

The Application Status and Trend Analysis of Personalized Recommendation in Short Videos

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Abstract. Short videos have become increasingly popular in recent years, leading to the rise of many short video platforms with large user bases, such as leading platforms like TikTok. The user groups on these platforms are vast. With the rise of short-video platforms, TikTok, as one of the leading players, has become a highly influential social media platform worldwide. With the development of short videos, personalized recommendations are also playing an increasingly important role in short videos and are constantly evolving. This report examines the definition, classification, and evolution of personalized recommendation systems, along with their applications and the development trends and suggested countermeasures in short video platforms, with the objective of analyzing the current status and emerging trends of personalized recommendations in this domain. Research has found that personalized recommendations are of great help to the development of short videos. Enterprises need to keep up with the times and constantly update their personalized recommendation systems to enhance user experience and retain more users. Meanwhile, users also need to improve their ability to distinguish during the process of using short videos. In addition, the government should supervise enterprises to ensure the healthy application and development of personalized recommendations in short videos. It provides valuable reference information for content creators, short video platforms, and end users.

Keywords: Short video; personalized recommendation algorithm; user data privacy.

1. Introduction

In the current digital era, algorithmic recommendation mechanisms are ubiquitous and profoundly influence the interaction between users and various platforms [1]. With the rise of artificial intelligence (AI), the application of algorithms has been expanding in numerous fields, including popular short video platforms like TikTok. These platforms leverage the power of algorithms to achieve significant results in information dissemination and user experience shaping [2].

Essentially, algorithmic recommendation systems build personalized content recommendation frameworks through in-depth mining and analysis of user data. Their composition involves several complex stages, such as data collection, feature extraction, model building, and prediction. Depending on different principles and application scenarios, they can be categorized into diverse types. There exists a close relationship between algorithmic recommendation mechanisms and the formation of user habits. They can accurately identify users' interests and preferences, continually delivering content that aligns with user interests, reducing interference from irrelevant information, thereby gradually fostering a habit of relying on the platform to acquire specific types of information [3].

The reshaping of user habits further increases user stickiness. When users consistently receive content that meets their needs on a platform, they are more inclined to spend prolonged periods on the platform and interact frequently with it. Personalized recommendations and social interactivity are two key factors in enhancing user stickiness through algorithmic recommendation mechanisms. Personalized recommendations make users feel that their unique needs are valued by the platform, while social interactivity allows users to connect with other users of similar interests on the platform, satisfying their social needs.

However, algorithmic recommendation mechanisms also face numerous challenges during their development. On one hand, over-reliance on algorithms may lead users into "information cocoons", restricting the expansion of their horizons [4]. On the other hand, optimizing user experience and

protecting user privacy are urgent issues that need to be addressed. How to harness the positive effects of algorithmic recommendations while tackling these challenges is a question that companies need to consider deeply. Companies that can better utilize algorithms to increase user stickiness will gain a favorable position in the intense market competition. This requires exploring specific methods, such as more precisely grasping the scale of personalized recommendations and enhancing the effectiveness of social interaction features. This article will first introduce personalized recommendation algorithms and their development and evolution, then provide examples of their application in short videos, followed by the development trends of personalized recommendations in short videos, and finally offer suggestions and countermeasures.

2. Overview of Recommendation Algorithms

2.1. Definition and Classification of Personalized Recommendation Algorithms

A recommendation system is an information filtering system whose core task is to predict the user's ratings or preferences for items. It aims to filter out content that users might be interested in from a large number of items. According to different classification criteria, recommendation systems can be divided into various types. Based on the recommendation method, common types include collaborative filtering-based recommendation, content-based recommendation, knowledge-based recommendation, and hybrid recommendation. In terms of recommendation task types, they can be divided into point-to-point recommendation, list comparison recommendation, conversational recommendation, and sequence recommendation [5]. The basic principle of personalized recommendation systems is to collect and analyze various data of users, and then use various recommendation algorithms to calculate the match or similarity between users and short videos. Based on the matching results, short videos are recommended to users [3].

2.2. Evolution

With the development of deep learning technology, deep learning technology has been widely used in short video recommendation systems. Deep learning algorithms can automatically learn complex features and patterns in data without manual feature extraction, significantly improving the performance and accuracy of recommendation systems [6].

In short video recommendations, commonly used deep learning models include multilayer perceptrons (MLP), convolutional neural networks (CNN), recurrent neural networks (RNN), and their variants, such as long short-term memory networks (LSTM) and gated recurrent units (GRU) [7].

