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Abstract

This research focuses on designing and implementing a scalable, intelligent, and domain-agnostic recommendation system as part of the Customer360 platform. The goal is to enhance digital user experiences by delivering personalized suggestions across various industries, such as e-commerce, e-learning, and media streaming. Unlike traditional systems that are confined to specific domains, this cross-domain recommender is designed to work with minimal input, allowing businesses to generate meaningful item recommendations using limited customer data.

A major challenge in recommendation systems is dealing with data sparsity and the cold-start problem—situations where little or no historical user-item interaction data is available. This research addresses these limitations through a hybrid deep learning approach that combines semantic feature extraction with collaborative filtering. Techniques like BERT are used to extract meaning from unstructured textual data, while methods such as Neural Collaborative Filtering (NCF) and matrix factorization help model user preferences and item similarities. This hybrid architecture enables the system to perform well even with sparse data, providing personalized and context-aware recommendations.

As digital platforms grow more complex and user expectations for personalization increase, conventional recommendation methods often fall short in real-time responsiveness and adaptability. This system is built to scale and operate efficiently in heterogeneous data environments, supporting real-time use cases where traditional models struggle. By leveraging structured and unstructured data sources, the system can make more informed predictions, resulting in higher accuracy and better user satisfaction.

The end product of this research will be a RESTful Web API that integrates seamlessly with business platforms. This API enables companies across different sectors to request and receive recommendations using only basic customer information. Performance evaluation of the system will be conducted using widely accepted metrics, including Root Mean Square Error (RMSE), Mean Reciprocal Rank (MRR), and Precision. The system's ability to generalize across domains and deliver explainable recommendations makes it a versatile solution for many real-world applications.

Customer360 provides a comprehensive ecosystem to support this recommender system. It integrates data from multiple sources, applies transfer learning techniques, and gathers user-specific input through a mobile application that serves as a personal assistant. The recommendation engine is central to this ecosystem, enabling businesses to access high-quality, personalized suggestions through the Web API. This research represents a step forward in the development of adaptable, intelligent recommendation systems that can serve diverse business needs with minimal overhead.

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Architecture

Deep learning-based recommender systems have shown promising results, offering improved accuracy over traditional approaches. However, they still face challenges such as data sparsity and the cold-start problem. One effective way to address these issues is through cross-domain recommendation, where insights gained in one domain can be transferred to another for similar users.

The Customer360 platform tackles this challenge using a slightly different strategy. It integrates data from multiple sources, applies transfer learning, and also gathers user data directly. As a comprehensive solution, Customer360 includes:

- A mobile application that acts as a personal assistant to users,
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- input,
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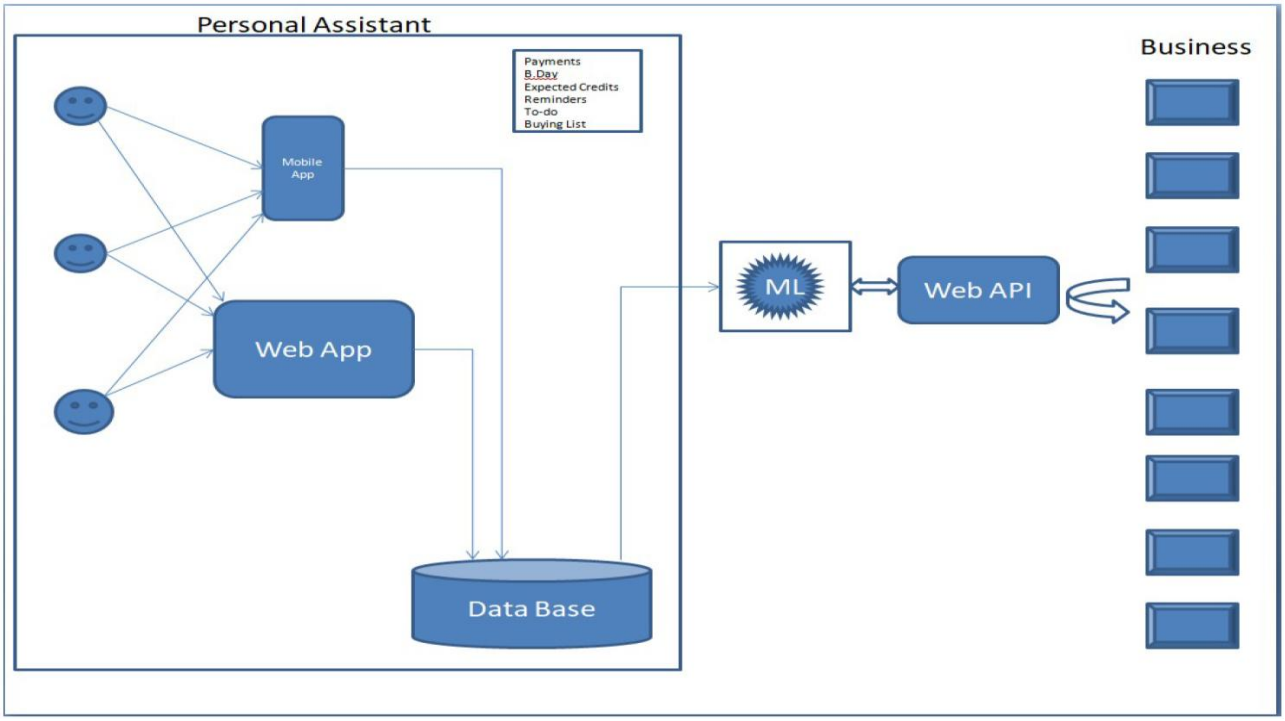
In this project, the focus will be solely on developing the recommendation system, which will be made available through a Web API. Businesses across various domains can use this API by providing minimal customer information and, in return, receive a list of recommended items tailored to their users



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