

Steganografi

Text Processing Application on Images using Modification of LSB and ROT13 Methods

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A B S T R A C T

This thesis is titled "Text Processing Application on Images Using Modified LSB and ROT13 Methods". This research aims to develop an application that can hide text messages within images using steganography techniques. The methods employed in this study are Least Significant Bit (LSB) for embedding messages into image pixels, and ROT13 for encrypting the message before embedding. By utilizing these two methods, it is expected that the hidden messages can be protected from unauthorized parties. The results of this research indicate that the developed application is capable of storing and retrieving messages effectively, while providing a higher level of security for the stored information. This research is expected to contribute to the fields of cryptography and steganography, and serve as a reference for future studies. The purpose and benefits of this research are to design and implement an application that is able to insert, encrypt, and extract text from digital images. Utilizing a combination of LSB (Least Significant Bit) and ROT13 methods to improve efficiency and security in text processing on images.

INTRODUCTION

Text that is composed into a message that is a valuable asset should be protected to be safe. Because the message is the result of data processing into a form that is more useful for the recipient which describes a fact that is used as a tool for making a decision. The importance of a message so that the message can only be accessed by certain people. If an important message that is confidential is stolen by an unauthorized party, it will be dangerous for the owner of the message. A stolen message can be redeveloped into a more useful form. Therefore, a technique is needed for an important message that is confidential so that unauthorized parties cannot find out the contents of the stolen message.

There are several techniques that can keep a message secret so that it cannot be easily stolen by unauthorized people, including cryptography and steganography. Therefore, researchers take both techniques so that the processed text can be kept secret better.

The use of cryptography requires a method that can change the original message into a secret message properly. There are many methods available in cryptography techniques such as caesar cipher, vigenere cipher, ROT13, and so on. This study uses the ROT13 method to keep the text secret because it is easy to use and many references are available for this study. However, the original message that has become a secret message can also be suspicious of message thieves, so message thieves will also try to reveal the secret message, therefore additional techniques are needed that can provide better security, namely steganography. There are many methods available in steganography techniques such as LSB,

MSB, spread spectrum, and so on. This study uses the least significant bit (LSB) method because it is easy to use, namely by storing the message in the right bit of the image so as not to damage the image. The simplest and most popular steganography technique is the LSB (Least Significant Bit) technique, namely the position of the bit in a binary number that provides a unit value, namely determining whether the number is even or odd. This technique replaces the last bit of the steganography media with the bit from the message. In order not to cause major changes, this bit replacement should only be done on information that is redundant and has a tolerance for small changes [1,2,3].

In this study, text processing on images is done by modifying two main methods: Least Significant Bit (LSB) and ROTI3 (Rotation-based Text Inversion 3). LSB is a steganography technique that inserts data into the least significant bit of an image pixel, so that the changes that occur are almost invisible to the human eye. Meanwhile, ROTI3 is a text rotation-based encryption method that aims to improve data security before being inserted into an image.

Although the LSB method is widely used in steganography because of its ability to store information without significantly changing the visual quality of the image, this method still has several weaknesses, such as its vulnerability to image manipulation (compression, reprocessing, or steganalysis attacks). Therefore, in this study, the ROTI3 method is modified and combined with LSB to improve the security and resilience of the inserted data. With the presence of message encoding and then the encrypted message is inserted into an image, then the secret message will not be easily known by unwanted parties. From the background that has been explained, the researcher concludes the title of this study, namely "Text Processing Application on Images Using Modified LSB and ROTI3 Methods".

METHOD

Fish Bone Research Method

The following is the fish bone research method used in writing this proposal.

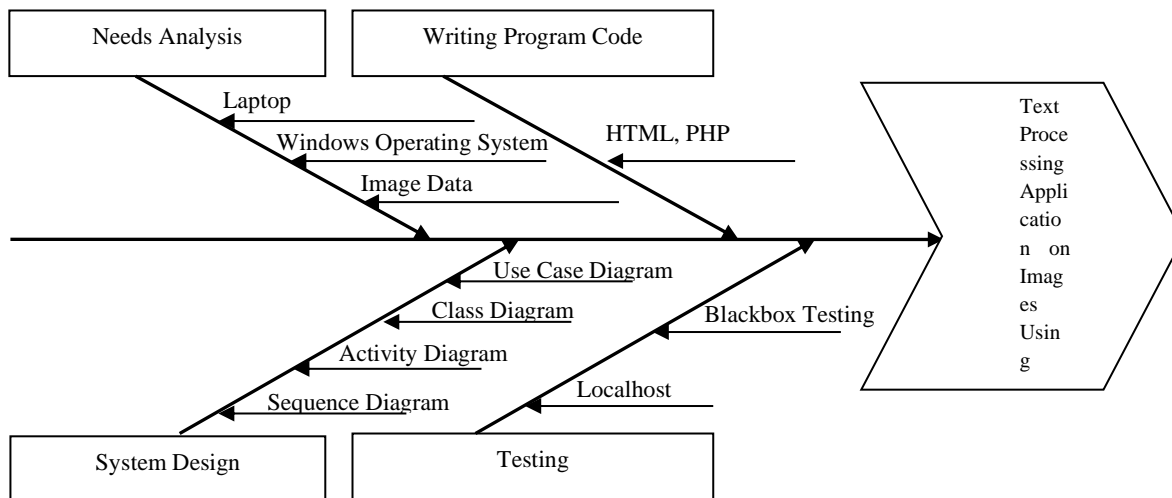


Figure 1. Fish Bone Diagram Research Methodology

Description:

1. Needs Analysis

At this stage, the researcher collects data related to the research. The researcher also determines the software and hardware that will be used to conduct the research.

