From Sales Strategies to Information Ecosystems: The Role of Personalized Recommendation

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Abstract. The paper is about the application of personalized recommendations on online shopping applications to improve sales success and the spread of fake news on social media platforms. First, the paper introduces a personalized recommendation system's concept and working principle, then emphasizes its importance in improving user experience and sales efficiency. Then it analyzes the information cocoon effect that personalized recommendation may bring, it is users only see the content that conforms to their interests and views, which intensifies the single and misleading information. This is followed by a discussion of how companies can use personalized advertisement recommendations to improve sales success.Then through deep learning and search, personalization systems can efficiently provide personalized product recommendations to users, but there are still opportunities to improve their effectiveness, such as improving network effects among relevant users. Therefore, it points out a new method to improve the sales success rate of online shopping applications. Then discusses the role of social networks in the spread of fake news. Finally, through the network diagram, the phenomenon of information-closed loop between different groups is demonstrated, and the information transmission gap that may be caused by personalized recommendations is explained.

Keywords: Personalized recommendation; network; advertisement; information spread.

1. Introduction

In today's era of digitalization and information explosion, personalized recommendation systems have played an important role in the field of Internet and e-commerce. From social media platforms to online retailers, algorithmic recommendation systems analyze massive amounts of user data to find out user preferences, thereby providing users with personalized products, services, and content recommendations. This not only improves the degree of personalization of the user experience but also significantly promotes the sales and market competitiveness of the enterprise. These events are brought by personalized recommendations.

First, the concept of algorithm recommendation. A recommendation system (or recommender system) is a class of machine learning that uses data to help predict, narrow down, and find what people are looking for among an exponentially growing number of options. It is an artificial intelligence or AI algorithm, usually associated with machine learning, that uses Big Data to suggest or recommend additional products to consumers. These can be based on various criteria, including past purchases, search history, demographic information, and other factors. Recommender systems are highly useful as they help users discover products and services they might otherwise have not found on their own.

Recommender systems are trained to understand the preferences, previous decisions, and characteristics of people and products using data gathered about their interactions [1]. These include impressions, clicks, likes, and purchases [1]. Because of their capability to predict consumer interests and desires on a highly personalized level, recommender systems are a favorite with content and product providers [1]. They can drive consumers to just about any product or service that interests them, from books to videos to health classes to clothing [1].

Results in one of the studires showed that almost 43-82% respondents were persuaded to purchase the product due to advertisement, whereas 18% respondents were never persuaded [2]. Other study showed that 28% of the respondents were mostly influenced by the appeal and 49% were sometimes influenced by appeal in the advertisement whereas 23% of respondents were never influenced from

the appeal used in advertisement, which meansthat advertisement did effect consumer behavior to a greater extent [2]. The third study showed the impact of personality used in commercials. 38% of the consumers were mostly influenced by the personality used advertisement of the specific brand [2]. But 26% of consumers were never influenced by personality [2].

In contrast, the recommendation algorithms of social media platforms recommend content based on users' historical behaviors and interests. Therefore, users will be more likely to communicate with like-minded people on social media, and share their views and opinions, thus forming a relatively closed social circle. It will be an important factor in the formation of an information cocoon. An information cocoon is what the platforms choose to expose you to the user to base on expressed interests, tastes, and preferences [3]. It is related to the idea that people see, hear, and seek what they like, pleases and comforts them, and are closed to the idea of newness that challenges it [3]. However, the downside of this phenomenon is non-exposure to opposing point of views, and non-awareness towards the things that exist outside our areas of interests [3].

Nonetheless, the algorithm recommendation also leads some disadvantages. The users will only see content that matches their views during they are getting information on social media platforms. Which means, the users will only see the thing that they are interested in, the infuluencers they agree with.Thus, personalized recommendations will exacerbate one-sidedness and misleading information.

The paper is aimed at the analysis of how companies use personalized advertising recommendations to improve sales success and how the network plays a role in the spread of fake news among people.

2. Personalized Advertising Recommendations help Companies to Improve Sales Success

Nowadays companies divide users into several types based on their preferences and historical behavior, thus there will be some clusters in the network, then show specific advertisements to each type of user for improving the success rate of sales.

There are 2 common social media applications, the first one is called Xiaohongshu which is famous in China, and the second one is TikTok which is popular overseas. In short, whatever the users choose which one, both will let users select their preference when they create new accounts, when they use them for the first time. Later, it will recommend the short video on the topic that you are interested in.

