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Abstract
The primary objective of this research is to design and implement a robust, scalable, and intelligent recommendation system for the Customer360 platform, aimed at enhancing digital experiences by generating personalized recommendations across various domains. The focus is on addressing traditional limitations like data sparsity and the cold-start problem through a hybrid deep learning approach, combining semantic understanding with collaborative filtering.
There is a growing need for more effective recommendation systems as users interact with increasingly vast digital ecosystems in e-commerce, e-learning, and streaming platforms. Traditional systems often fail in providing real-time personalization in the absence of sufficient user-item interactions, leading to a poor user experience. Addressing cold-start scenarios, optimizing scalability, and ensuring accuracy in diverse data environments are vital research challenges that necessitate this work.
Unlike conventional recommendation systems that rely solely on user history or item metadata, this research integrates deep learning models—including BERT for textual semantic embeddings—with Neural Collaborative Filtering (NCF) and matrix factorization techniques. This hybrid architecture leverages both structured and unstructured data to deliver recommendations that are contextually relevant and interpretable.
The proposed methodology introduces a modular pipeline involving text preprocessing, semantic feature extraction using BERT embeddings, collaborative filtering via NCF, and efficient search using FAISS-based approximate nearest neighbor algorithms. Additionally, greedy optimization strategies are evaluated to enhance revenue-aware recommendation outputs, incorporating dynamic selection techniques such as Global Greedy, Sequential Local Greedy, and Randomized Local Greedy algorithms.
The expected outcome includes the development of a Web API that integrates seamlessly with business platforms to provide domain-agnostic personalized recommendations. Performance will be evaluated using standard metrics such as Root Mean Square Error (RMSE), Mean Reciprocal Rank (MRR), and Precision@K. This work not only advances the state-of-the-art in recommendation systems but also provides a scalable and deployable solution adaptable to various industry domains.

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