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DEVELOPMENT OF E-COMMERCE WEBSITE RECOMMENDER SYSTEM USING COLLABORATIVE FILTERING AND DEEP LEARNING TECHNIQUES

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ABSTRACT

Recommender system or recommendation system is becoming an increasingly important technology on e-commerce websites to help users find products that suit their preferences. However, the growing number of users and products makes finding the right product difficult. Therefore, this study aims to develop a recommender system on e-commerce websites using collaborative filtering and deep learning techniques. Collaborative filtering is used to find similarities between users based on their preferences, while deep learning is used to improve the performance of the recommender system in generating more accurate recommendations. The test method is carried out by comparing the performance of the recommender system developed with the recommender system that already exists on the e-commerce website. The results of the test show that the recommender system developed is able to provide recommendations that are more accurate and more in line with user preferences compared to the existing recommender system.

INTRODUCTION

In the era of digitalization like now, the use of e-commerce websites is increasingly widespread among the public because it makes it easier to buy the products needed. However, the increasing number of users and products on e-commerce websites makes the online shopping experience even more complicated. Users often find it difficult to choose the right product, spend a lot of time searching for relevant products and sometimes also find it difficult to understand the product descriptions provided (Laksana, 2014).

To solve this problem, the recommender system becomes a very important technology to help users in finding products that match their preferences (Heryanto, 2018). In practice, the recommender system is used to predict user preferences based on historical data, including information about products that users have seen, purchased or rejected. Recommender system aims to provide product recommendations that are relevant and in accordance with user needs, so as to increase user satisfaction and speed up the purchase process (Safitri, 2017).

However, choosing the right technique in the development of a recommender system can be a challenge in itself. Currently, there are several recommender system techniques that have been developed, including collaborative filtering, content-based filtering, and hybrid filtering (Prayoga & Kusnawi, 2022). Collaborative filtering is one of the most popular and effective techniques in developing recommender systems. This technique works by finding similarities between users based on their preferences, and then recommending products preferred by users with similar preferences (Khusna, Delasano, & Saputra, 2021).

Although collaborative filtering techniques have proven effective, there are still drawbacks to using this technique (Wibowo & Munir, 2013). The main problem of collaborative filtering techniques is the cold-start problem, where this technique cannot provide recommendations to new users or new products that do not yet have sufficient historical data. Therefore, more effective techniques are needed in developing recommender systems on e-commerce websites (Wahyudi, 2017).

One of the techniques that is currently developing in the development of recommender systems is deep learning (Aisha, 2022). Deep learning is a machine learning technique that works by utilizing highly complex neural networks, so as to predict user preferences more accurately and effectively. Deep learning techniques have proven effective in several applications such as facial recognition and voice recognition (Gusti, Nasrun, & Nugrahaeni, 2019).

In this study, we developed a recommender system on e-commerce websites using collaborative filtering and deep learning techniques (Hutabarat, 2022). The combination of these two techniques is expected to increase the accuracy and effectiveness of the recommender system on e-commerce websites. The test method is carried out by comparing the performance of the recommender system developed with the recommender system that already exists on the e-commerce website. It is hoped that the results of this study can contribute to the development of a more accurate and effective recommender system in the future (Nuryunita & Nurhadryani, 2013).

METHOD RESEARCH

This research uses quantitative research methods with an experimental approach. Data collection is carried out through the analysis of historical user data on e-commerce websites used as samples. Collaborative filtering and deep learning methods are used in the development of recommender systems. The test was carried out by comparing the performance of the recommender system developed with the recommender system that already exists on the e-commerce website. The resulting data were analyzed using statistical methods to measure the accuracy and effectiveness of the recommender system.

Population and Sample:

The population in this study were users of e-commerce websites who had made purchases. Samples were selected using purposive sampling techniques. The sample consists of e-commerce website users who have made a purchase in 2021, with available and complete data.

Research Instruments:

The research instrument used is a data collection technique from historical user data on e-commerce websites. The data were analyzed using collaborative filtering and deep learning algorithms to develop a recommender system. The performance of the recommender system is measured using evaluation metrics such as precision, recall, and F1-score.

Data Collection Procedure:

Historical user data on e-commerce websites is collected and processed using collaborative filtering and deep learning techniques. The resulting data is then used to develop a recommender system. The test was carried out by comparing the performance of the recommender system developed with the recommender system that already exists on the e-commerce website. The resulting data were analyzed using statistical methods to measure the accuracy and effectiveness of the recommender system.

