# 1. INTRODUCTION

The development of the Internet has accelerated in recent years, indicating that humanity has entered the era of big data [1]. In this era, there is an exponential increase in data, which not only provides vast amounts of information but also causes information overload problems. Information overload occurs on various platforms, including e-commerce, where users struggle to find products that match their preferences.

E-commerce refers to using electronic media and the Internet to trade goods and services [2], including various types of products, one of which is books. Book sales, especially on large e-commerce sites such as Amazon, are often updated rapidly due to the publication of new works and growing reader interest, making the book market dynamic with collections that cater to the needs of diverse consumers. This growth generates large amounts of complex data, including information about products, transactions, user preferences, and more. One of the biggest challenges of handling large and complex data is how to process and filter the information to make it relevant to the needs and preferences of each user. The solution to overcome this is by utilizing a recommendation system. recommendation system is a software engine that can be used to provide a product recommendation tailored to the preferences of each user [3]. The recommender system plays an important role in recommending items based on each user's preferences. However, when what is recommended by the system is too much or not relevant, the impact is that users will have difficulty in choosing the right book. This can lead to decreased satisfaction, potentially reducing the sales conversion rate.

In previous studies, the methods most often used for e-commerce recommendations, especially for Amazon books, include Collaborative Filtering and hybrid approaches. Margaris et al. [4] proposed the Confidence-Aware Collaborative Filtering (CACF) method with MAE results greater than 0.8 for the Amazon book dataset. In addition, Kharroubi et al. [5] proposed the Item Share Propagation for Link Ranking (ISpLR) method which was compared with several comparison methods (Item based, slope one predictors for online rating, incremental SVD, user-item clustering, and HSI) and found that the method proposed by the author is the best method with MAE results for the Amazon book dataset less than 0.80. Meanwhile, Gao et al. [6] proposed the Automated Collaborative Filtering (AutoCF) method, which they compared with single models (MF, FISM, GMF, MLP, DMF, JNCF-Dot, JNCF-Cat, CMF) and fused models (SVD++, NeuMF, DELF, SinBestFuse), and they found that the proposed method was the best, with RMSE below 0.90 and MAE below 0.80.

In addition, Addanki et al. [7] proposed a hybrid recommender system by combining pre-processing (debiasing) and post-processing (preference correction) applied to several recommendation algorithms (User KNN, Item KNN, ALS, and SVD), it was found that recommendations with the preference correction phase for Amazon books were best applied to the Item KNN algorithm, with RMSE results below 0.90 and MAE below 0.70. Moreover, Karabila et al. [8] proposed a hybrid recommender system by combining the CF method with sentiment analysis (Glove + Bi-LSTM), which they compared with other sentiment analysis methods (TF-IDF + SVM) they found that the proposed method was the best, with RMSE and MAE results less than 1.10.

In previous studies, researchers have successfully developed a recommender system that performs well. However, its accuracy still has the potential to be improved. One approach is to utilize deep learning methods with high accuracy, such as Neural Collaborative Filtering. Neural Collaborative Filtering uses a combined architecture of Generalized Matrix Factorization (GMF) that can handle linear data and Multi-Layer Perceptron (MLP) neural networks that can overcome

the limitations of traditional methods in handling more complex data and capturing non-linear data. However, the Neural Collaborative Filtering method has disadvantages, one of which is less able to handle cold start items because it only uses user and item interactions. cold start items are conditions when the system has difficulty recommending products because they include new products that lack ratings [9].

In this paper, we propose the Feature Enhanced Neural Collaborative Filtering (FENCF) method, a modification of the Neural Collaborative Filtering method. FENCF is a method that utilizes genre metadata information as an item attribute, which not only relies on user and item interaction but also utilizes the content features of the item itself. By utilizing the content features of items, the recommender system can recommend new items with limited user interaction and no rating history from users. Thus, the recommender system can overcome item cold start and improve the accuracy of e-commerce recommender systems compared to conventional Neural Collaborative Filtering. The features of the Amazon book dataset used in this study include user ID, book ID, rating, and genre, providing important information about users and recommended items. This study evaluates its effectiveness using the RMSE (Root Mean Square Error) and MAE (Mean Absolute Error) metrics to prove its effectiveness, which demonstrates that FENCF outperforms the conventional NCF method. FENCF contribution as a new, more accurate approach to book recommendation is to produce a higher quality and more relevant recommender system to handle the dynamic nature of actual book sales on e-commerce platforms. FENCF is not only accurate in recommending old books but also in recommending new books with no ratings or only a few ratings. The advantage of FENCF, which uses genre metadata to improve accuracy and overcome the cold start problem, is that it increases user satisfaction with the system. The system's reliability in recommending old and new books based on each user's preferences will make users feel that the platform understands their needs, which, in turn, encourages users to use the e-commerce platform more frequently in the long run. In addition, a more accurate system can reduce the search time to find relevant books and speed up the purchase process. This improvement will result in a greater chance of increasing sales conversion.