

# Chapter 1

## INTRODUCTION

A recommender system refers to a system that is capable of predicting the future preference of a set of items for a user, and recommend the top items. One key reason why we need a recommender system in modern society is that people have too much options to use from due to the prevalence of Internet. In the past, people used to shop in a physical store, in which the items available are limited. For instance, the number of movies that can be placed in a Blockbuster store depends on the size of that store. By contrast, nowadays, the Internet allows people to access abundant resources online. Netflix, for example, has an enormous collection of movies. Although the amount of available information increased, a new problem arose as people had a hard time selecting the items they actually want to see. This is where the recommender system comes in.

Traditionally, there are two methods to construct a recommender system:

- **Content-based recommendation**
- **Collaborative Filtering**

The first one analyses the nature of each item. For instance, recommending poets to a user by performing Natural Language Processing on the content of each poet. Collaborative Filtering, on the other hand, does not require any information about the items or the users themselves. It recommends items based on users' past behaviour. Collaborative filtering models use the collaborative power of the ratings provided by multiple users to make recommendations. The main challenge in designing collaborative filtering methods is that the underlying ratings matrices are sparse. Consider an example of a movie application in which users specify ratings indicating their like or dislike of specific movies. Most users would have viewed only a small fraction of the large universe of available movies. As a result, most of the ratings are unspecified. The specified ratings are also referred to as observed ratings. Throughout this book, the terms “specified” and “observed” will be used in an interchangeable way. The unspecified ratings will be referred to as “unobserved” or “missing.” The basic idea of collaborative filtering methods is that these unspecified ratings can be imputed because the observed ratings are often highly correlated across various users and items.

## Chapter 2

# LITERATURE SURVEY

Recommender systems (RS) which use data mining and information filtering techniques to provide products, services and information to potential customers have attracted a lot of attention of researchers. It has been regarded as an important tool to solve the information overload problem. While RS being originally a field dominated by computer scientists and is now a topic of interest also for mathematicians, physicists, and psychologists. [1]

The basic models for recommender systems work with two kinds of data, which are (i) the user-item interactions, such as ratings or buying behavior, and (ii) the attribute information about the users and items such as textual profiles or relevant keywords. Methods that use the former are referred to as collaborative filtering methods, whereas methods that use the latter are referred to as content-based recommender methods. [2]

Recommended third generation systems are now at the very beginning of their development. The main innovation of such systems is their orientation to semantic models of representation and use of knowledge, in particular, knowledge about the user's personal profile. At present, the most natural and most developed way of formalizing semantic categories, which are usually used in decision-making processes, is ontology. For this reason, in modern and future systems, which are called third-generation recommender systems, ontology is viewed as a general framework for presenting diverse and diverse types of knowledge. Examples of such knowledge are, for example, knowledge of the user's personal profile, the context of decision making, the emotional state of the user when making a decision [3,4]

Two basic paradigms involved in generating recommendations for any recommender systems are collaborative Filtering and content-based filtering. Collaborative filtering [5] is a technique that uses information of a user like ratings or purchases made by the user to other users of the site who have a similar taste. This can be done either matching a similarity between users or items. The two approaches have been given the names User based collaborative filtering and Item based collaborative filtering. You tube and amazon recommends items based on item to item collaborative filtering. [6]

## **Chapter 3**

# **PROBLEM STATEMENT**

### **3.1 Existing System**

A recommender system helps people who do not have sufficient personal experience to evaluate the number of alternatives offered by a Website. It provides consumer with the information to help them decide which option to choose among related options. The proposed work is different from existing recommender systems since the existing only considers recommending the places based on user ratings of item or nearby location. It doesn't recommend items when ratings for an item are not available or based on the cuisines preferred by the user.

### **3.2 Limitations of Existing System**

The existing system taken into consideration is Zomato, an online portal to discover places to dine out. It only recommends places to users only when ratings are available. It also does not take into account the interests of the user wherein places based on a user's history are not recommended but rather the ones in the radius of the user. The results are also less accountable as there is no assurance that the recommendations are based on the personal interest of the user such as her preferred cuisine.

### **3.3 Proposed System**

The proposed system is a restaurant recommender system which uses content based and collaborative filtering to provide recommendations based on ratings provided by other similar users and the browsing history of the current user. New users are provided with a quiz to better understand their preferences. Intermediate users are provided with recommendations based on their very few yet reliable ratings. Users who have rated more than three places are provided suggestions using collaborative filtering algorithm. Sign up and sign in features are also provided to gauge the users' interests more accurately. The required data for the system is obtained by scraping similar websites.

### **3.4 Advantages of Proposed System**

The proposed work is different from existing recommender systems since the existing only considers recommending the places based on user ratings of item or nearby location. It doesn't recommend items when ratings for an item are not available or based on the cuisines preferred by the user. The following highlight the advantages of the proposed system.

- Higher algorithm performance
- More accurate results
- No need of initial ratings by the user

## **Chapter 4**

# **REQUIREMENT ANALYSIS AND FEASIBILITY STUDY**

### **4.1 Functional Requirements**

- Comparing SVD and SVD++ algorithms.
- Creating sparse matrix from test data frame and finding PDF and CDF of ratings.
- Implementing utility modules required for algorithm implementation.
- SVD matrix factorization with user place interactions and implicit feedback.

### **4.2 Non-Functional Requirements**

- Improved accuracy of the system due to better recommendations
- Improved performance as user interest is taken into account

### **4.3 Hardware Requirements**

- System : Pentium IV 2.4 GHz
- Hard disk : 500 GB
- RAM : 4 GB

### **4.4 Software Requirements**

- Operating system : Window 7/higher
- Programming language : Python
- IDE : Spyder
- Database : MongoDB