The following is the software used to create the system:

- a. Windows operating system
- b. Appserv
- c. Notepad++

The following is the hardware used to implement the system:

- a. Laptop/Computer
- b. Hard disk
- c. Mouse

The following is the reading material used for theory:

- a. Journal
2. System Design
To design the system, the researcher used several UML models, namely use case diagrams, class diagrams, activity diagrams and sequence diagrams.
3. Writing Program Code
In writing the program code, the researcher used HTML and PHP programming.
4. Testing
Program testing is carried out to determine application deficiencies. If there are deficiencies in the application or the program does not run properly, improvements will be made until the entire program runs properly. Testing with theory using blackbox testing and testing with practice using localhost.
5. Results
At this stage, the Text Processing Application on Images Using Modified LSB and ROT13 Methods can run well.

Rotate 13 (ROT13) Method

The steps of the Rotate 13 (ROT13) method for encryption can be seen as follows:

1. Create a message, for example RIZKI to be encrypted (kept secret) with ROT13.
2. The key used is a shift of 13 letters, for example A becomes N.
3. Change the message per character into ascii code, for example:
R becomes 82
I becomes 73
Z becomes 90
K becomes 75
I becomes 73
4. Perform the process of shifting 13 letters by adding the ascii code of each character with the number 13.
The following is the encryption formula of the ROT13 method:
$$C_i = (P_i + 13) \bmod 256$$

The flowchart of the ROT13 encryption method can be seen as follows:

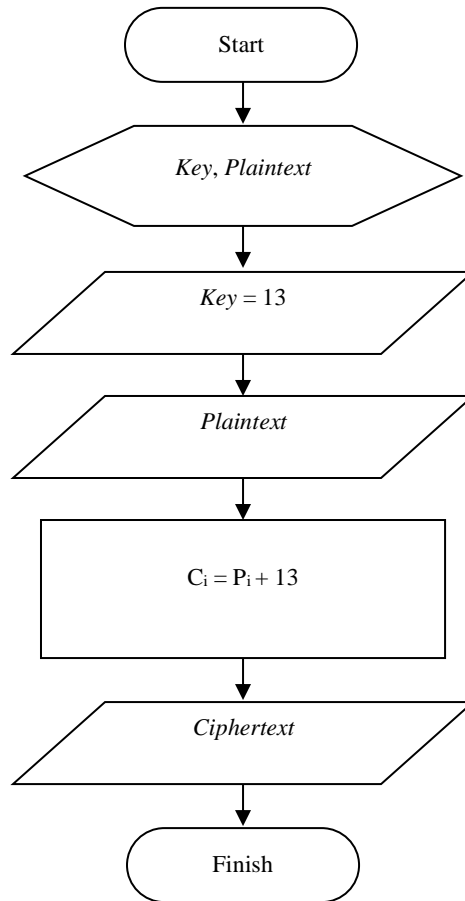


Figure 2. ROT13 Method Encryption Flowchart

The steps of the ROT13 method for decryption can be seen as follows:

1. Enter the encrypted ciphertext to be decrypted.
2. Change the message per character into ascii code.
3. Perform the process of reducing the ascii message with the number 13 on each character.

Encryption Process Example:

Plaintext: RIZKI

Solution:

$$R = 82 + 13 = 95 = _$$

$$I = 73 + 13 = 86 = V$$

$$Z = 90 + 13 = 103 = g$$

$$K = 75 + 13 = 88 = X$$

$$I = 73 + 13 = 86 = V$$

Chipertext: VgXV

The following is the decryption formula of the ROT13 method:

$$P_i = (C_i - 13) \bmod 256$$

The flowchart of the ROT13 decryption method can be seen as follows:

