1. INTRODUCTION

Indonesia's rich natural resources make it have numerous interesting tourist attractions in various regions. Tourism is currently one of the most influential and productive economic sectors for several regions and is regarded as important because it can affect the economy of the country [1]. This sector is very effective and plays a major role in the country's foreign exchange earnings, especially because Indonesia offers a variety of beautiful tourist destinations [2]. This is evidenced by data from Badan Pusat Statistika (BPS), cumulatively foreign tourist visits in 2023 increased 98.30 percent compared to the same period in 2022 [3]. A lot of changes have been made to advance the tourism sector, such as digitalization through various social media platforms, such as Twitter, which has had a good impact on the advancement of the tourism sector in Indonesia. However, the amount of information available can confuse tourists when choosing the place they want to visit. In addition, with social media algorithms that only bring up trends in tourist attractions that are viral, then, of course, information from tourism will only revolve around that place within a certain period of time [2]. Travelers often need advice and recommendations for places to visit when travelling to an area [4]. Therefore, a recommendation system is needed that can be used to provide recommendations for tourist attractions to overcome these problems.

Recommendation systems are useful in providing recommendations for tourist attractions that match the likes or preferences of tourists. The methods commonly used in recommendation systems are collaborative filtering (CF), content-based filtering (CBF), and hybrid approaches [5]-[7]. CBF is a recommender method that is performed based on the similarity of the user's preferred items [6]. In the CBF process, all item information is classified into different item profiles based on their respective descriptions [7].

In addition, the utilization of deep learning can support this, especially for classification tasks. Classification is one of the fundamental tasks in natural language processing with a wide field of applications [8]. Deep learning-based recommendation systems are increasingly in demand because they offer superior performance and can provide high-quality recommendations [6]. In deep learning, there are various methods for decision making, one of which is a recommendation system. Feedforward Neural Network (FFNN) is one of the simplest and most commonly used types of deep learning for classification tasks [9]. FFNN is a form of combined supervised learning and deep learning that belongs to an architecture consisting of multiple non-linear processing layers and is considered a good choice in recommendation systems. On the other hand, BiLSTM (Bidirectional Long Short-Term Memory) is an artificial neural network model that is able to consider context information from both directions, past and future, resulting in a more comprehensive representation of the text. The advantage of BiLSTM lies in its ability to capture temporal relationships in sequence data, which makes it highly effective in sentiment analysis tasks [10]. Recommender systems that use deep learning can provide more accurate and relevant recommendations because they are able to manage and analyze large with high complexity.

A literature review was conducted to support this research. Several studies that are aligned with the methods that have been done previously are used as references in this research. In research [11], a CBF model was developed to predict movie popularity based on initial features such as genre and director, achieving high accuracy with data from IMDb and TMDb. Research by S. Missaoui et al. [12] used CBF in the LOOKER application for filtering tourism content on social media based on multi-layered user profiles to recommend hotels, restaurants, and tourist attractions. CBF strategy was also used to recommend movies [13], with an analysis of previous user behaviour to provide more personalized recommendations. In addition, CBF was applied to an e-learning system to generate recommendations that match students' interests [14], showing significant improvements in MAE by 25.26% and accuracy by 93%.

On the other hand, research by Mingsheng Fu et al. [15] developed a FFNN model to describe the interaction between users and items, which can capture various types of relations. The model showed high performance with an RMSE of 0.843, outperforming previous methods. In addition, the research of B. Markapudi et al. [16] developed a video recommendation system to overcome semantic gaps by utilizing visual features and neural networks, using Motion Adaptive Gaussian Denoising Filtering and Multilayer Feed-Forward. Implementation with MATLAB r2020a showed a computation time of about 0.999 seconds and 94% accuracy. In addition, the sentiment analysis method proposed in this study integrates the degree of contribution of sentiment information into the TF-IDF algorithm for term weight

calculation, resulting in a better word vector representation. The BiLSTM model is used to consider the context information thoroughly and obtain a more accurate text representation, with the sentiment results determined through FFNN and softmax mapping [10].