Reinforcement learning is a machine learning method that learns optimal behavior strategies by interacting between an agent and its environment based on the reward signals from the environment. It is gradually applied in the field of short video recommendation. Reinforcement learning can dynamically adapt to changes in user behavior and interests, adjust recommendation strategies in real-time, and has better flexibility and adaptability [8].

3. Application in Short Videos

The purpose and significance of the content analysis of mainstream platforms in this chapter is to understand the role of personalized recommendations in the development of short videos through actual cases, so as to provide some inspiration for the platforms.

One of the key factors in TikTok's success is its personalized recommendation system. It collects multi-dimensional data, including basic user information, behavioral data (likes, comments, shares, viewing history, etc.), device information, and geographic location information to build a comprehensive and detailed user profile. Regarding recommendation algorithms, TikTok utilizes various technologies, including deep learning and machine learning. It employs deep neural networks to extract and understand video content features, combines these with user profiles and behavioral

data, and calculates the match between users and videos using models like multilayer perceptrons. TikTok also adopts real-time recommendation technology to dynamically adjust recommendations based on real-time user behavior, ensuring users always see content they are interested in. In addition, TikTok's recommendation system emphasizes content diversity and timeliness, not only recommending popular videos that users may be interested in but also unearthing some niche yet quality content, while promptly pushing the latest videos [9].

4. Development Trends

4.1. Impact of 5G and Edge Computing on Short Video Recommendations

The high bandwidth and low latency characteristics of 5G technology, combined with the localized data processing capabilities of edge computing, will profoundly change the experience and model of short video recommendations [10]. 5G supports high-speed transmission of short videos, while edge computing deploys some recommendation logic on user devices or nearby edge nodes, reducing the delay of data transmission to the cloud. This allows the recommendation system to respond more quickly to changes in user behavior (e.g., real-time adjustment of recommendation lists) and enhance the immediacy of recommendations.

4.2. Possibility of Cross-Platform Personalized Recommendations

As users' behaviors intersect across multiple short video platforms (such as Douyin and Kuaishou) and other content platforms (such as social software and e-commerce platforms), cross-platform personalized recommendation becomes a potential trend. A single platform's user data is limited. Cross-platform collaboration can integrate user behaviors in different scenarios (e.g., after browsing products on an e-commerce platform, users receive related product review videos on a short video platform), building a more complete user profile and improving recommendation accuracy. Cross-platform recommendations need to solve the issue of data silos, which relies on the establishment of data-sharing mechanisms (such as the application of privacy-preserving technologies like federated learning). Meanwhile, the different content styles and user groups on different platforms require designing recommendation models adaptable to multiple platforms to avoid recommendations that do not “fit”. Additionally, user acceptance of cross-platform data sharing and the coordination of commercial interests between platforms are important challenges. Cross-platform recommendations can break content boundaries, such as integrating short video recommendations with offline services (like local lifestyle and cultural tourism consumption), forming a “content-service” closed loop, and providing users with a more coherent experience.

4.3. Prospects of Multi-Modal Data Integration

Short videos comprise image, audio, text (title, comments), user behavior, and other multimodal data. Integrating this data will be crucial for enhancing recommendation effectiveness. Single-modal data (e.g., relying solely on text tags) struggles to comprehensively describe video content, whereas multi-modal integration can combine scenes in images, emotions in audio, and semantics in text to more accurately capture content features. For instance, by recognizing objects in images and combining the style of background music in audio, more content in line with users' potential preferences can be recommended. The heterogeneity of multi-modal data (e.g., images as visual signals, text as semantic signals) presents challenges for integration. The future will require developing more efficient modality alignment and fusion algorithms (such as cross-modal models based on Transformers) to achieve deep interaction of different types of data. Simultaneously, techniques for cleaning and enhancing low-quality modal data (e.g., blurred images, cluttered text) will also be emphasized. Multi-modal recommendations can better understand users' needs in complex scenarios. For instance, when a user watches a dance video without subtitles (relying on images and audio), the system can recommend dance tutorial videos of the same style through multi-modal analysis, improving recommendation relevance and user satisfaction.

5. Recommendations and Strategies

5.1. For Businesses

In today's digital age, personalized recommendations have become a core competitive factor among short video platforms. By utilizing big data and advanced algorithmic technologies, platforms can accurately capture users' interests and preferences, providing content recommendations that better match individual needs. This not only enhances the user viewing experience but also increases user engagement and platform activity.

