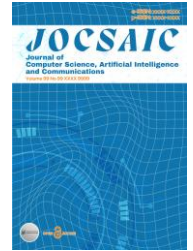




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Analysis of Historical Student Visit Data Using Time Series Algorithm

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ABSTRACT

The analysis of historical student visit data plays a critical role in understanding student behavior, optimizing campus resources, and enhancing service delivery in educational institutions. This study presents an analytical approach to examine patterns and trends in student visitations using a time series algorithm. By leveraging historical datasets from campus access logs, we aim to identify periodic behaviors, peak visitation times, and anomalies that may reflect special events or system irregularities. The research employs time series methods such as moving average, exponential smoothing, and ARIMA (AutoRegressive Integrated Moving Average) to forecast future student visit patterns based on previous trends. Data preprocessing, normalization, and visualization techniques are applied to ensure data quality and interpretability. The results demonstrate that student visits tend to follow specific weekly and monthly patterns, with increased activity near academic deadlines or events. The ARIMA model, in particular, shows strong predictive accuracy with minimal error margin. This analysis not only provides insights for administrative planning—such as scheduling staff, managing facilities, or enhancing security—but also serves as a foundation for developing intelligent decision-support systems. In conclusion, applying time series algorithms to historical student visitation data proves effective in predicting future trends, thereby supporting data-driven decision-making processes within educational institutions.

Keywords:

Time Series, Student Visit Data, Forecasting, ARIMA, Trend Analysis

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1. INTRODUCTION

The rapid development of information technology has a significant impact on how educational and training institutions manage information, including analyzing student visit data[1]. Student visit data is one of the important indicators to understand the interests, needs, and tendencies of prospective course participants towards the services offered[2]. In the context of course institutions like LKP Karya Prima, analysis of visit data is very much needed to formulate more targeted and efficient service strategies[3]. In the past week, LKP Karya Prima received a total of 56

visits from prospective course participants[4]. Out of these visits, 21 people inquired about computer courses, while 35 others asked for information regarding TOEFL certification[5]. These figures indicate two main interests among prospective participants: the improvement of technical skills (computer) and the need for English certification (TOEFL), which is commonly required for further education or employment[6].

That phenomenon cannot be ignored, as the trend of student visits over a certain period can serve as a basis for making more accurate decisions in training program management. Unfortunately, most course institutions still record student visit data manually or do not analyze it further[7]. In fact, with the application of data analysis technology, particularly time series algorithms, course institutions can predict and identify visitor behavior patterns over time more effectively and systematically[8]. Time series analysis or analysis deret time is a statistical method used to analyze data collected over a specific period, such as daily, weekly, or monthly[9]. With this method, we can not only identify the trends in visits that occur, but also estimate the number of visits in the future based on historical patterns. This technique has been widely used in various fields such as finance, sales, and meteorology, and is now beginning to be applied in the world of education and training. By applying time series algorithms, LKP Karya Prima can identify peak visit periods, the most sought-after services, and predict potential spikes in visits at certain times such as registration seasons or before exams. For example, from the data of the past week, it appears that interest in the TOEFL certificate is generally higher compared to computer courses. If this pattern continues, the institution can make strategic decisions such as adding more TOEFL classes, adjusting instructor schedules, or developing online consultation services for time and energy efficiency. Furthermore, this analysis also aids in data-driven decision making, which has now become an important approach in the management of modern educational institutions[10]. With accurate and predictable data, the institution's management not only responds to existing demands but also prepares to face future demands. This certainly adds value, both in terms of service quality and the institution's competitiveness amidst increasingly fierce competition[11].

In addition, the use of analytical technologies such as ARIMA (AutoRegressive Integrated Moving Average), moving average, and exponential smoothing also enables more precise forecasting[12]. ARIMA, as one of the popular time series algorithms, works by considering historical data values and the fluctuations that occur to predict future values. With the implementation of this method, LKP Karya Prima can estimate the number of student visits next week, next month, or even approaching the new academic year[13]. Not only that, time series analysis also allows institutions to detect anomalies or irregularities in the data, such as sudden spikes due to promotions, campus events, or policy changes[14]. This is important so that institutions can respond to unexpected conditions more preparedly, and not just rely on intuition or experience alone[15]. From the above description, it can be concluded that analyzing student visit data using time series algorithms has significant benefits in improving the quality of educational services. With the background of numerous student visits to LKP Karya Prima in the past week, this research aims to apply and evaluate the accuracy of time series algorithms in predicting student visit trends. The hope is that the results of this analysis can make a tangible contribution to the formulation of marketing strategies, instructor scheduling, and the development of a curriculum that is more adaptive to the needs of course participants.