Data Analysis:

The data obtained were analyzed using statistical methods to measure the accuracy and effectiveness of the recommender system. The performance of the recommender system is measured using evaluation metrics such as precision, recall, and F1-score. The test results will be compared with the performance of the existing recommender system on the e-commerce website. The analysis is performed using software such as Python, R or MATLAB.

RESULT AND DISCUSSION

Result

The results showed that the development of a recommender system by combining collaborative filtering and deep learning techniques can improve the quality of recommendations on e-commerce websites. From the evaluation of the performance of the recommendation system, it can be seen that the use of deep learning techniques can significantly increase the accuracy and relevance of product recommendations compared to using collaborative filtering techniques alone. The results show that deep learning techniques can help models to learn complex and abstract features in the product, so that the resulting recommendations become more accurate and relevant (Firmansyah, Subroto, & Mulyono, 2022).

In conclusion, the development of a recommender system on an e-commerce website using collaborative filtering and deep learning techniques can improve the quality of product recommendations for users. Accurate and relevant recommendations can help improve user experience and product sales on e-commerce websites. Therefore, this recommendation system developed with collaborative filtering and deep learning techniques can provide significant benefits for e-commerce companies (Solichin & Painem, 2020).

Discussion

Recommender system is one of the technologies that is often used in various e-commerce platforms to provide product recommendations to users. The use of the recommender system aims to increase user convenience and attract their interest in making product purchases (Pari & Kurniawan, 2021).

One technique that is often used in the development of recommender systems is collaborative filtering. Collaborative filtering works by comparing user preferences to find common ground between them and generating recommendations based on those preferences. This technique is often used in movie or music recommendation systems on platforms such as Netflix or Spotify (Kesuma & Iqbal, 2020).

In addition to collaborative filtering, deep learning techniques are also increasingly popularly used in the development of recommender systems. Deep learning allows models to learn patterns and features that are more complex and cannot be learned by traditional methods. Deep learning techniques such as neural networks and convolutional neural networks (CNN) can be used to generate recommendations based on more complex data, such as images or text.

The development of recommender systems using collaborative filtering and deep learning techniques can be done in several stages, including:

Data Processing

The first stage in the development of a recommender system is data processing. At this stage, data from the e-commerce platform is captured and processed to be able to be used in the model. Required data includes user data, product data, and historical

transaction data. Historical transaction data can be used to train models and define user preferences.

Model Development

After the data is processed, the next stage is model development. At this stage, collaborative filtering models and deep learning models are developed. Collaborative filtering models can be developed using techniques such as user-based collaborative filtering or item-based collaborative filtering. Deep learning models can be developed using techniques such as neural networks or CNN.

Model Evaluation

The next stage is the evaluation of the model. At this stage, the developed model is evaluated using data that was not used at the time of training. Model evaluation is performed using several metrics, such as accuracy, precision, recall, and F1-score. These metrics are used to evaluate how well the model can provide users with the right product recommendations.

Model Implementation

After the model is successfully evaluated, the next stage is the implementation of the model. At this stage, the developed model is implemented on the e-commerce platform and tested with actual users. At this stage, it is also necessary to monitor to ensure that the model provides appropriate and effective product recommendations for users.

The development of a recommender system using collaborative filtering and deep learning techniques can improve the quality of product recommendations on e-commerce platforms. Users will find it easier to find the desired product and the e-commerce platform will become more attractive to users. In addition, by utilizing advanced technology such as deep learning, the development of a recommender system can produce more accurate and effective product recommendations.

CONCLUSION

In today's growing digital era, recommender systems are one of the most important technologies in e-commerce platforms. The development of a recommender system using collaborative filtering and deep learning techniques is the right solution to improve the quality of product recommendations and attract users to make purchases.

The collaborative filtering technique works by comparing user preferences to find common ground between them and generating recommendations based on those preferences. Whereas deep learning techniques allow models to learn patterns and features that are more complex and cannot be learned by traditional methods.

The development of recommender systems using collaborative filtering and deep learning techniques is carried out in several stages, including data processing, model development, model evaluation, and model implementation. In the evaluation phase, metrics such as accuracy, precision, recall, and F1-score are used to evaluate how well the model can provide users with the right product recommendations.

By developing a recommender system using collaborative filtering and deep learning techniques, users will find it easier to find the desired product and the e-commerce platform will become more attractive to users. In addition, advanced technologies such as deep learning can produce more accurate and effective product recommendations.

In conclusion, the development of a recommender system using collaborative filtering and deep learning techniques is the right solution to improve the quality of

product recommendations on e-commerce platforms and can provide great benefits for users and the e-commerce platform itself.

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