Building an Online News Article Recommendation System Using Generative Recommendation

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Abstract—Selecting news articles to read has become increasingly challenging in the era of artificial intelligence due to the overwhelming amount of content generated daily by diverse news outlets. With the rapid expansion of digital media, users are often inundated with choices, leading to decision fatigue and difficulties in finding content that aligns with their preferences. To address these challenges, we developed a cutting-edge recommendation system powered by generative AI, specifically leveraging the capabilities of diffusion models. Unlike traditional recommendation systems that rely heavily on textual or visual content, our approach focuses on analyzing user interaction patterns with news articles to generate personalized recommendations. This method minimizes the reliance on additional data modalities while maintaining high performance. The development of this system involved rigorous data preprocessing and transformation techniques, which were employed to enhance the model's ability to understand and infer relationships between users and articles. By optimizing these processes, we ensured that the model could accurately capture the nuances of user behavior, improving the relevance and quality of the recommendations. Experimental evaluations demonstrated that our Diffusion model significantly outperforms other state-of-the-art models, such as FairGAN, across all major evaluation metrics, including precision, recall, and NDCG. This research not only highlights the potential of diffusion models in recommendation systems but also underscores their effectiveness in striking an optimal balance between exploration and exploitation in content delivery. This advantage is driven by the gradual refinement of the diffusion model results using probabilistic sampling. As a result, the model provides more relevant, diverse, and high-quality news recommendations, aimed at enhancing user experience and engagement.

Index Terms—Generative Recommender Systems, Online News Recommendation, Generative Adversarial Networks (GANs), Diffusion Model

I. Introduction

With the abundance of news sources available, a new challenge arises: selectivity in choosing relevant and high-quality information. This highlights the need for an effective recommendation system to assist users in finding news that aligns with their interests and preferences [1].

Recommendation systems play a crucial role in helping users navigate content more efficiently. These systems aim to filter out irrelevant information and provide suggestions tailored to user preferences. Recommendation systems operate by identifying and ranking items for specific users based on content or preferences of similar users [2].

A commonly employed approach involves recommendation systems that rely on user-item interactions, emphasizing patterns like clicks or user preferences for certain items. This method allows the system to deliver relevant suggestions even in the absence of supplementary inputs, such as textual reviews or visual content. In this scenario, generative models present an innovative solution, as they can analyze these interaction patterns and create highly personalized recommendations [3].

Generative models have emerged as an innovative solution to address these limitations. Among them, Generative Adversarial Networks (GANs) have shown promise in analyzing hidden patterns within user-item relationships. However, GAN-based systems often face challenges, such as mode collapse and difficulties in handling diverse user-item interaction data [4]. Diffusion models, in contrast, offer a robust alternative by overcoming these challenges. They excel in capturing complex patterns and generating highly personalized recommendations, even in scenarios with sparse or implicit user data [3], [5].

The implementation of recommendation systems based on generative models has emerged as an innovative solution to address this challenge. By leveraging generative models, the system can learn patterns from implicit data and generate more personalized and relevant recommendations [3]. This study aims to explore the application of recommendation systems using generative models on online news article platforms, with the hope of enhancing user experience in accessing information.

II. Related Works

A. Recommendation System

Recommendation systems are a type of artificial intelligence application designed to provide relevant suggestions or recommendations to users based on their preferences, needs, or behavioral patterns [6]. With the advancement of technology, recommendation systems have increasingly become an integral part of various applications, such as e-commerce, music, movies, news, and many others. The primary goal of a recommendation system is to reduce the effort and time users spend searching for relevant information by providing personalized recommendations tailored to the individual needs