQuery
- MySQL Datbase
- Collaborative Filtering
- Python using Anaconda

1.7 **Benefits for environment and society**

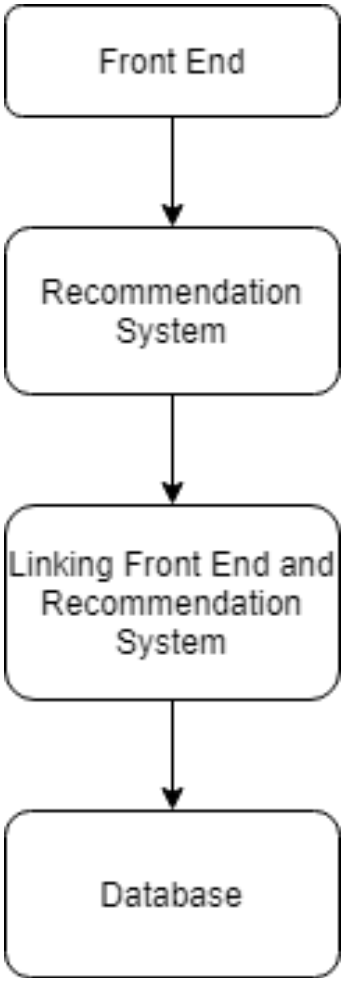
- This project will make ordering groceries easy especially during pandemic times and also will help for elders who cannot step out frequently.
- This project will also make sure you do not compromise on the brand you prefer.

2. Project Design

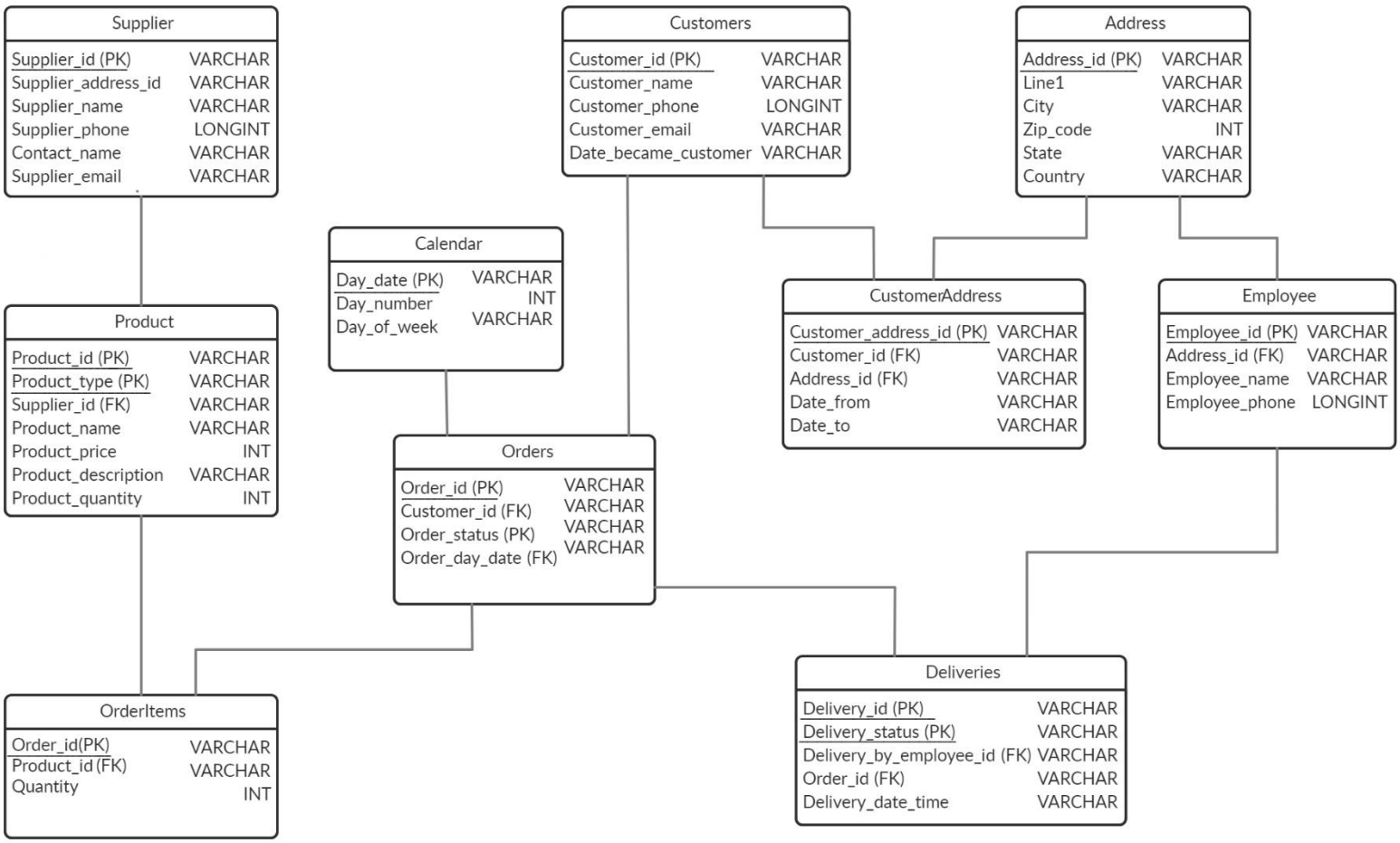
2.1 **Proposed System**

This project will be a web application-based project. It will have a search engine-based feature in which if you search for a particular product, you will get the options of that product available in different stores around your locality. A recommendation system will be introduced, which will recommend the customers about other better quality products, healthier or cheaper.