However, behind this convenience of information, user privacy protection has become an issue that cannot be ignored. As the collection and analysis of user data deepen, platforms must maintain a high level of transparency and responsibility when using this data. Users should have the right to know how and for what purposes their data is being used, and companies should ensure that rigorous data protection measures and policies are in place to prevent misuse or leakage of user information.

Moreover, corporate integrity is also the cornerstone of the platform's sustainable and healthy development. Short video platforms need to strike a balance between technological innovation and ethical responsibility, ensuring that content recommendations are both intelligent and efficient while privacy protection is meticulous and comprehensive. While gaining users' trust, platforms should continuously optimize their algorithms and data usage strategies to achieve a win-win situation for user experience and ethical responsibility. This is not only a respect and commitment to the users but also a requirement for the platform's long-term development.

5.2. For Governments

The government should delineate a safe and reasonable scope of operation for enterprises. This means formulating relevant policies and regulations to clarify the responsibilities and obligations of enterprises in algorithm development and application, thereby promoting technological advancement while ensuring that the use of technology does not infringe on public interests. These regulations can include aspects such as data privacy protection, transparency requirements, and fairness in algorithmic decision-making. To better safeguard user rights, the government needs to enact specific laws to protect users from malicious exploitation or improper influence while enjoying the conveniences brought by algorithms. These laws should cover all aspects of user data collection, storage, use, and sharing to create a secure digital environment for users. The government should also closely monitor the potential impact of algorithmic technology in promoting or altering social values and behaviors. This means conducting comprehensive social impact assessments to evaluate the role of algorithmic technology among different social groups and its potential impacts on social culture, economic equality, freedom of speech, and other areas.

5.3. For Users

While individual agency is important, structural changes—such as default settings that promote diversity and transparency—are equally critical in supporting healthy user behavior. Users can set clear purposes and time limits for their usage. Short video content often attracts users to watch for extended periods due to its high level of entertainment and immediacy. By reasonably setting viewing durations and purposes, users can avoid wasting significant time and energy on unimportant content. Users should focus on and select high-quality content creators. Actively follow accounts that provide positive value, inspire thought, or offer professional knowledge, rather than passively accepting all content recommended by the platform. This not only enhances the viewing experience but also allows users to learn and absorb beneficial information subtly. Regularly review and adjust viewing preferences. Short video platforms use algorithms that may recommend similar content based on users' past viewing behavior. Users need to stay alert to these recommendations and periodically update their interests and focus areas to avoid getting trapped in an information bubble. Actively participate in meaningful interactions. By liking, commenting, and sharing, users can engage in

positive interaction and communication with content creators and other viewers. This not only enhances social connections but also promotes the formation and refinement of their own viewpoints.

5.4. Toward a Collaborative Governance Framework

The sustainable development of short video recommendation systems requires a collaborative governance framework [11]. Both enterprises and the government are expected to take proactive measures. Enterprises can optimize the ethical design of algorithms, establish an "algorithm transparency list", and accept government evaluations. They should reduce the "information cocoon" effect by proactively including 10% to 15% of high-quality cross-domain content (such as science popularization and traditional culture) in recommendations to prevent users' perspectives from narrowing. The government can enhance regulatory and law enforcement efforts, promote a "government-enterprise collaborative training program", and jointly conduct training with universities and enterprises in areas such as algorithm ethics and content governance to improve the overall compliance capabilities of the industry.

6. Conclusion

Personalized recommendation plays a pivotal role in the sustainable development of short-form video platforms. Methodologies continuously evolve to meet the demands of the short-video era—progressing through iterative updates, machine learning advancements, and the transition from manual to AI-driven approaches. This paper provides insights for short-video platforms by analyzing the current applications and emerging trends of personalized recommendation systems, which also hold transferable potential for other domains. The vast and diverse user base of short-video platforms presents boundless opportunities. Amid intensifying market competition, these platforms must innovate content formats, enhance the technological infrastructure for personalized recommendations, and uphold social responsibilities to achieve sustainable growth. For content creators, a profound understanding of user needs and alignment with platform evolution will be crucial to seizing opportunities and fostering mutual success. The limitations of this study lie in the constrained scope of the literature reviewed, which precludes exhaustive coverage of all possibilities, as well as the inherent uncertainty in forecasting future trends. Future research should aim for greater specificity, proposing actionable and concrete implementation strategies.

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