There is an algorithm method about how social media applications and companies analyze users' behavior to determine what content to them. Matrix factorization (MF) techniques are the core of many popular algorithms, including word embedding and topic modeling, and have become a dominant methodology within collaborative-filtering-based recommendations [1]. MF can be used to calculate the similarity in user’s ratings or interactions to provide recommendations [1]. For example, Jack likes playing Call of Duty (A kind of video game) and Forza Horizon (A kind of video game), and so does Jenifer. Therefore, the MF will figure out that people who like playing Call of Duty might also like playing Forza Horizon. Then, when the procedure finds Peter likes playing Call of Duty, what the platforms will do is to recommend Forza Horizon to Peter, as shown in figure 1.

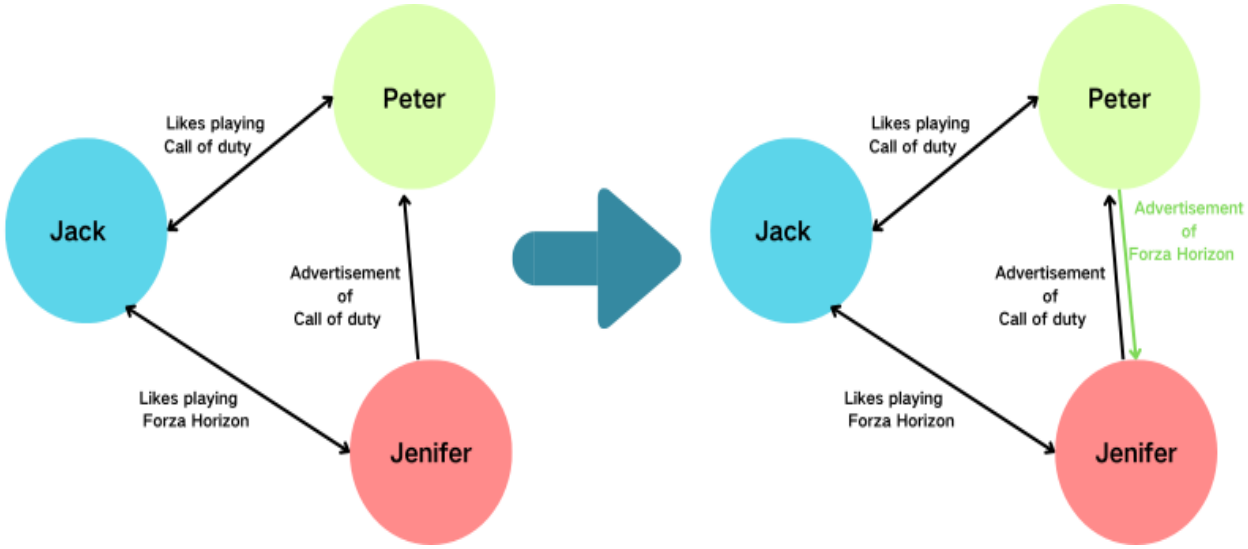

Fig. 1 The change of network after social media applications' recommendation

Also, several online shopping applications, they will show the product advertisements that they think users are interested in algorithm analysis. For example, Amazon, 35 percent of what consumers purchase on Amazon comes from product recommendations based on such algorithms [4]. Besides, Taobao's home page will customize personalized page content according to users' browsing and search records, interests, and preferences, and adjust the recommended product display order and content to improve user experience.

Next, combining online shopping platforms with social media applications can enhance the network effect on online shopping platforms, thereby providing sales success. From several searches and comparisons, there is an improving method. Add friends' historical behavior records to some types of products. For example, when opening an item on Amazon, it will show that several of the user's friends have followed the item, and several of them have bought it more than twice. To protect personal privacy and to prevent people from deliberately creating a personality out of vanity, it is anonymous and only clothing food and digital products are recommended.

3. Network Plays a Role in the Spread of Fake News Among People

The COVID-19 ended only a few years ago, nowadays people do not pay close attention to it anymore. However, at its beginning, the Covid- 19 was horrible which made the whole society panic. New estimates from the World Health Organization (WHO) show that total deaths directly or indirectly related to the COVID-19 pandemic (known as "excess deaths") between 1 January 2020 and 31 December 2021 are approximately 14.9 million (with a range of 13.3 million to 16.6 million) [5]. Everyone at that time does not want to contract it. They try all the way they can to get away from getting ill, and they usually communicate on such topics during their daily life or on social media platforms. Therefore, during the COVID-19 pandemic, social media platforms were inundated with misinformation about the virus, preventive measures, and treatments. Most of the unofficial information was not true, even harmful.

For example, early in the pandemic, false claims about drinking bleach curing COVID-19 spread widely on Facebook, garnering over 100,000 comments and shares [6]. This misinformation caused public panic and dangerous self-treatment behaviors [6]. Another widely spread false claim was that wearing multiple masks could completely prevent virus infection [6]. This claim received over 50,000 shares and comments within a week, misleading the public on effective preventive measures [6].

