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JITK (JURNAL ILMU PENGETAHUAN DAN TEKNOLOGI KOMPUTER)

WEB-BASED INFORMATION SYSTEM PREDICTION OF VEHICLE THEFT VULNERABILITY IN JAYAPURA USING REGRESSION ANALYSIS

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Abstract—*Vehicle theft in Jayapura Regency is quite high and there is no application to assist the police in making estimates or predictions of the number of theft cases that will occur in the next year. In 2022, cases of theft in Jayapura district will start to increase. to make these predictions the authors designed and built a system that can predict the number of these cases in building this application the authors use the Regression Analysis method this process can help the police predict the number of cases in the coming year. The development method used is SDLC, linear regression analysis and using the PHP programming language, the database uses MYSQL, Sublime Text. This research was conducted because there was no system that could assist the staff of the Resort Police (Polres) of Jayapura Regency. From this research, a system for predicting the level of vulnerability to motorized vehicle theft has been successfully built at the Jayapura District Police with data processed for attendance data using face region, reporting data using barcodes, queue data using counters and digital archive data helping the police store important documents.*

Keywords: *information system, prediction, regression analysis, theft vulnerability, web.*

Intisari—*Pencurian kendaraan di Kabupaten Jayapura cukup tinggi dan belum ada aplikasi untuk membantu pihak kepolisian dalam membuat estimasi atau prediksi jumlah kasus pencurian yang akan terjadi di tahun depan. Pada tahun 2022, kasus pencurian di Kabupaten Jayapura mulai meningkat. untuk melakukan prediksi tersebut penulis merancang dan membangun sebuah sistem yang dapat memprediksi jumlah kasus tersebut dalam membangun aplikasi ini penulis menggunakan metode Analisis Regresi proses ini dapat membantu pihak kepolisian memprediksi jumlah kasus di tahun yang akan datang. Metode pengembangan yang digunakan adalah SDLC, analisis regresi linier dan menggunakan bahasa pemrograman PHP, database menggunakan MYSQL, Sublime Text. Penelitian ini dilakukan karena belum adanya sistem yang dapat membantu staf Kepolisian Resor (Polres) Kabupaten Jayapura. Dari penelitian tersebut telah berhasil dibangun sistem prediksi tingkat kerawanan pencurian kendaraan bermotor di Polres Jayapura dengan data yang diolah untuk data absensi menggunakan face region, data pelaporan menggunakan barcode, data antrian menggunakan loket dan data arsip digital membantu polisi menyimpan dokumen penting.*

Kata Kunci: *sistem informasi, prediksi, analisis regresi, kerentanan pencurian, web.*

INTRODUCTION

Motor vehicle theft is one of the most frequent criminal acts in Papua, the increasing number of motorized vehicles, especially two-wheeled vehicles, is quite significant each year accompanied by an increasing number of motorcycle thefts each year. One of the factors that causes the occurrence of vehicle theft is the increase in the number of unemployed. Crime or criminality is not only the responsibility of the police but the responsibility of all levels of society. Motorcycle theft is a criminal act including the most frequently occur in Indonesia. The growth of motor vehicles, especially motorcycles significantly in each year accompanied by the increasing theft of motorcycles in each year. In addition, population growth, unemployment participated affect the increase in such crime. Therefore, we need a system that can predict the susceptibility of an area to the crime of motorcycles theft as well as the factors that influence it [1]. The next research entitled "Application of the Simple Linear Regression Method to Predict the Distribution of the Covid 19 Vaccine in Cilacap Regency", the linear regression prediction method can produce predictions with several criteria, where there is a linear regression prediction model that has an error value of less than

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18%, meaning it has accuracy amounting to 82% or included in the good category [2]. Based on data on vehicle theft reports from the Jayapura District Police for 2010-2021, there were 507 cases of vehicle theft, and the number of data on vehicle theft cases found from 2010-2021 was 176 thefts. The data collected is then processed again to make predictions. The application of predicting the level of vulnerability to theft in an area is urgently needed in order to be able to determine in the coming year how many cases of vehicle theft and vehicle cases are found, by using data mining on the prediction of the level of vulnerability to theft of the vehicle so that it becomes information that can be used by the police to prevent cases of theft in front. From the data that has been obtained, the authors make a graph of lost and found vehicle theft cases per year.