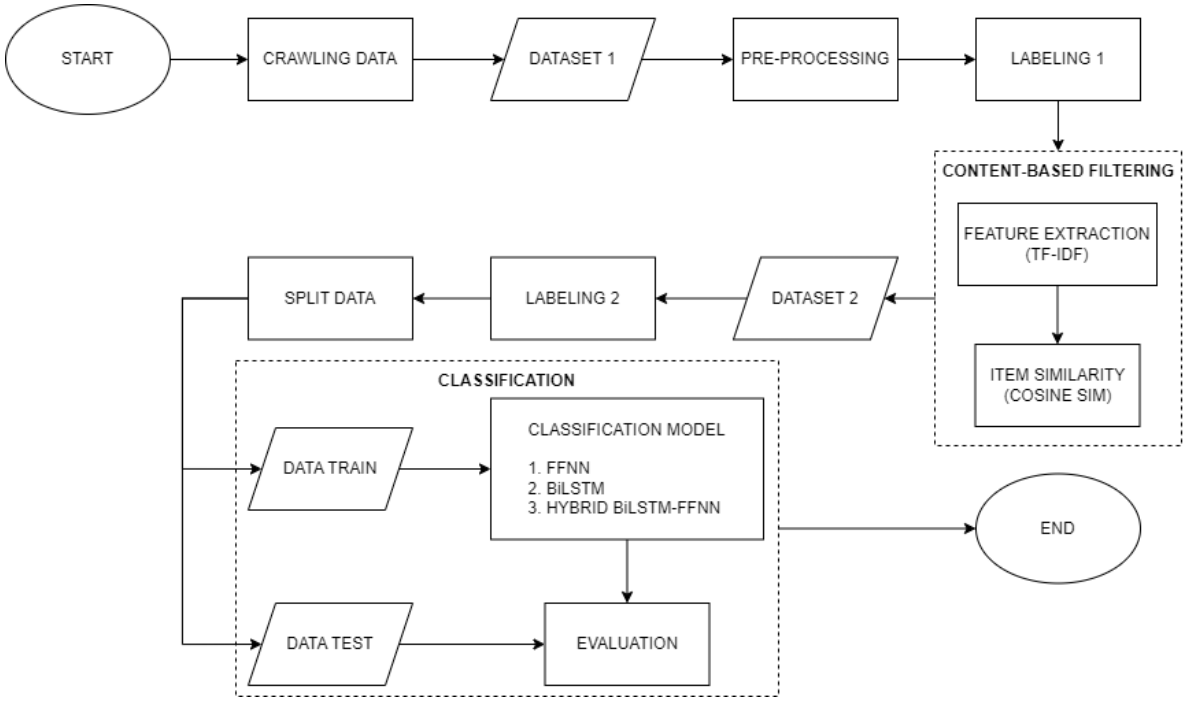

Figure 1. *The Model Development Workflow*

Classification models in carrying out their tasks usually experience various problems, such as data balance problems. SMOTE (Synthetic Minority Over-sampling Technique) is a technique used to overcome the problem of class imbalance in datasets in the classification process [17]. This problem often occurs when the minority class in the dataset has a much smaller number of samples compared to the majority class, which can cause the classification model to favor the majority class and ignore the minority class. As in the research conducted by J. Shen et al., using SMOTE on the Support Vector Machine model optimized with Particle Swarm Optimization (PSOSVM) proposed successfully increased the accuracy by 38.29% from the model without SMOTE.

In this research, the tourism recommendation method will use a Content-Based Filtering and hybrid BiLSTM Feed-Forward Neural Network (BiLSTM-FFNN). The dataset used is tweet data from Twitter, because Twitter is considered a popular platform for expressing opinions, providing reviews, and providing recommendations [18]. This research aims to fill the knowledge gap, as there is no research on the use of CBF method with BiLSTM-FFNN hybrid in the development of travel recommendation system. This indicates the need for further experiments to explore the potential of this integration method in depth. This research contributes by developing a travel recommendation system method that integrates CBF and hybrid deep learning BiLSTM-FFNN with high accuracy and provides a comprehensive analysis of various hyperparameter optimization and tuning with Learning Rate Finder (LFR).