

CHAPTER I

INTRODUCTION

1.1. Background of the Study

The development of information and communication technology in the current digital era has brought many changes to various aspects of life [1], including in the fields of transportation and tourism. One of the sectors experiencing rapid growth is the transportation industry, which is widely used for various activities. One branch of this transportation industry sector is the tourism transportation sector, which operates in the areas of tourist travel, work visits, and academic activities. Amid the high demand for these transportation services, service provider companies are required to deliver fast, transparent, and efficient services.

PT. Setio Budi Luhur Trans is one of the companies operating in the tourism transportation service sector, specifically in bus rental. In running its operations, this company provides tourism bus rental services with varying pricing, adjusted according to the travel distance and the type of bus chosen by the customer. Until now, the management of operational data and bus rental transactions has still been carried out manually through record-keeping in books and direct communication via messaging media. This process has several limitations, including the potential for recording errors, delays in data updates [2], and difficulties in conducting analysis for evaluation purposes or rental price determination.

One of the main problems faced by the company is the bus rental price determination process, which does not yet have a consistent calculation standard. Rental prices are often determined based on the subjective experience of the administration staff or agreements with customers without systematically considering the relevant influencing factors. This type of pricing falls into the category of subjective pricing, that is, prices determined based on individual estimates or opinions, where sellers and buyers may have different perceptions of a product, and these prices often do not align with the general market price [3]. This condition can lead to price mismatches with market conditions, either too high, thereby reducing customer interest, or too low, thereby reducing company profits [4]. In addition, differences in bus type, travel distance, and seasonal conditions (holiday or non-holiday) also affect

the rental prices offered, so a system capable of providing objective and accurate price predictions based on existing data is needed.

The implementation of a web-based system is an effective solution to address these problems. A web-based system allows data management processes, transactions, and analysis to be carried out in an integrated, efficient, and easily accessible manner by relevant parties [5]. With the support of modern framework technology such as Laravel, application development can be carried out in a more structured, secure, and easily maintainable and scalable manner [6]. Through this system, all bus rental data can be stored properly and used as a basis for the bus rental price determination process in the future.

In price prediction, the application of machine learning algorithms provides a scientific approach to modeling the relationship between various factors that influence rental prices. There are several algorithms commonly used in regression and price prediction problems, including Random Forest (RF), Light Gradient Boosting Machine (LightGBM), and Extreme Gradient Boosting (XGBoost). Random Forest builds many decision trees in parallel but tends to require longer computation time [7]. LightGBM has very high training speed but is prone to overfitting on small datasets [8].

The selection of XGBoost as the algorithm in this research is based on several considerations. First, XGBoost is equipped with a regularization mechanism that can prevent overfitting. Second, XGBoost is capable of providing an optimal balance between training speed and prediction accuracy, offering a combination of computational speed that remains efficient with a more consistent level of accuracy [9]. With these considerations, XGBoost is chosen as the most suitable algorithm for the tourism bus rental price prediction system in this research.

Based on the description above, it can be concluded that a system capable of performing integrated tourism bus rental data management while also providing accurate price prediction capabilities is still needed. Therefore, this research focuses on the "Design and Development of a Tourism Bus Management Website with Price Prediction Using the XGBoost Algorithm (Case Study of PT. Setio Budi Luhur Trans)" as a solution to improving operational efficiency.

1.2. Problem Formulation

Based on the description in the background, PT. Setio Budi Luhur Trans still faces obstacles in managing bus data, customer data, and rental transaction data that are carried out manually, as well as rental price determination that is not yet based on data analysis. Irregularities in record-keeping, price inconsistencies, and the absence of a system capable of processing factors such as travel distance, bus type, and seasonal or holiday conditions form the basis for the need to develop a web-based system integrated with a price prediction method using the Extreme Gradient Boosting (XGBoost) algorithm. To address these needs, this research formulates the following questions:

1. How can a tourism bus management website for PT. Setio Budi Luhur Trans be designed and developed to manage bus data, customer data, and rental transaction data in an integrated manner?
2. How can the Extreme Gradient Boosting (XGBoost) algorithm be applied to predict bus rental prices?
3. How can the developed system help users obtain rental price estimates more quickly?

1.3. Research Objectives

This research aims to design and develop a tourism bus management website integrated with a rental price prediction feature using the Extreme Gradient Boosting (XGBoost) algorithm, with PT. Setio Budi Luhur Trans as the case study.

1.4. Research Benefits

This research is expected to provide benefits to various parties, both for the academic community and practitioners in the tourism transportation industry. From an academic perspective, this research can serve as a reference in the application of machine learning algorithms, particularly Extreme Gradient Boosting (XGBoost), for price prediction problems in web-based information systems. The results of this research are also expected to add to the scientific literature in the fields of management information system development and the application of predictive models in the transportation sector, so that they can be used as a reference for subsequent research seeking to develop similar systems with different methods or approaches.

Meanwhile, for parties in the industry or the non-academic community, this research is expected to provide a tangible contribution to improving operational efficiency and data-based decision-making. Through the developed system, PT. Setio Budi Luhur Trans can manage bus rental data in a more structured manner, reduce the potential for recording errors, and accelerate the booking administration process. In addition, the bus rental price prediction results generated by the XGBoost model can be used as a reference for determining rental prices that are more accurate and competitive, thereby improving customer satisfaction and the company's competitiveness in the tourism transportation service industry.

1.5. Scope and Limitations

To keep this research focused and within the defined scope, the following limitations are established:

1. The developed system only covers the management of bus data, customer data, rental transaction data, and payment data, as well as the rental price prediction feature, without including additional features beyond the operational needs of PT. Setio Budi Luhur Trans.
2. The platform being developed is limited to a web-based application using the Laravel framework, so this research does not cover mobile application development or integration with other platforms.
3. The variables used for the prediction process are limited to three main variables, namely travel distance, bus type, and seasonal or holiday conditions, in accordance with the availability of company data; variables outside these three factors are not included in the research.
4. The prediction model used in this research is only the Extreme Gradient Boosting (XGBoost) algorithm, so no performance comparison with other algorithms or other machine learning methods is carried out.
5. This research does not focus on advanced optimization processes to achieve maximum model accuracy. The XGBoost model is used to produce consistent and representative price estimates as the basis for automatic price determination within the system. Efforts to improve accuracy through expanding variables, improving data quality, or testing other algorithms are recommended as directions for development in subsequent research.

6. System testing is carried out with reference to aspects of functionality and usability, so it does not cover in-depth security testing of the system or system performance testing at a large scale.