Regression analysis is used in predicting vehicle theft cases because it provides a statistical method that can help understand the relationship between independent variables (factors that can influence vehicle theft cases) and the dependent variable (the number of vehicle theft cases). The prediction method used is a simple regression analysis method because the data processed is small size data, which is an approach method for modeling the relationship between one dependent variable and one independent variable. In simple regression analysis, the relationship between variables is linear, where changes in variable X will be followed by changes in variable Y permanently. From the case above, the authors are interested in taking the research title with the title "Prediction of the Level of Vulnerability of Motorized Vehicle Theft at Resort Police (Polres) Jayapura Regency Papua Using Web-Based Regression Analysis Methods". Linear Regression Analysis is commonly used for make predictions or predictions [3]. Linear regression is one prediction method that uses straight lines for describes the relationship between two variables (or more) [4].

MATERIALS AND METHODS

The methodology used in this study consists of 3 types, namely:

1. Framework of Thinking

The following is the framework of the Data Processing Information System for predicting the level of vulnerability to web-based motor vehicle theft in Figure 1.

2. Data Retrieval Method

a. Observation

Observations were carried out to understand field conditions related to vehicle theft cases in Jayapura district.

b. Interview

The author makes a list of questions to conduct interviews in order to find out what is needed to make a system for predicting the level of vulnerability of vehicle theft. Interviews were conducted to obtain information from various parties involved, such as the police and vehicle owners, regarding vehicle theft incidents.

c. Study of Literature

A literature study was conducted to gain an in-depth understanding of the factors that influence vehicle theft cases.

d. Documents

Documentation involves collecting and analyzing historical data related to vehicle theft cases in Jayapura. The data taken by the author from the Jayapura district police are:

1) Lost report data
2) Report data found

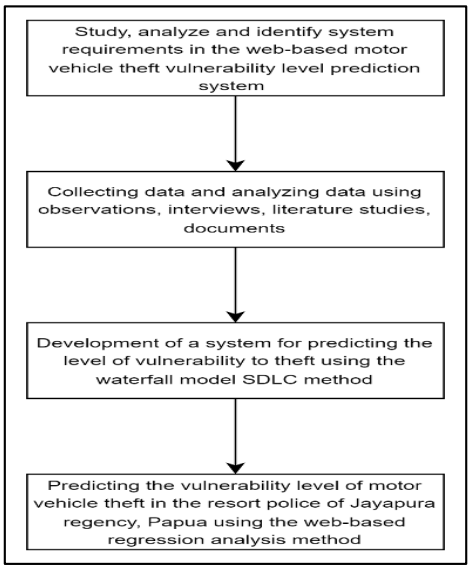

Figure 1. Thinking Framework

3. System Development Method

SDLC waterfall (waterfall) is often also called a linear sequential model (sequential linear) or classic life cycle (classic life cycle). The Waterfall Model is more suitable for projects where significant changes are not expected to occur after the start of the development phase. If the vehicle theft prediction information system in Jayapura district does not require frequent iteration and changes, the Waterfall Model could be a reasonable choice. The waterfall model provides a sequential or sequential software lifeflow approach starting from analysis, design, coding, testing and support. This method was used in this research because it was for a software development project so that it could be used by the Jayapura Regency Resort Police. The following is a picture of the waterfall model in Figure 2 [5].