Because of the influence, which is led by personalized recommendations, users can only see the content that they are interested in and the influencers who hold the idea that users agree with. Therefore, fake news will easily aggravate the one-sidedness and misleading of information.

Mirrored in the network diagram. Some nodes are clustered together but each small cluster is relatively independent. Back to the example that was shown above. People in cluster one believes that drinking bleach can cure COVID-19 and people in cluster two hold the opinion that wearing multiple masks could completely prevent virus infection and the right ways to avoid infection of Covid-19 are spread in the third cluster, as shown in figure 2.

Because each cluster is relatively independent, people in different clusters hold different opinions, but the opinion is hard to spread to another cluster, because of the weak link between each cluster. So even the true information cannot be widespread in the whole network, either.

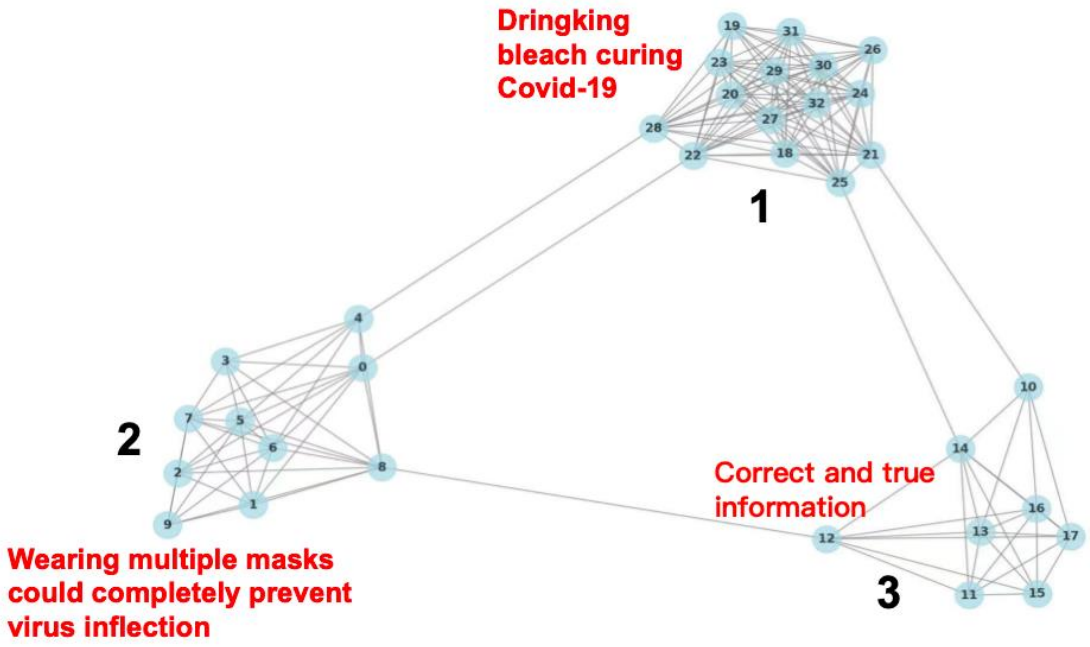

Fig. 2 The circumstance of information spreaded between people during Covid-19 which is reflected into network diagram

That is the ideal model which is assumed. When it comes to the circumstances in real society. Search platforms earn money from the click volume of the websites. If companies want their websites can appear while users search the information that is relative to the companies' services, companies have to pay money to the search platforms, and the amount depends on the number of click volume (usually 0.035 dollars to 0.15 dollars for each time). Due to the eye-catching and unbelievable characteristics of fake news, people will be more curious about what the fake news is about, rather than some declarative official information. In other words, users will be more likely to click the websites that publish the fake news. However, to get more income some of the search platforms are not strictly regulated, even helping the spread of the fake news. That is why even if such fake news, shown above, are published on Facebook, it still can get into our lives (as Chinese almost people do not use Facebook).

4. Conclusion

The wide application of personalized recommendations in online shopping platforms have significantly improved the efficiency of sales. This system can accurately recommend products and services to improve sales success. Nevertheless, the personalized recommendation also brings about the information cocoon influence, making users more inclined to contact and share content with their interests and opinions, thus exacerbating the one-sidedness and misleading information.

At the same time, personalized recommendation systems also face the challenge of the spread of fake news. Algorithms are more likely to recommend content related to a user's historical behavior and interests, these systems may inadvertently exacerbate the spread of fake news, especially on social media platforms.

To sum up, the personalized recommendation system in online shopping applications has brought huge business opportunities for companies. However, people must be aware of the possible negative effects of information spreading. How to balance the advantages and disadvantages of personal recommendation has become an important issue at present and in the future

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