

# ITEM TO ITEM BASED RECOMMENDATION BASED ON PRODUCT DESCRIPTION

**Dr.M.Rajeswari <sup>1</sup>**

**Assistant Professor**

**Department of B.Com Business Analytics**

**PSGR Krishnammal College for Women, Coimbatore, India**

[rajeshwarim@psgrkcw.ac.in](mailto:rajeshwarim@psgrkcw.ac.in)

**S. Taraka <sup>2</sup>**

**UG Scholar**

**Department of B.Com (Business Analytics),**

**PSGR Krishnammal College for Women, Coimbatore, India.**

[tarakasakthivel@gmail.com](mailto:tarakasakthivel@gmail.com)

## ABSTRACT:

Buying patterns are habits and routines that consumers establish through the products and services they buy. Sentiment analysis which is also referred to as opinion mining is an approach to natural language processing that identifies the emotional tone behind a body of text. Item to item base recommendation based on product description refers to recommendation of items to consumers based on the description of products. This can be used by many businesses effectively to make consumers buy more of their products by recommending items that might be of interest to the consumers. It is also useful to consumers in easily finding items that they need in the vast arena with large quantity of products. This study focuses on recommendation of items to customers based on their interests. The items that have the highest chances of being liked and preferred by the customer are being recommended based on their past buying patterns.

**Keywords:** Buying pattern, Sentiment analysis, item to item based recommendations.

## I. INTRODUCTION

Item to item base recommendation based on product description operates with the product description given to each item as its base. K-means can be used for certain calculations. Item-item collaborative filtering is a type of recommendation system that is based on the similarity between items calculated using the rating users have given to items. The first step is about build a model by finding similarity between the descriptions given to items. The similarity between the descriptions of pairs can be found in different ways. The second stage is about presenting a recommendation to the consumer. Therefore, most of these recommendations are about predicting the needs of the consumer. Recommender system or recommendation system is a subclass of information filtering systems that predict the items the user may be interested in based on the user past behaviour. Collaborative filtering is one such recommendation technique that filters items of user interest based on similarities. Recommendations can provide businesses with the opportunity to better understand the expectations of a customer is in order to satisfy them, add value, and improve the overall image of the brand. It can also help in improvement of customer services. Sometimes, the history of one user might be coupled with various user histories to recommend common products that might interest the consumer. Even though item to item recommendation system is has its own disadvantages, it is hard to deny that it has been a great break through for many businesses especially in the e-commerce sector.

## II. OBJECTIVES

The main objective is to present an item to item based recommendation system based on product description. First the datasets are collected. The unwanted data from these datasets are removed and the dataset is modified as per requirements. The items in the collected dataset are product id, user id, product description, ratings and price along with count of products. K-means are used to find which items best suits the interest of consumers and can be recommended. Visualisations are made in Google Colab by using k-means. This gives the results on the products that can be recommended based the buying pattern of the consumer. The descriptions of product that can be recommended are displayed as output.

## III. RELATED WORKS

Recommender systems apply knowledge discovery techniques to the problem of making personalized recommendations for information, products or services during a live interaction. These systems, especially the k-nearest neighbour collaborative filtering based ones, are achieving widespread success on the Web. The tremendous growth in the amount of available information and the number of visitors to Web sites in recent years poses some key challenges for recommender systems. These are: producing high quality recommendations, performing many recommendations per second for millions of users and items and achieving high coverage in the face of data sparsely. In traditional collaborative filtering systems the amount of work increases with the number of participants in the system. New recommender system technologies are needed that can quickly produce high quality recommendations, even for very large-scale problems. To address these issues we have explored item-based collaborative filtering techniques. Item based techniques first analyze the user-item matrix to identify relationships between different items, and then use these relationships to indirectly compute recommendations for users. [3]

Collaborative filters help people make choices based on the opinions of other people. Group Lens is a system for collaborative filtering of net news, to help people find articles they will like in the huge stream of available articles. News reader clients' display predicted scores and makes it easy for users to rate articles after they read them. Rating servers, called Better Bit Bureaus, gather and disseminate the ratings. The rating servers predict scores based on the heuristic that people who agreed in the past will probably agree again. Users can protect their privacy by entering ratings under pseudonyms, without reducing the effectiveness of the score prediction. The entire architecture is open: alternative software for news clients and Better Bit Bureaus can be developed independently and can interoperate with the components we have developed. [4]