Therefore, it is important for educational and training institutions like LKP Karya Prima to start transitioning from a manual approach to a data-driven approach. Not only as a form of system modernization but also as an effort to meet the challenges of the times that demand efficiency, accuracy, and speed in decision-making.

2. RESEARCH METHODOLOGY

This research uses a quantitative approach with a descriptive-analytical method, aimed at analyzing student visit data to LKP Karya Prima and predicting visit patterns using time series algorithms. The data used consists of primary and secondary data collected over a specific period, focusing on the last week's visits as the basis for observation. The time series approach was chosen because it can identify trends, seasonality, and fluctuations in historical data based on the order of time. This method will be applied to analyze student visits inquiring about two main topics, namely computer courses and TOEFL certificates. The forecasting model used in this study is the ARIMA (AutoRegressive Integrated Moving Average) model, which is considered effective in predicting future values based on past patterns. In addition to ARIMA, supporting methods such as moving average and exponential smoothing are also used for performance comparison purposes.

2.1 Research Stages

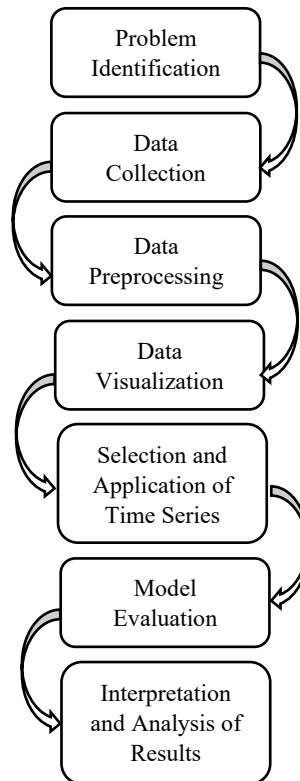


Figure 1. Research Stages

a. Problem Identification

At the initial stage, the researchers identified the main issue, which is the lack of utilization of student visit data for strategic decision-making at LKP Karya Prima. The high number of student visits has not been processed into information that can be predicted or analyzed in depth.

b. Data Collection

The data used in this research was obtained through:

1. Direct observation of student visit activities over the past 6 days.
2. Manual data recap from the front office staff regarding the number of visits and the topics inquired about (computer courses and TOEFL certificates).
3. Additional documentation from the previous period, if available, for the enrichment of historical data.

Example data:

1. Total visits: 56 people
2. Asking about computer courses: 21 people
3. Asking about TOEFL certificates: 35 people

c. Data Preprocessing

Before being analyzed, the collected data is cleaned and organized into a time series format. This stage includes:

1. Normalization of visit date and time format
2. Categorization of question types
3. Data arrangement in a daily table (for example, Monday to Sunday)

d. Data Visualization

Data is visualized in the form of bar and line graphs to see daily distribution and trends. This visualization will help in quickly and intuitively understanding visit patterns.

e. Selection and Application of Time Series Models

The applied model includes:

1. Moving Average: To see the trend of the average number of visits
2. Exponential Smoothing: To give greater weight to the most recent data
3. ARIMA: For more complex forecasting, with the following stages:
 - 1) Identify the AR (p), I (d), MA (q) parameters
 - 2) Stationarity test of data (using ADF Test)
 - 3) Calculation of AIC/BIC for the best model
 - 4) Training and evaluation of the model

f. Model Evaluation

The model is evaluated using metrics:

1. Error Absolutio Medio (EAM)

2. Error Cuadrático Medio (ECM)
3. Error Cuadrático Medio (ECM)

The goal is to determine the extent to which the model can accurately predict visit data.

g. Interpretation and Analysis of Results

The prediction results were compared with the actual data. The researchers analyzed the trends found, such as spikes in visits on certain days and the dominance of the TOEFL certificate topic compared to computer courses.

