

## Abstract

The beauty product industry has become one of the sectors influenced by technological advancements and changes in consumer behavior. In this industry, the main challenges include the wide variety of products, diverse consumer preferences, and the difficulty consumers select the right products when shopping online. Conventional recommender systems often struggle to provide personalized and relevant suggestions tailored to individual needs, leading to a less satisfying shopping experience. To address this issue, we introduce Belle, a beauty product recommender system that integrates a Large Language Model (LLM) with a Conversational Recommender System (CRS). Belle is designed to provide more personalized and dynamic beauty product recommendations by utilizing the fine-tuned GPT-4o model, which better understands user preferences and supports more natural conversational interactions. Belle was developed through a fine-tuning process on the GPT-4o model using a dataset of 53,511 tokens over three epochs. This process significantly improved, with a training loss of 0.5344 and a validation loss of 0.3643. Semantic similarity evaluation showed improved results compared to pre-fine-tuning values, with the final BERTScore (Precision: 0.8676, Recall: 0.9182, F1: 0.8921) and Cosine Similarity (0.7227). Additionally, the Distinct@1 value increased from 0.7089 to 0.9081, indicating more diverse and natural responses after fine-tuning. By leveraging the strengths of LLM and CRS, Belle demonstrates that the beauty product recommendations generated are more personalized, flexible, and relevant to each user.

**Index terms:** large language model, conversational recommender system, beauty products recommender system.