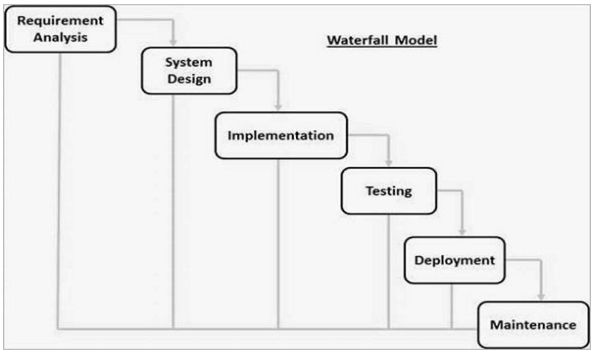

Figure 2. Waterfall Model

a. Requirement Analysis

The process of collecting needs analysis is carried out as follows:

1. Running System Analysis

The author observes the running system carried out by the police to make a report on a theft case until the report is made into a police archive. This running system is described in the form of a flowmap.

2. System Requirements Analysis

Identification of system requirements needed by the police, namely.

a. Hardware requirements.
b. Software requirements.
c. Vehicle theft report data.
d. Vehicle found report data.

3. Proposed System Analysis

The system proposed by the author is a system that can record each case of loss report, the report found is made in a database form report. From this data we can predict the number of vehicle theft cases in the next year, the tool used is a Website-based application (web).

4. Predictive Analysis

The prediction analysis uses the regression analysis method, which is a calculation method to determine the number of cases of motor vehicle theft in the next year.

b. System Design

At this stage the authors carry out the design of making software programs.

c. Implementation

The programming language used:

1. PHP, CSS (bootsrap), JavaScript and Json
2. Xampp Support PDO Database.

Website can also be interpreted as a group of related web pages, between one another. Usually on the first page of the website is the home page page, while page by page is called web page [6].

d. Testing

At this stage the author tests the system that has been created and ensures that the system "Predicting the Level of Vulnerability of Motorized Vehicle Theft at the Resort Police (Polres) of Jayapura Regency, Papua Uses Web-Based Regression Analysis Methods" and uses blackbox testing.

e. Deployment

The deployment phase typically involves the final step of delivering the completed system to the end-users or customers. This phase comes after the completion of all development activities, including design, coding, testing, and documentation.

f. Maintenance

The maintenance phase comes after the implementation phase. During this phase, the system is deployed and delivered to the customer or end-users. The primary focus of the maintenance phase is to ensure that the system operates correctly in the production environment and meets the user's expectations.

4. Referenced Library

Research that has been done and related to previous research:

a. A. P. Setyan with the titled " Prediksi Kerawanan Lokasi Terhadap Kasus Pencurian Kendaraan menggunakan Algoritma Jaringan Syaraf Tiruan,". This study proposes the development of a computer-based prediction model for regional vulnerability to computer-based motorcycle theft. The results of this prediction can be used as initial information to take certain actions that can suppress the crime of motorbike theft in the future by the Police or related parties [7].
b. Mansah, Fauzi, I., & Oktama, A. “Law Enforcement Of Theft Of Motor Vehicles Based On Article 362 Of The Kuhp In The Bandar Lampung Police Area" explain how law enforcement is an attempt to express the moral image contained in the law. The rise of motor vehicle theft that is growing, the strategic location and ease of committing the crime of motor vehicle theft, and the difficulty of finding evidence of perpetrators by investigators make the crime of motor vehicle theft increasingly attractive to criminals. The formulation of the problem in this study is how to enforce the law against the crime of motor vehicle theft and what are the obstacles and how to enforce the law against the crime of motor vehicle theft. The research used is empirical research. The results of the study found that law enforcement against the crime of motor vehicle theft was carried out by following up on reports from victims of theft through the SPKT which were then made a BAP which was then carried out by an investigation and after completion the investigator handed over the suspect to the police and if it was not

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known or found a further examination was carried out and made DPO letter [8].

c. M. A. Kaseger, Y. D. Y. Rindengan, A. S. M. Lumenta, "Aplikasi Pemetaan Daerah Rawan Kriminalitas Di Manadi Berbasis Web". Crime/criminality is not only the responsibility of the police but the responsibility of all levels of society, so that by mapping crime-prone areas it will be known where the crime occurred. Then the mapping of crime-prone areas with a systematic presentation will make it easier for us to monitor, avoid and prevent crime, and can also be used to predict crime in terms of the location and time when the crime usually occurs [9].

