IOT-Based Personalized products recommendation system

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Abstract. Recommendation technology is an essential component of the Internet of Things (IoT) services that can help users get information at any time and from any place. Traditional recommendation algorithms, on the other hand, are unable to satisfy the IoT environment’s swift and reliable recommendation criteria. The use of mathematical and information discovery methods to overcome the relationship with target consumers in order to have desired items is known as a recommendation system. In this paper, a recommendation algorithm based on collaborative filtering is proposed. In this sense, the recommendation method (Recommender Systems) was developed; it is focused on the user's characteristics, such as hobbies, and it is recommended to satisfy the object's user specifications, also known as customized recommendation system (Personalized Recommender Systems). The majority of modern e-commerce recommender programs tend to recommend the best goods to a customer, believing that each product's properties remain constant. Some properties, such as price discounts, can, however, be customized to respond to the preferences of each customer.

Keywords: IOT, Personalized, Recommender system, collaborative filtering, e-commerce

1. Introduction

Recommendation systems play an important role in e-commerce turnover. The exponential growth of the internet encourages the growth of e-commerce pages. Typically, an e-commerce platform will have several comment pages, which are lists of product user feedback [1]. The feedback will help a potential buyer decide whether or not to purchase a product. Furthermore, the recommender method has developed into a tool for potential customers to access the desired commodity [2]. The aim of personalization is to make it easier for users to communicate their needs and to provide them with useful information in these information system accesses. A set of customizable preferences specific to each user or user community determines the relevance of information [3]. Profiles are also used to group data on people. Depending on the method and implementation, the quality of a user's profile varies. The majority of previous research on knowledge-based recommender systems has relied on product-feature-based recommendation techniques. In this paper, we incorporate product ratings, as well as product characteristics, into the suggested methodology [4]. Since many consumers are unfamiliar with the technological aspects of the product, the interests of customers are articulated in the form of practical specifications of products in our suggested context [5]. Based on the findings of the assessment, we believe that using product feedback in recommender programs will improve perceived utility and ease of use. Furthermore, a recommender system that has product feedback is more appropriate than a recommender system that does not [6]. We examine current recommendation mechanisms that enable e-commerce personalization in this article, paying special attention to their data specifications and the degree to which the data can be collected without being intrusive from the
user [7]. Ecommerce personalization is a concept used by online retailers to describe the process of dynamically displaying content, media, or product recommendations based on browsing habits, buying history details, profiles, and psychographics on e-commerce platforms to create personalized encounters and experiences [8]. A feedback framework considers a user's actions based on the user's interaction with the interface and the underlying mechanisms [9]. Collaborative filtering and content-based filtering are the two main filtering methods used in these recommendation schemes. Collaborative filtering strategies provide a model based on previous user behavior, as shown in fig 1,2 [10].

![Content-Based Filtering](image1.png)

**Figure 1. Content-Based Filtering**

![Collaborative Filtering](image2.png)

**Figure 2. Collaborative Filtering**

Then add what you've learned from your history and related choices taken by other users. That model to predict what objects a consumer would be interested in. Content-based approaches are based on
product specifics and consumer expectations[11]. These algorithms attempt to suggest items that are close to those that a user has previously looked for or enjoyed. In e-commerce, personalization has the potential to boost sales, customer purchase intent, and acquisition, as well as improve customer interaction. Personalization is recognized as a controllable variable in e-commerce success [12]. Previous literature on personalization, on the other hand, suggested a wide range of ideas from various fields. However, with the rapid growth of social media info, relational personalization has consistently risen as a new fascinating subject to research. The remainder of the paper is organized as follows. The preliminary history of the research work is presented in Section 1. Section 2 provides the proposed recommendation system; each mechanism in the system is outlined in detail. Section 3 performs tests based on different scenarios, as well as demonstrating how the proposed can improve performance. Finally, Section 4 summarizes the findings of the study and raises several questions for future studies.