Nowadays e-commerce has spread all over the world. The e-shops are not similar to the physical shops. The e-shops can have hundreds or thousands of items independent of physical boundaries. The information about all these products is available on the Internet. So now customer is overloaded with information. Recommendation System finds users interest by utilizing implicit or explicit user's action on the e-commerce website and recommends items that best matches user's preferences. In this way RS helps in alleviating information overload problem. The two mainstream recommendation systems are Content Based Filtering and Collaborative Filtering. The CBF recommends items that have similar characteristics as items used by the user in the past. The CF creates a group of similar users and recommends items to the target user which is preferred in his group. Another variant of collaborative filtering finds and recommends items similar to items rated by the user, it is known as Item based Collaborative Filtering. [1]

Grouping people into clusters based on the items they have purchased allows accurate recommendations of new items for purchase: if you and I have liked many of the same movies, then I will probably enjoy other movies that you like. Recommending items based on similarity of interest is attractive for many domains. A formal statistical model of collaborative filtering and compare different algorithms for estimating the model parameters includes variations of K-means clustering and Gibbs Sampling. This formal model is easily extended to handle clustering of objects with multiple attributes. [7]

Recommender systems are being used by an ever-increasing number of E-commerce sites to help consumers find products to purchase. What started as a novelty has turned into a serious business tool. Recommender systems use product knowledge - either hand-coded knowledge provided by experts or "mined" knowledge learned from the behaviour of consumers - to guide consumers through the often-overwhelming task of locating products they will like. [6]

A recommendations Service recommends items to individual users based on a set of items that are known to be of interest to the user, Such as a set of items previously purchased by the user. In the disclosed embodiments, the Service is used to recommend products to users of a merchant's Web site. The Service generates the recommendations using a previously-generated table which maps items to lists of "similar" items. The similarities reflected by the table are based on the collective interests of the community of users. To generate personal recommendations, the Service retrieves from the table the similar items lists corresponding to the items known to be of interest to the user. These Similar items lists are appropriately combined into a single list, which is then sorted and filtered to generate a list of recommended items. [5]

Recommender systems play the role of leading users to customized suggestions in the broad universe of available possibilities. While producers use it for cross-selling, which suggests additional products or services to customers, consumers use recommender systems to seek items that match their interests and preferences. By establishing a value-added relationship between the system and the customer, recommender systems boost loyalty. In present e-commerce systems, user pattern search, item, and historical analysis are a substantial component of a recommendation system. A better recommendation system based on product specifications and product similarity measures rather than historical data could lead to a progressive change in e-commerce recommendation technologies. This paper proposes a model that uses product specifications and various similarity measures to compute the user recommendations. The model considers product description and specifications to calculate a similarity measure and then uses these similarity values to form clusters of products. Based on the generated cluster of products, relevant products are recommended to the user. [2]

