

Context-Aware Recommender Systems: Exploring the Role of Time, Location, and Social Influence in Personalized Recommendations

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Abstract: Recommender systems have become a cornerstone of personalized user experiences across various domains, from e-commerce to entertainment. While traditional models focus on user-item interactions, they often overlook critical contextual information that could significantly enhance prediction accuracy. In this paper, we explore the concept of context-aware recommender systems, which integrate temporal, geospatial, and social context to improve recommendation quality. Temporal context considers factors such as time of day, seasonality, or the user's activity history, while geospatial context leverages the user's location or proximity to items, enhancing the relevance of recommendations. Additionally, social context incorporates user interactions with social networks or communities, enriching the understanding of preferences through peer influence and shared interests. We examine various techniques for incorporating these contexts into recommendation algorithms, including hybrid models, deep learning approaches, and context-sensitive matrix factorization. Furthermore, we address the challenges in balancing the complexity of these models with the need for real-time recommendations and scalability. Finally, we present empirical evaluations on real-world datasets, demonstrating that context-aware models significantly outperform traditional recommender systems in terms of prediction accuracy, diversity, and user satisfaction. This paper aims to provide a comprehensive framework for developing context-aware recommender systems and outline key areas for future research, such as integrating emerging contextual dimensions like sentiment and emotional state.

Keywords: Context-aware recommender systems, temporal context, geospatial context, social context, personalization, hybrid models, deep learning, matrix factorization, user satisfaction, prediction accuracy, real-time recommendations, scalability, user preferences.