

## **Condensed Abstract (Approx. 15 Lines)**

This research aims to develop a robust, hybrid recommendation system for the Customer360 platform to deliver personalized recommendations across various digital domains. The model focuses on overcoming key challenges like the cold-start problem and data sparsity through deep learning and semantic analysis.

The growing need for accurate and scalable personalization across sectors like e-commerce and e-learning necessitates advanced techniques beyond traditional collaborative or content-based filtering. These conventional methods often underperform when user history or item metadata is limited.

This study distinguishes itself by integrating BERT-based semantic embeddings with Neural Collaborative Filtering and matrix factorization. This hybrid approach enhances item representation and enables more contextual recommendations.

The proposed system includes a preprocessing module, hybrid model integration, and FAISS-based ANN search for fast retrieval. The output is served through a Web API for seamless business integration. Performance will be evaluated using RMSE, MRR, and Precision@K, with the goal of delivering scalable, accurate, and interpretable recommendations.