Information System is a combination of information technology and the activities of people who use that technology to support operations and management [10].

The web is data-based software that functions to receive requests from clients and respond to requests by transferring them via a browser which is a website page [11].

Linear regression mainly studies the relationship between variables, using lines to fit all the data points, and then investigating how to minimize the difference in distance between the lines and all the data points [12]. In the regression model, the independent variable explains the dependent variable. In simple regression analysis, the relationship between variables is linear, where changes in variable X will be followed by changes in variable Y permanently. The Simple Linear Regression Equation Model is shown in the formula (1).

$$Y = a + bX \quad (1)$$

Where:
Y = Response Variable or Consequence Variable (Dependent)
X = Predictor Variable or Causal Factor Variable (Independent)
a = constant
b = regression coefficient (slope); the magnitude of the response generated by the predictor.

The values of a and b can be calculated using the formula below [13]:

$$a = (\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy).n(\Sigma x^2) - (\Sigma x)^2 \quad (2)$$
$$b = n(\Sigma xy) - (\Sigma x)(\Sigma y).n(\Sigma x^2) - (\Sigma x)^2 \quad (3)$$

The following are the model is to capture the non-linear and dynamic spatial dependency and temporal patterns and steps in carrying out a Simple Linear Regression Analysis [14]:

1. Define the Purpose of doing a Simple Linear Regression Analysis.
2. Identify Causal Factor Variables (Predictors) and Effect Variables (Response).
3. Perform Data Collection.
5. Compute X^2, Y^2, XY and the total of each.
6. Calculate a and b based on the formula above.
7. Create a Simple Linear Regression Equation Model.
8. Make Predictions or Forecasts of Causal Factor Variables or Effect Variables [15].

The Simple Linear Regression Equation Model calculation is in the prediction menu in the system to predict the vulnerability of losing a vehicle. After analyzing the system, the next thing is to design the proposed system. The design made is a Data Flow Diagram (DFD), Use Case Diagram, schematic and user interface design tables [16].

1. DFD context/level 0

There are three entities, namely the SPKT admin, officer, chief of police admin who manages the data and the officer who inputs the vehicle theft reporting data, the officer requests data on the loss of the vehicle from the results of the data making a loss report, then the loss report is stored in the database, and the prediction of vehicle theft will be processed by the system, then the report in the system can be seen by the police chief.

The context diagram of the Web Based Information System for Predicting the Level of Vehicle Theft Vulnerability at the Jayapura Regency Police Resort in Figure 1 can be accessed by Admin, Police Chief, and Officer. Where Admin and Officers can carry out all processes including: Login, Absence Input and Report, Counter Data Input and Report, Reporter Data Input and Report, Vehicle Data Input and Report, Vehicle Found Input and Report, and Vehicle Lost Input and Report. Meanwhile, the Police Chief can only log in, Absence Report, Counter Data Report, Vehicle Data Report, Vehicle Found Report, and Vehicle Lost Report. This Context Diagram is a comprehensive perspective of the system being designed.