2.2 **Design (flow of modules)**



2.3 **Class Diagram**



2.4 **Modules**

Module 1 – Front End

This module contains all the visual representation of the website. MS Visual Studio will be used to build it.

Module 2 – Recommendation System

This module will uphold the recommendations given to the user based on his purchases and interests. Accordingly, the products will be shown.

Module 3 – Database System

This module will have the all the information which is entered by the user while interacting with the website. It will also store the user's account information. The database system will hold all the product details and quantity which will be updated based on the users purchase.

3. Planning for next semester

As we have completed the planning of all the required modules and implemented the database module, we intend to further complete the recommendation system module and website (frontend-backend development) module thereby integrating these modules and thus, verifying the working of our overall project and finally complete our proposed system by meeting all the requirements, modules and functionalities as proposed by us in our report.

References

1. *https://scihub.wikicn.top/10.1109/HICSS.2016.450/*
Why Consumers Go to Online Grocery: Comparing Vegetables with Grains

This study investigates factors affecting the adoption of online grocery shopping and online grocery purchase amount based on the theories of innovation classification scheme, food related lifestyle, and product heterogeneity. Using real purchase data from 732 consumer households, logit regression and linear regression with Box-Cox transformation were conducted to accomplish the goals of this study. This study found that the effect of convenience variables and food related lifestyle variables varies across the context (adoption vs. post-adoption) and product categories. Interestingly, the time requirement to access offline grocery markets, one of the convenience variables, had no effect on the adoption of online grocery shopping. However, it did affect the online grocery purchase amount. This study identified the factors that affect the adoption of online grocery shopping and the purchase amount of online groceries. In the context of adoption, FRL variables, specifically quality aspects, affect the probability to adopt online grocery shopping. The convenience variables had no influence on the adoption of online grocery shopping. However, time required to access the offline market did have an effect on the online purchase amount of grain.

2. *http://tiny.cc/6nq6tz/*
Grocery Shopping Recommendations Based on Basket-Sensitive Random Walk

While recommender systems have been widely studied, this is mostly in relation to leisure products (e.g. movies, books and music) with non-repeated purchases. In grocery shopping, however, consumers will make multiple purchases of the same or very similar products more frequently than buying entirely new items. The proposed recommendation scheme offers several advantages in addressing the grocery shopping problem, namely: 1) a product similarity measure that suits a domain where no rating information is available; 2) a basket sensitive random walk model to approximate product similarities by exploiting incomplete neighbourhood information; 3) online adaptation of the recommendation based on the current basket and 4) a new performance measure focusing on products that customers have not purchased before or purchase infrequently. Empirical results benchmarking on three real-world data sets demonstrate a performance improvement of the proposed method over other existing collaborative filtering models. This paper proposes a basket-sensitive random walk model for personalized recommendation in the grocery shopping domain.

3. https://sci-hub.se/https://ieeexplore.ieee.org/document/8646645
Recommender Systems Challenges and Solutions Survey

A recommender system is an important research field today. Today's Recommender system is a relatively new area of research in machine learning. The recommender system's main idea is to build a relationship between the products and users and select the most appropriate product for a specific user. There are four main ways that recommender systems produce a list of recommendations for a user – content-based, Collaborative, Demographic, and hybrid filtering. In content-based filtering, the model uses specifications of an item to recommend additional items with similar properties. Collaborative filtering uses past behavior of the user like items that a user previously viewed or purchased, In summation to any ratings the user gave those items rate and similar conclusions made by other user's items list. To predicts items that the user may find

interesting. Demographic filtering is view user profile data like age category, gender, education, and living area to find similarities with other profiles to get a new recommender list. Hybrid filtering combines all three filtering techniques. This paper introduces a survey about recommendation systems, techniques, challenges the face of recommender systems, and list some research papers to solve these challenges.

4. https://ieeexplore.ieee.org/document/6630420/
A Combined Predictor for Item-Based Collaborative Filtering.

Collaborative filtering is one of the most important technologies in recommender systems, making predictions about user preferences for products or services by learning known user-item relationships. This paper introduces a new idea that incorporates the item-based nearest-neighbor model within slope one. In this paper, slope one and item-based nearest-neighbor collaborative filtering algorithms are analyzed on the MovieLens dataset. In order to obtain better accuracy and rationality, a new combined approach is proposed that takes advantage of slope one and item-based nearest-neighbor model. In addition, simple gradient descent and bias effect is taken into consideration to improve performance further. Finally, some experiments are implemented on the dataset. The experimental results show that the proposed final solution achieves a great improvement of prediction accuracy compared to the method of using slope one or item-based nearest-neighbor model alone.

5. https://www.sciencedirect.com/science/article/pii/S1877050915023431
Recommendation System for Grocery Store Considering Data Sparsity

In recommending product items in grocery stores, data sparsity is a problem. This is because individual customers only purchase very few of the total number of product items a store sells. In grocery stores, large-scale transaction data with identification, such as point of sales (POS) data, is being accumulated as a result of the introduction of frequent shopper programs. Although the recommendations based on this data are often adopted in e-commerce shopping stores 3, they are rarely introduced in face-to-face selling, such as in brick-and-mortar grocery stores. Therefore, introducing a system based on these recommendations to grocery stores could induce customers to visit the store to make a purchase. When recommendation systems are applied to grocery stores, the sparsity of evaluation values can be a problem. This paper proposes two recommendation systems (a) direct recommendation and (b) two-step recommendation of product items based on stored POS data considering the sparsity of data. Two-step recommendation is composed of product category recommendation by using a recommendation algorithm and product item recommendation by heuristic decision of store manager.