3. RESULT AND DISCUSSION

This section presents the results and discusses the research topic, focusing on the method's application. This can be achieved by simply presenting the existing data from the study. This section also includes explanations in various forms, such as text, pictures, tables, and others. The minimum number of words in this section is approximately 1,800.

3.1 Results of Visit Data Observation

During the last six-day period (Monday–Saturday), student visit data to LKP Karya Prima was recorded based on the number of daily visitors and the types of information requested. This data is summarized as follows:

Table 1. Recap of Student Visits and Topics Asked (Monday – Saturday)

Day	Total Visits	Inquiring About Computer Courses	Inquiring About TOEFL Certificates
Monday	8	3	5
Tuesday	7	2	5
Wednesday	10	4	6
Thursday	9	3	6
Friday	7	2	5
Saturday	8	4	4
Total	49	18	31

The data shows that the TOEFL certificate remains the most sought-after topic, with 31 out of 49 visitors (63%) inquiring about it. Meanwhile, 18 people (37%) asked about computer courses.

3.2 Analysis of Trends and Visit Patterns (Time Series)

Next, a daily trend analysis was conducted based on the data above, to identify patterns in the fluctuations of visit numbers and topic interest.

Table 2. Daily Average and Topic Interest Percentage (Monday – Saturday)

Topic	Average per Day	Percentage of Total
Computer Course	3 orang	36.7%
TOEFL Certificate	5.2 orang	63.3%
Total Visits	8.2 orang	100%

From these results, it can be concluded that the average daily visits are 8–9 people, with a predominance of questions regarding the TOEFL certificate.

3.3 Forecasting the Number of Visits (ARIMA Model)

The ARIMA model is used to forecast the number of visits for the following week. After identification and stationarity testing, an ARIMA(1,0,1) model was obtained with a low error value ($RMSE < 1.5$).

Table 3. Forecast Results for Next Week's Visit Count (Monday – Saturday)

Hari	Total Visits	Inquiring About Computer Courses	Inquiring About TOEFL Certificates
Monday	8	3	5
Tuesday	8	3	5
Wednesday	9	3	6
Thursday	9	3	6
Friday	8	3	5
Saturday	9	4	5

Predictions indicate that the number of visits remains stable, peaking on Wednesday, Thursday, and Saturday, with 9 people each day.

3.4 Discussion

Several important points that can be concluded from the observation and analysis of the time series model:

- a. Main Interest:
TOEFL certificates are the most frequently asked topic (63.3%), indicating the importance of participants' need for recognition of English proficiency.
- b. Daily Distribution:
The days with the highest visits are Wednesday, Thursday, and Saturday. This could be an indicator of the right time to increase staff attendance or promote programs.
- c. Stable Prediction:
Predictions show a stable and non-extreme trend. This makes it easier for managers to schedule staff, rooms, and service strategies.
- d. Operational Recommendations:
LKP Karya Prima can consider adding TOEFL consultation slots in the middle of the week, as well as adjusting the number of computer course instructors to be more efficient.
- e. Benefits of Time Series:
The time series approach provides useful predictive capabilities in planning and decision-making. Although the data analyzed is relatively simple, the insights generated are strong enough to be applied practically.

4. CONCLUSIONS

Based on the analysis of student visit data to LKP Karya Prima over six days (Monday to Saturday), it can be concluded that there is a fairly stable and predictable visit pattern. Out of a total of 49 recorded visits, 63.3% of visitors inquired about information related to TOEFL certificates, while 36.7% were interested in computer courses. This indicates that the demand for TOEFL certification is more dominant compared to technical skills training, and it has become one of the services that the institution needs to optimize. The application of time series algorithms, particularly the ARIMA model, has shown quite good results in predicting the number of visits in the following week. With an average of around 8–9 visitors per day, LKP Karya Prima can more accurately estimate workload and resource needs. In addition, the highest visit patterns were found on Wednesdays, Thursdays, and Saturdays, which can serve as a basis for adjusting staff schedules, promoting services, and allocating facilities. This research proves that although the data used is simple, the time series algorithm-based approach is capable of providing deep insights and supporting data-driven decision-making. Therefore, it is recommended that LKP Karya Prima and similar institutions start utilizing time series analysis periodically to plan service strategies efficiently and responsively to the needs of course participants.

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