## IV. METHODOLOGY

### A. PROPOSED SYSTEM

**STEP 1:** Dataset was imported, modified and saved in Excel.csv format.

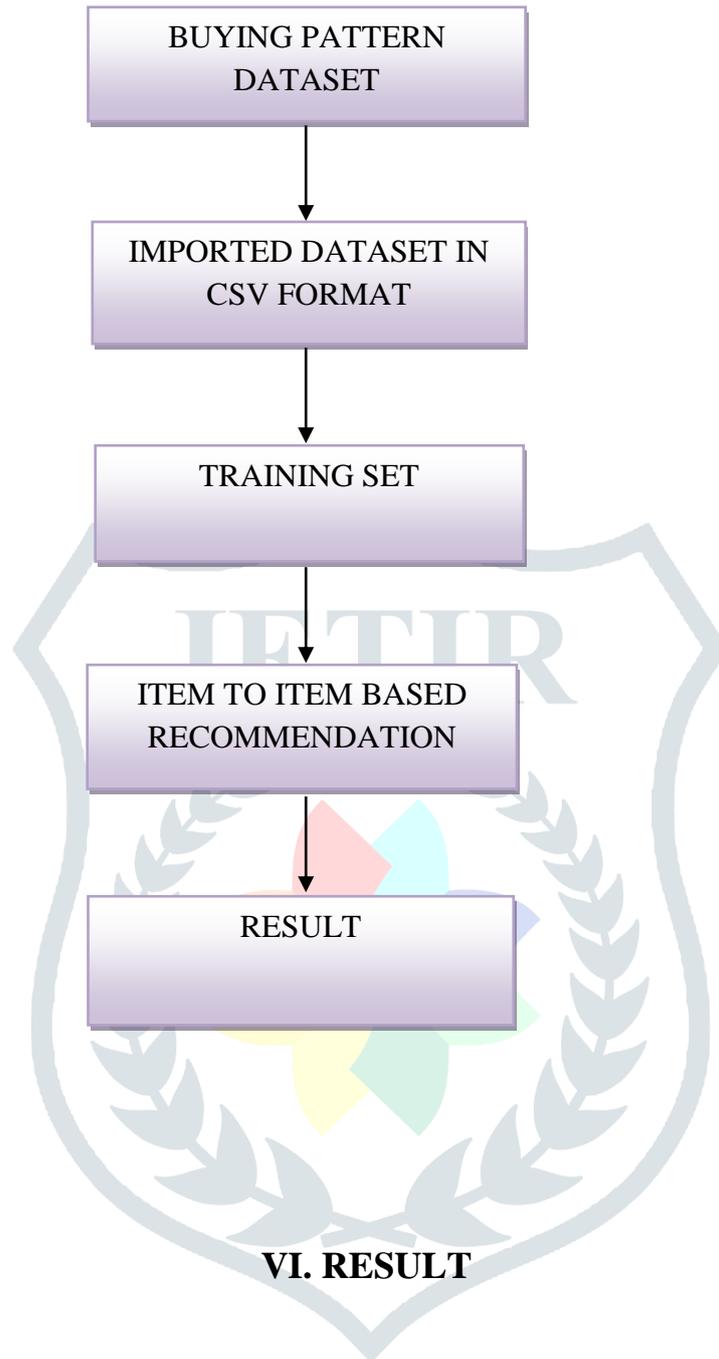
**STEP 2:** Executed Python coding using Google Colab and all unwanted data was removed from the dataset.

**STEP 3:** The dataset is then split into training and testing datasets.

**STEP 4:** Google Colab is used for visualisation for better understanding of dataset.

**STEP 5:** The results of the visualising were used for item to item based recommendation based on product description.

### V. WORKFLOW



### VI. RESULT

```

[29] # missing values
data = data.dropna()
data.shape
data.head()

   UserId  ProductId  Rating  UnitPrice  Quality  Timestamp  Price(Rs)  product_description
0  A39HTATAQ9V7YF  205616461    5      2.55      6  1369699200    1200.0  Not only do angles make joints stronger, they ...
1  A3JM6GV9MNOF9X  558925278    3      3.39      6  1355443200     200.0  BEHR Premium Textured DECKOVER is an innovativ...
2  A1Z513UWSA00F  558925278    5      2.75      8  1404691200    1000.0  Classic architecture meets contemporary design...
3  A1WMR494NWEVV  733001998    4      3.39      6  1382572800     350.0  The Grape Solar 265-Watt Polycrystalline PV So...
4  A3IAAVS479H7M7  737104473    1      3.39      6  1274227200    5000.0  Update your bathroom with the Delta Vero Singl...

[30] product_descriptions1=data

[36] product_descriptions1 = product_descriptions1.head(500)
# product_descriptions1.iloc[:,1]
product_descriptions1["product_description"].head(11)

0  Not only do angles make joints stronger, they ...
1  BEHR Premium Textured DECKOVER is an innovativ...
2  Classic architecture meets contemporary design...
3  The Grape Solar 265-Watt Polycrystalline PV So...
4  Update your bathroom with the Delta Vero Singl...
5  Achieving delicious results is almost effortle...
6  The Quantum Adjustable 2-Light LED Black Emerg...
7  The Teks #10 x 1-1/2 in. Zinc-Plated Steel Was...
8  Get the House of Fara 3/4 in. x 3 in. x 8 ft. ...
9  Valley View Industries Metal Stakes (4-Pack) a...
10 Recycler 22 in. Personal Pace Variable Speed S...
  
