1. INTRODUCTION

Music is one of the most popular forms of entertainment. Along with the development of information technology [1]. With the advancement of information technology, music streaming systems like Spotify, Apple Music, and Deezer are gaining popularity among users. Nevertheless, due to the vast number of songs accessible on these music streaming sites, customers frequently have challenges in discovering songs that align with their preferences. Thus, the implementation of a music recommender system is necessary as it can assist users in discovering songs that align with their interests [2]. A viable approach for a music recommender system is the utilization of the content-based filtering method [3]. This approach operates by examining the attributes of the music that users have expressed a preference for, and subsequently suggesting songs that possess comparable attributes. Content-Based Filtering approaches have been extensively utilized in numerous applications, such as music recommender systems.

Nevertheless, the Content-Based Filtering technique still possesses limitations in delivering precise recommendations. We address this issue by employing a Deep Neural Network (DNN) [4]. Deep Neural Networks (DNN) is a very efficient technique for handling extensive and intricate datasets. Therefore, it can be employed to analyze music data and offer more precise recommendations [5].

This project involves the development of a music recommender system by utilizing a blend of content-based filtering and Deep Neural Network methodologies. The objective of this project is to develop a customized music recommender system for users, taking into account their preferences. Additionally, the study aims to evaluate the precision of the developed music recommender system by employing a combination of content-based filtering and deep neural networks. We analyze the characteristics of the music that consumers enjoy and subsequently utilize Deep Neural Networks (DNN) to suggest tracks that align with their preferences. The method we plan to develop is expected to aid users in locating songs that align with their interests.

Multiple papers served as the primary sources of literature for this investigation. The writers utilized these references to get crucial information for the successful completion of their research. This research drew upon five primary studies, one of which was undertaken by Gunawan et al. [7]. Their study focused on the development of a genre-based music recommender system utilizing Convolutional Recurrent Neural Networks (CRNN). This study employs a combination of Convolutional Neural Network (CNN) and Recurrent Neural Network (RNN) architectures within the CRNN network to tackle the issue of music recommendations. The Convolutional Neural Network (CNN) is employed to extract music features from audio recordings, whilst the Recurrent Neural Network (RNN) is utilized to simulate the intricate interactions among these elements. Niyazov et al. [8] conducted research on a content-based music recommender system. This system recommends songs to users based on the music content itself, including audio features and metadata. Content-based music recommender systems offer song suggestions that align with user tastes. Schedl [9] discusses the utilization of Deep Learning in music recommender systems. The study elucidates the utilization of advanced Deep Learning methodologies, namely Neural Networks and Convolutional Neural Networks (CNN), to enhance the caliber of music recommendations. Gharaei et al. [10] created a garment recommender system based on the content of the apparel using Deep Neural Network (DNN). The objective of this system is to provide clothing recommendations to users by analyzing the characteristics of the apparel, such as product photos or descriptions. The research concludes that Deep Neural Network-based content-based clothing recommender systems have the capability to offer clothing recommendations that align with customer preferences. Martijn et al. [11] created a music recommender system that offers individualized explanations to users. The objective of this study is to augment users' comprehension of the suggestions offered by the system and to bolster users' confidence in the recommendations. The key references for constructing an optimal music recommender system involved five studies that utilized a combination of content-based filtering and deep neural network techniques.

Music is a genre of art that combines sound and rhythm to achieve artistic expression [6]. Music comprises various elements, such as melody, harmony, rhythm, lyrics, and instruments. Various civilizations and customs around the world have given rise to several styles of music. Common music genres encompass pop, rock, hip-hop, jazz, classical, country, and R&B, among other others. Every genre possesses distinct musical characteristics and techniques. Content-based recommender systems are a type of recommender system that utilizes data on products that consumers find enjoyable in order to suggest similar things [12]. Features or properties of things, such as genre, category, color, or material, play a crucial role in content-based recommender systems. The system acquires users' preferences by analyzing the items they express a liking for and then identifies similarities with the items stored in the database. The system thereafter suggests things that possess comparable characteristics to the items that customers prefer. A content-based recommender system is exemplified by an e-commerce website that suggests similar products to consumers based on their previous views or purchases [14]. Content-based recommender systems on music or video streaming sites might suggest songs or movies with similar genres or artists to the ones that users enjoy.

Deep Neural Network (DNN) is a machine learning model composed of multiple layers of neurons. Each neuron in the network receives input from the neurons in the previous layer and generates an output, which is then transmitted to the neurons in the next layer [15]. Deep Neural Networks (DNN) are widely adopted and very effective machine learning models utilized in several domains such as pattern recognition, facial detection, object identification, audio classification, and language translation. Deep neural networks (DNN) enable the gradual acquisition of more intricate feature representations at each layer of neurons, based on the input data[23]. The process ultimately leads to the creation of more abstract feature representations [16]. Subsequently, these feature representations are utilized to

carry out classification or regression tasks on the provided data. The DNN learning process is conducted by the utilization of the backpropagation method, which computes the gradient of the error function and improves the model parameters to minimize the error.

Convolutional Neural Network (CNN) is a specialized Deep Learning model that is specifically built to handle grid-structured data, such as photographs or other spatial data [17]. CNN employs convolution operations to extract significant features from the input data and convolutional layers to progressively acquire intricate feature representations in a hierarchical manner [18]. CNN utilizes convolution techniques to extract fundamental attributes from input data, while convolutional layers acquire increasingly intricate feature representations in a hierarchical fashion. CNN possesses a superiority in the identification of intricate visual patterns and characteristics, as well as the ability to maintain consistency in the interpretation of incoming data[20]. CNN is highly valuable for computer vision tasks such as image classification, object identification, and picture segmentation[19].