2. The Proposed Recommendation System

Personalization is beneficial in several ways. For example, once you have purchased products from a certain online website, the next time you visit, they will greet you with a welcoming atmosphere and assist you by suggesting the best choices. This will undoubtedly strengthen the bond, attracting more buyers. Any online page can assist you in a particular way; there are several portal places to choose from. This will undoubtedly strengthen the bond, attracting more buyers. Any online website can assist you in a different way; several portal services encourage users to customize the page and choose the best choices from new categories. Users' preferences, interests, and profiles are used by the recommendation system to suggest more convenient or complementary materials that the users may be interested in. To recommend goods, these systems often rely on explicit feedback techniques (rating, search history, etc.). The proposed recommendation system's experimental findings show that it outperforms current mechanisms in terms of precision in predicting related items.

The proposed Recommendation System's architecture, as seen in Figure 3, is made up of three main components: customers, facilities, and electronics. This system includes a number of clients, each of whom has a unique identity, and who use IoT products, which are operated by servers in the businesses. As a result, each service includes certain IoT artifacts, which consumers use. The recommender framework analyzes consumer data based on three criteria (customer, services, and device, an RFID Tags for each product) and provides them with suitable solutions, assisting them in using other IoT products.

The aim of this paper is fourfold, as seen in Figure 3 by the high-level functional architecture of the proposed system:

1. It makes recommendations to consumers based on their current and historical background knowledge, while also taking into account the customers' contextual preferences.
2. It introduces an expanded relational profile model for managing service usage expectations for organizations.
3. It demonstrates how context-aware tailored advice can incorporate trust.
Figure 3. Customers, services, and objects of the IoT architecture

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3. Results
A system has been created to collect user comments and analyze them.
- Every product has a rating, making it more easy for customers.
- Every comment is given a score based on how much it contributes to the overall score.
- Product recommendations based on the user’s prior search.

3.1. Web Application
The outcomes of the web application are depicted in the figure below.

Figure 4. login to rate the product
3.2. Product recommendation system

This section explains how we make recommendations, the suggested model's fundamental aim is to give IoT users with relevant and individualized suggestions.

- Product with high average rating
• The top ten consumers that have given the highest ratings to the majority of the products

\[
\text{ratings\_grouped\_by\_product\_head(3)}
\]

| customer_id | price_product | rating |
|-------------|---------------|--------|
| 1AB121      | 100           | 0      |
| 1AB123      | 100           | 0      |
| 1AB125      | 100           | 3      |

**Figure 8.** The top ten consumers

• Product with low average rating

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Entrée [44]: low rated product filter = ratings grouped by product['rating'][mean] < 1.5
Entrée [45]: low rated product = ratings grouped by product[low rated product filter]
Entrée [49]: low rated product head(20).plot(kind = 'barh', figsize = (7,5));
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**Figure 9.** Product with low average rating

4. Conclusion
In the e-commerce domain, the recommendation mechanism is critical for recommending related products/services based on end-user choice or interest. This makes it easier for end-users to choose from a wide variety of products and labels available on the market. The recommendation method undergoes extensive testing with the goal of providing the most appropriate product to the end-user based on the end-previous user's purchasing experience, transaction information, and other factors. Goods are often classified according to their age group level. One of the most critical facets of optimizing the customer's buying experience is personalization; the foundation of every company is giving consumers just what they want. In this paper, we addressed how personalization in e-commerce stores can affect your company in this post, as well as some basic tips for enhancing personalization. Personalization in e-commerce refers to delivering personalized experiences to the customers by dynamically showing content, recommending products, and offers based on previous actions, searching behavior, purchase history, and other data.
Acknowledgments

The authors of this paper would like to thank the support of the National School of Engineers of Carthage (ENICarthage) and Electrical Engineering Department, University Carthage, Tunisia, for overall support in finalizing this research. Cooperation from, University of Kufa, Iraq, and University Carthage, Tunisia, for carrying out this research work. The authors would like to thank Pr. Afef Abdelkrim and Dr. Hamza Ghrsellaoui for their generous support and encouragement during the preparation this manuscript.

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