


Chapter 5

How Netflix Uses AI to Personalize Content for Individual Viewers

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ABSTRACT

Netflix dominates the streaming marketplace by implementing Artificial Intelligence (AI) to deliver personalized content using collaborative filtering combined with deep learning techniques. Reinforcement learning combined with natural language processing enables real-time analysis of user actions and emotional responses. The system refines its recommendations by applying matrix factorization and ranking algorithms to data from user play actions and skips. A/B testing confirms that these AI approaches increase user engagement while minimizing decision fatigue. The issues of algorithmic bias along with privacy concerns and filter bubbles remain unresolved according to studies. The use of AI by Netflix transforms content consumption and triggers ethical debates surrounding personalized entertainment.

BACKGROUND

AI technology has revolutionized entertainment especially through its impact on personalized content delivery. Initial AI applications which used expert systems and decision trees to predict user preferences provided only basic customization options through manual curation methods like video rentals and standardized cable programming (Khandelwal, 2023; Sunitha, 2024; Hsiao, 2024). The 1990s witnessed a significant transformation through collaborative filtering which created personal-

DOI: 10.4018/979-8-3373-6582-4.ch005

ized recommendations by assessing user behaviour patterns in large datasets (Joseph et al., 2025; Babatunde et al., 2024). The development of intelligent recommender systems started at that point and created the foundation for personalization based on data analysis. Netflix took the lead in this area when it moved from DVD rentals to streaming services in 2007. The initial recommendation models operated using basic weighted averages to process user ratings (Bhavani & Sai, 2024). The 2006 Netflix Prize advanced innovation through a competition that tasked data scientists with achieving a 10% improvement in the Cinematch algorithm. The competition demonstrated the commercial importance of personalization even though they did not implement the winning model because it was too complex (Khandelwal, 2023; Babatunde et al., 2024). Netflix implemented machine learning techniques during the 2010s which analysed viewing patterns along with session lengths and demographic data. The industry quickly adopted hybrid systems which combined collaborative filtering with content-based recommendations. Deep learning improved personalization by discovering nonlinear connections between user preferences and content features according to Babadoğan (2024) and Sevaslidou et al. (2024). Netflix utilized convolutional and recurrent neural networks to analyse video frames as well as audio and subtitle tracks to enhance content matching capabilities (Sunitha, 2024). Netflix used reinforcement learning to measure user engagement by rewarding actions that resulted in longer viewing sessions (Joseph et al., 2025). Content relevance was indicated by implicit behavioural signals such as pauses and rewinds. Through AI integration Netflix improved user experience by optimizing interfaces and personalizing content dynamically while processing natural language which enabled them to deliver real-time recommendations that adapt to changing user preferences (Meza & D'Urso, 2024; Harshavardhan et al., 2024). Netflix led the development of ensemble models which integrated multiple algorithmic outputs to achieve higher accuracy. Netflix utilized predictive analytics to produce original shows like House of Cards by analysing audience preferences across different genres and favorite actors and directors (Khandelwal, 2023). Dynamic artwork personalization combined A/B testing with computer vision to adjust promotional thumbnails according to user engagement patterns as described by Bhavani & Sai in 2024. Netflix implemented explainable AI (XAI) to address algorithmic transparency concerns by enabling users to comprehend the reasoning behind their recommendations (Sevaslidou et al., 2024). With the expansion of digital content effective personalization remains vital to maintaining user satisfaction and retention (Ichino et al., 2023). The capacity of Netflix to extend viewing sessions and minimize subscription cancellations sets it apart from competitors like Disney+ and HBO Max (Han, 2024). However, ethical issues persist. Major issues like data privacy violations along with algorithmic biases and filter bubbles draw attention from experts (Babadoğan, 2024; Reddy et al., 2025). Netflix needs to maintain transparent systems that respect user autonomy

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