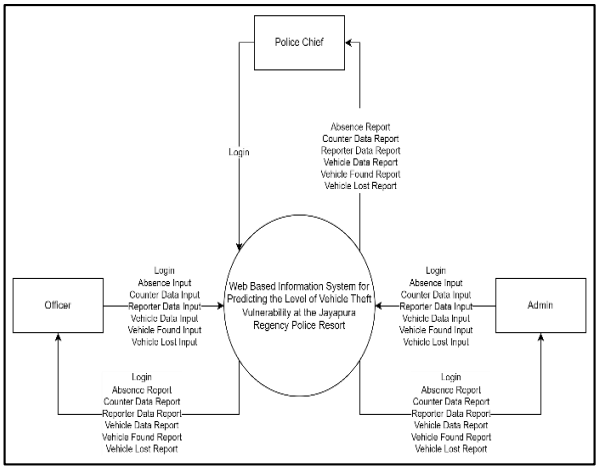

Figure 3. Context Diagram (DFD Level 0)

2. Use Case Diagram System

Figure 4 shows the Use Case Diagram System of the system which consists of 2 actors, namely the Officer and Admin to input data and the Police Chief who can view the reports produced by the system. All actors in the use case diagram are in the system and use the information system to interact according to their respective roles, namely as Admin, Police Chief and Officer.

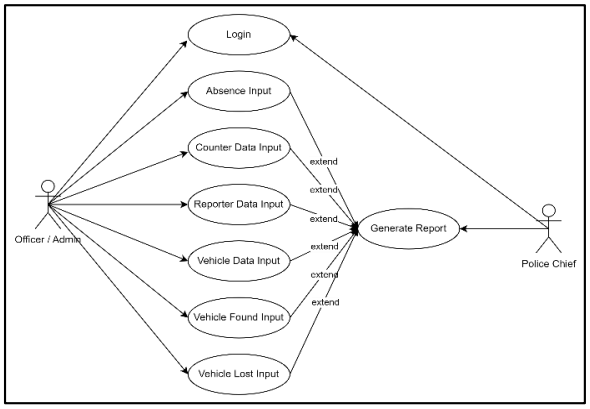

Figure 4. Use Case Diagram System

RESULTS AND DISCUSSION

The application of regression analysis is in the prediction menu in the system where The prediction analysis uses the regression analysis method, which is a calculation method to determine the number of cases of motor vehicle theft in the next year.

1) Implementation Of Input Interface/Dialog

a. Main Course

The following figure is the display of the main menu in the application Prediction of the Vulnerability Level of Motor Vehicle Theft at the Jayapura Papua Police (Polres). Access Rights on the bottom of the dashboard, the author made a graphic of vehicle thefts from 2010-2022 and what types of vehicles were missing, which can be found on the bottom of the dashboard menu. The main menu display is shown in Figure 5.

Figure 5. Main Menu

b. Input Data Menu

The following picture is the display of the operational menu data to input every data from the community who comes to report so when the reporter already has personal data in the reporting menu, the officer does not need to re-enter the data, all that remains is for the officer to record the new incident data, the community reports the Operational from Reporter data can be seen in Figure 6.

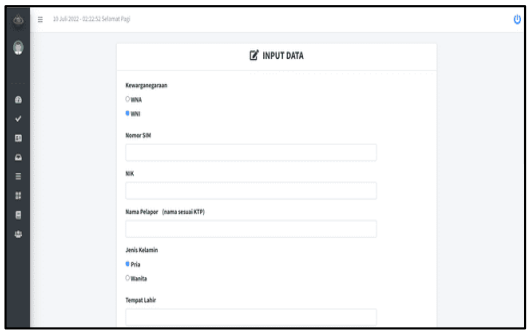

Figure 6. Input Data Menu

c. Input Vehicle Menu

The following image is the operational menu to input each vehicle theft case data starting from selecting reporting data, date of report, time of report, type of case, police number, year of vehicle, frame number, engine number, vehicle color, vehicle type, date of incident, place of incident, alleged, chronology, name of the witness, gender, date of birth of the witness and address of the witness's house, all of these incident data will be stored in the operational menu database can be seen in Figure 7.

