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(57) Abstract :

Abstract The present invention discloses a system and method for generating personalized product recommendations in E-commerce platforms using a hybrid approach that integrates graph theory and machine learning. User-product interactions are modeled as a bipartite graph, wherein users and items are represented as nodes, and interactions such as purchases, clicks, or ratings form weighted edges. From this graph, structural features including centrality, similarity, and community-based metrics are extracted. These features are combined with behavioral and contextual data to train a machine learning model capable of predicting relevance scores for products. The system dynamically generates personalized, ranked recommendations for users based on predicted relevance, continuously learning from new data to adapt to evolving user preferences. The invention enhances recommendation accuracy, diversity, and scalability while addressing Q) challenges such as data sparsity and the cold start problem

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