```

Fig: 1

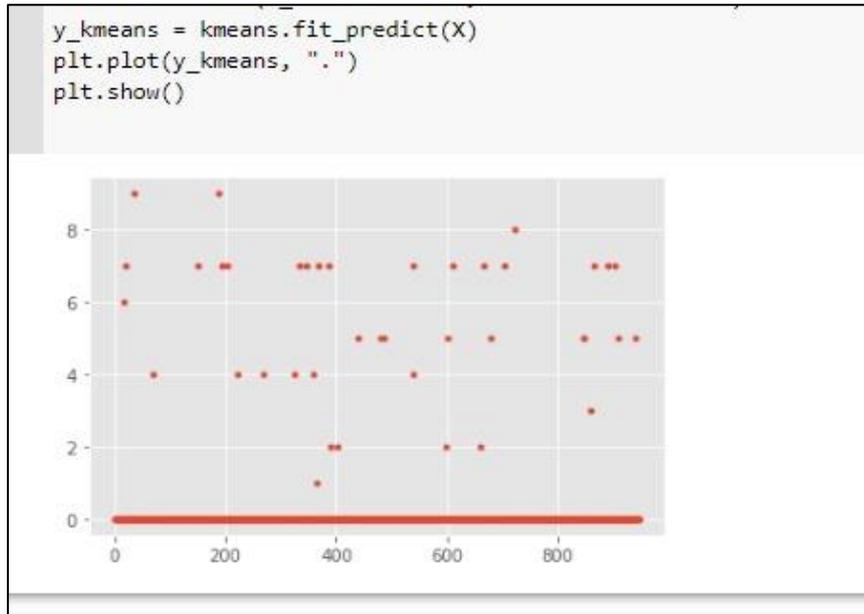


Fig: 2

|           |            |            |            |            |            |            |            |            |      |            |            |            |            |            |            |      |      |      |
|-----------|------------|------------|------------|------------|------------|------------|------------|------------|------|------------|------------|------------|------------|------------|------------|------|------|------|
| ProductId | 1304139212 | 1304139220 | 130414089X | 130414643X | 1304146537 | 130414674X | 1304168522 | 1304174778 | ...  | 9788077382 | 9788077625 | 9788077927 | 978807801X | 9788078389 | 9788078885 |      |      |      |
| Quality   | 6          | 6          | 6          | 32         | 8          | 6          | 3          | 6          | 2    | ...        | 2          | 2          | 2          | 3          | 2          | 3    |      |      |
| UnitPrice | 4.25       | 1.85       | 1.85       | 2.1        | 1.69       | 3.75       | 1.65       | 4.95       | 4.25 | 9.95       | ...        | 2.1        | 2.1        | 2.55       | 2.55       | 1.25 | 2.95 | 2.95 |

Fig: 3

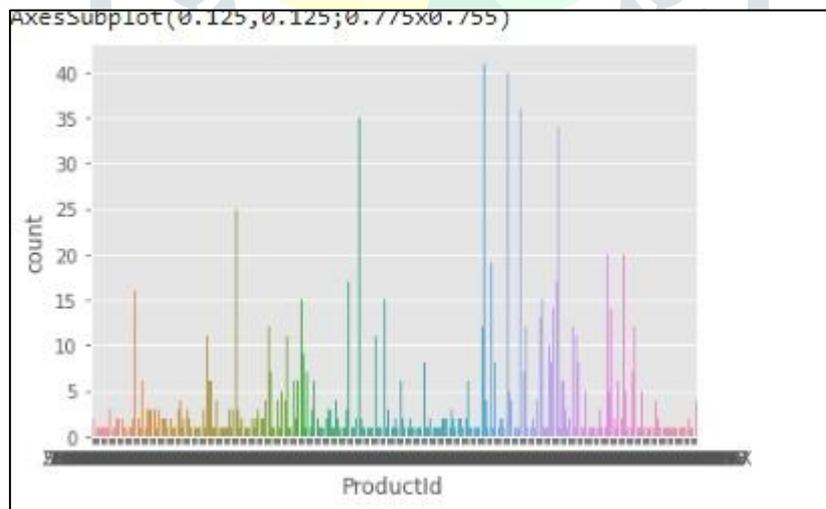


Fig: 4

- Fig: 1 represents the description of product that can be recommended based on the buying pattern of consumers based on ratings.
- Fig: 2 represents plot using k-means based on products that can be recommended to the consumers.
- Fig: 3 represents product id of products that can be recommended along with their quantity and price.

- Fig: 4 represent a plot showing the relation between product id and product count. The x-axis represents product id while the y-axis represents product count.

## VII. CONCLUSION AND FUTURE WORK

This study has focussed on an effective recommendation system based on past purchases of the consumer. It can help consumers easily find the items that they might be interested in. An item to item based recommendation based on product description is provided by the businesses to their consumers. Google Colab is used for visualisation of data for better understanding the data. This is done after importing and modifying the data and splitting them into training and testing datasets. The item to item based recommendation based on product description can be further improved by using keywords in descriptions that makes them easier to process and analyse which in turn results in more accurate results.

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