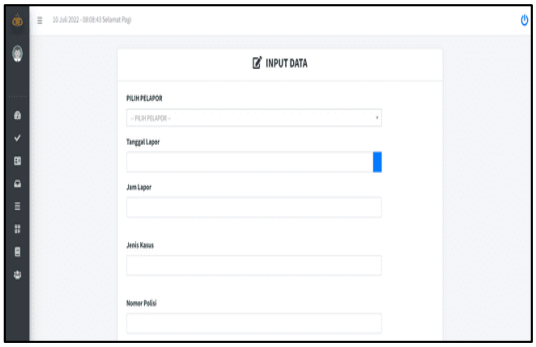

Figure 7. Input Vehicle Menu

d. Input Found Data Menu

The following figure is the operational form found. We input the data found by the vehicle, we select the reporter, the date the vehicle was found, a photo of the vehicle documentation and save the data into the database. The operational found can be seen in Figure 8.

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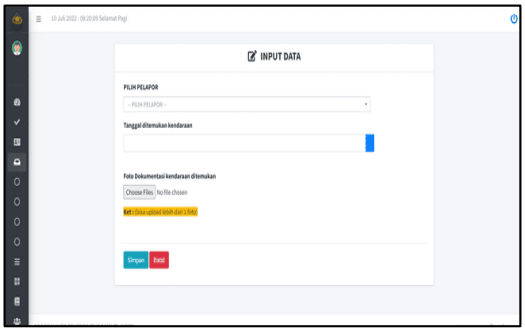

Figure 8. Input Found Data Menu

e. Prediction Menu

The following figure is the Prediction menu form. On this menu, officers can predict the number of vehicle theft cases in the next year by inputting from 2010-2022 the number of vehicle theft cases in the next year, the Prediction menu can be seen in Figure 9.

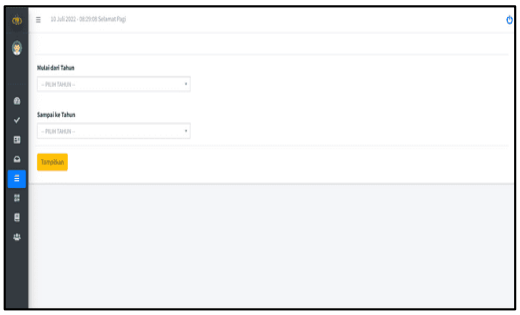

Figure 9. Prediction Menu

f. Access Rights Menu

The following picture is From the Access Rights Menu on this menu the author makes access rights for each admin, officer and police chief by inputting Face recognition Id data, NIK, rank (police), full name, gender, place of birth, date of birth, telephone number, email address, home address, user name, password, login access rights and counter (queue) access rights then the data will be stored in the database Access Rights Menu can be seen in Figure 10.

Figure 10. Access Rights Menu

2) Implementation Interface

a. Operational Report Menu

The display image of this menu is an operational report of the reporter. This menu displays the results of the data that we have input the reporter's name, TTL, Occupation and Options. In this options menu, officers can print CVs, edit, print reporting cards, biodata and delete data. operational/recorded reporting data can be seen in Figure 11.

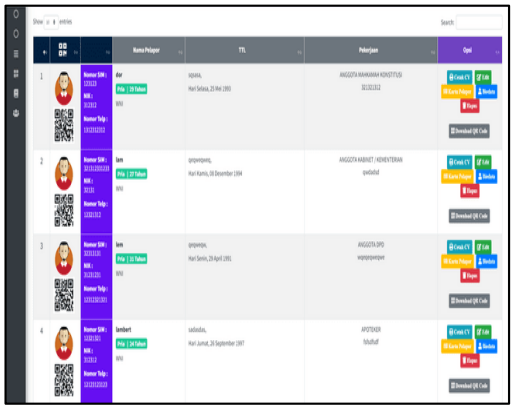

Figure 11. Operational Report Menu

b. Confirmation Found Menu

The display image of this menu is the confirmation menu found on this menu. We can see reports of vehicles that have been found with data on the name of the complainant, vehicle, vehicle documentation found and options in the options menu. We can view details, edit, delete, view reporting cards. and send a message to the complainant so that the complainant knows that his vehicle has been found confirmation menu found can be seen in Figure 12.

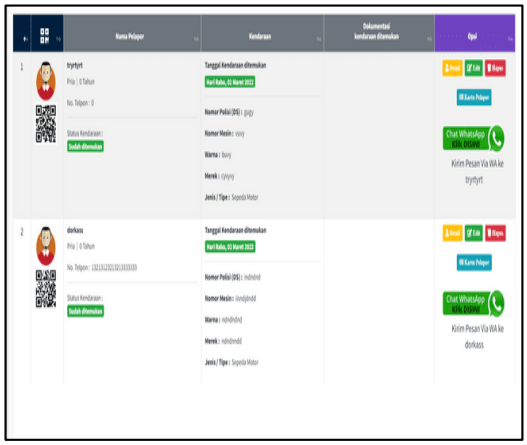

Figure 12. Confirmation Found Menu

c. Vehicle Report Menu Has Not Been Found

The display image of this menu is the vehicle has not been found on this menu officers can see all vehicle data that has not been found by searching

CC BY NC

for data on the name of the complainant, date and case, in the options menu there are print letters, print details, print cv, report card, details and biodata Operational report menu / vehicle not yet found can be seen in Figure 13.

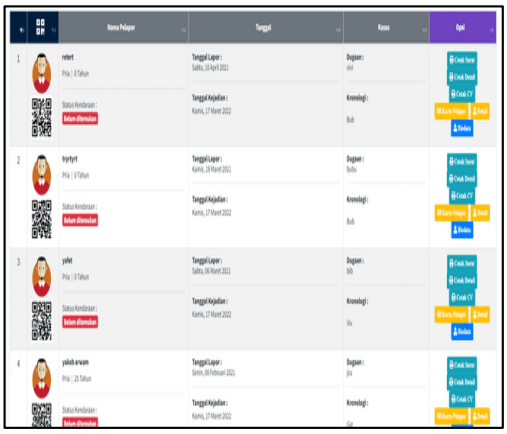

Figure 13. Vehicle Not Yet Found Menu

d. Prediction Report Menu

The display image of this menu is the prediction report menu, officers can find out how many theft cases will be in the next year by inputting from 2010-2022 the results of linear regression calculations will come out to calculate the number of theft cases that will occur in the coming year. The prediction report menu can be seen in Figure 14.

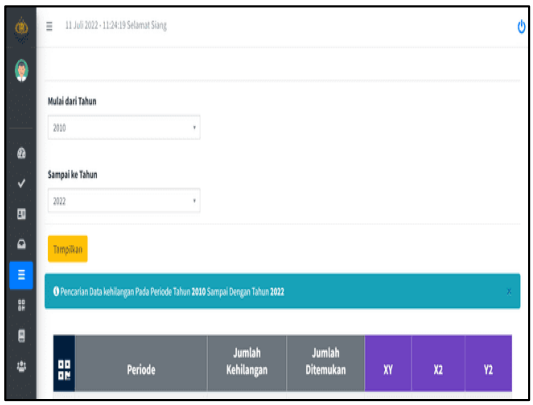

Figure 14. Prediction Report Menu

e. Access Rights Report Menu

The display image of this menu is the Access Rights Report Menu. In this menu, the admin can create access rights for each officer and have each user, data from the access rights report, namely the user list, TTL, address, Face Recognition and options on the admin options menu can activate rights access, edit, view biodata, delete and download QR code Access Rights Report Menu can be seen in Figure 15.

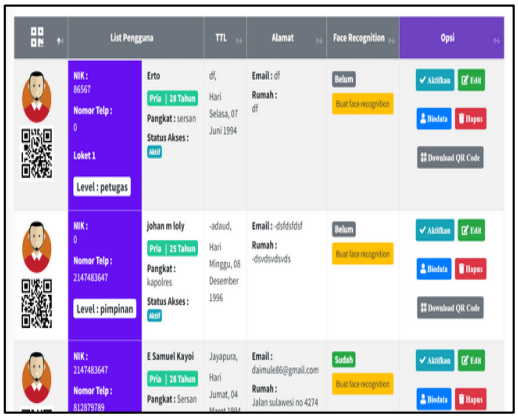

Figure 15. Access Rights Report Menu

f. Prediction Menu Display

This menu display is for input from 2010-2022 how many cases of vehicle theft will be in 2023. The prediction menu display can be seen in Figure 16.

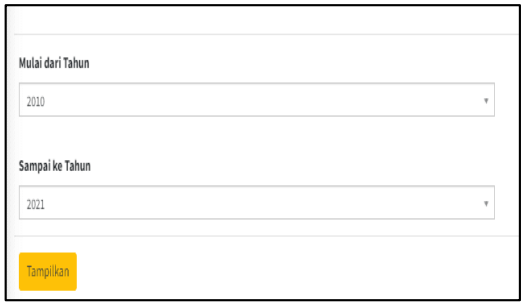

Figure 16. Display of the Prediction Menu

g. Display of Linear Regression Calculation

This menu displays the amount of linear regression calculation data to get prediction results in 2023, namely 62.4038. The display of simple linear regression calculations can be seen in Figure 17.

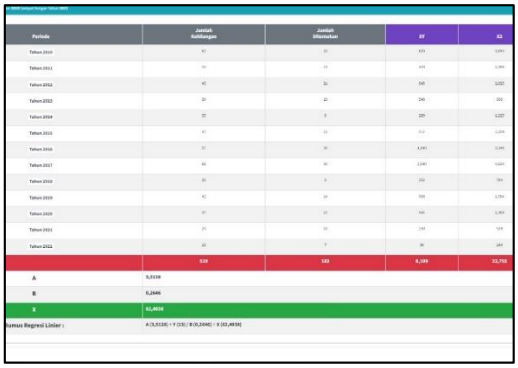

Figure 17. Display of Linear Regression Calculation

3) Predictive Final Conclusion Display

a. Display Final Conclusion

This menu displays suggestions to the police so that security must be tightened again because cases of theft in the next year will increase. The

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display of the final prediction can be seen in Figure 18.

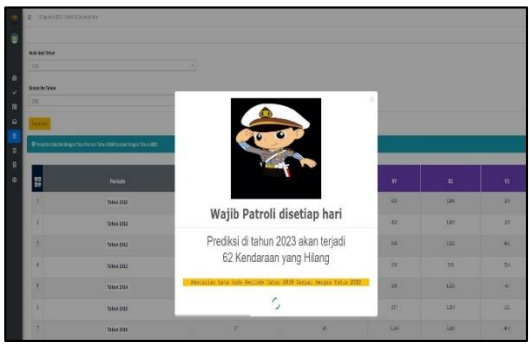

Figure 18. Display of Prediction Final

CONCLUSION

The differences between current research regarding the design of an information system for predicting the level of vulnerability to vehicle theft using web-based linear regression and previous research may involve several factors, such as methods, technology, data, or research focus. Current research may utilize the latest web technologies, including web-based developments to facilitate system access and use. The use of linear regression may still be relevant, but current research may try to integrate more complex or specific prediction models. The web-based information system developed in this research uses regression analysis to predict vehicle theft vulnerability. This system helps provide a more accurate picture of high-risk areas, which can serve as a basis for decision-making and preventative action. The results of the prediction of the level of vulnerability to theft in 2023 produce a value of 62.4038 vehicle theft occurred. Based on research findings, concrete recommendations can be put forward to improve security in areas identified as vulnerable. This may involve increasing patrols, installing additional security systems, or other preventive measures.

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