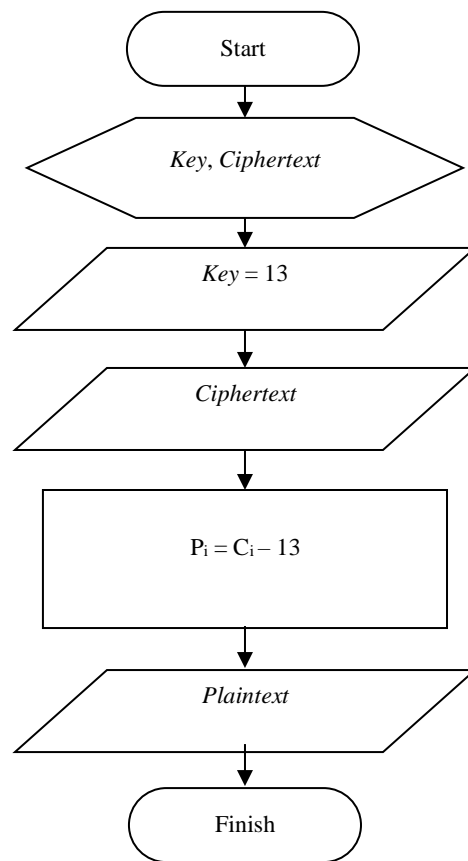


Figure 3. Flowchart Description of ROT13 Method

Example of decryption process:

$$_ = 95 - 13 = 82 = R$$

$$V = 86 - 13 = 73 = I$$

$$g = 103 - 13 = 90 = Z$$

$$X = 88 - 13 = 75 = K$$

$$V = 86 - 13 = 73 = I$$

Plaintext : RIZKI

The steps of the LSB method for message insertion and retrieval can be seen as follows:

1. Stages in the message insertion process, namely:
 - a. Input secret message.
 - b. Verify the message, must be input.
 - c. Input cover image.
 - d. Verify cover image.
 - e. Inserting a message using the Least Significant Bit method, namely by inserting data at the end of the file with a special mark as the start identifier of the data and the end identifier of the data.
2. Stages in the message return process, namely:
 - a. Input stego image.
 - b. Verify stego image.
 - c. Verify stego image, there must be a message.
 - d. Retrieving a message using the Least Significant Bit method, namely by opening the data that has been inserted with a message at the end of the file from a special mark as the start identifier of the data and the end identifier of the data.

RESULTS AND DISCUSSION

The display of the results of the LSB Method Modification Application for Text Processing on Images using the ROT13 Method can be seen as follows: Initially, the user opens the application and logs in by entering the username and password shown in Figure 4.

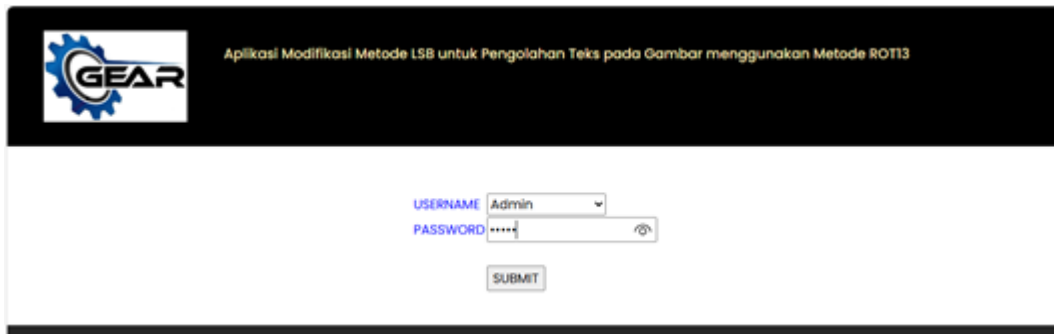


Figure 4. Login Form View

Then if the password is wrong, an error message will appear and if the password is correct, the application displays a menu and can be Seen in Figure 5.



Figure 5. Menu Form View

Then the user can select the available menus, namely encrypt and decrypt. If the user clicks encrypt, an encrypt form will appear as in Figure 6.

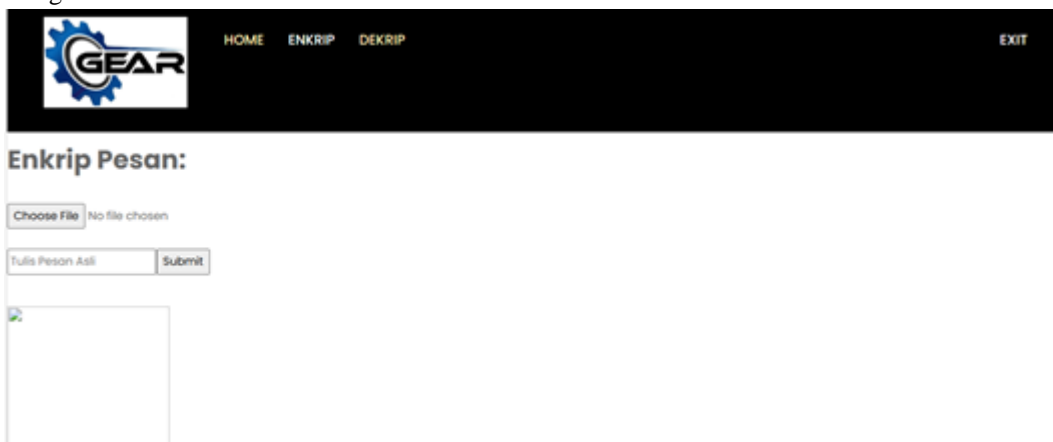


Figure 6. Enkrip Form View

First, the user selects an image available on the computer device and writes the message to be inserted, which can be seen in Figure 7.

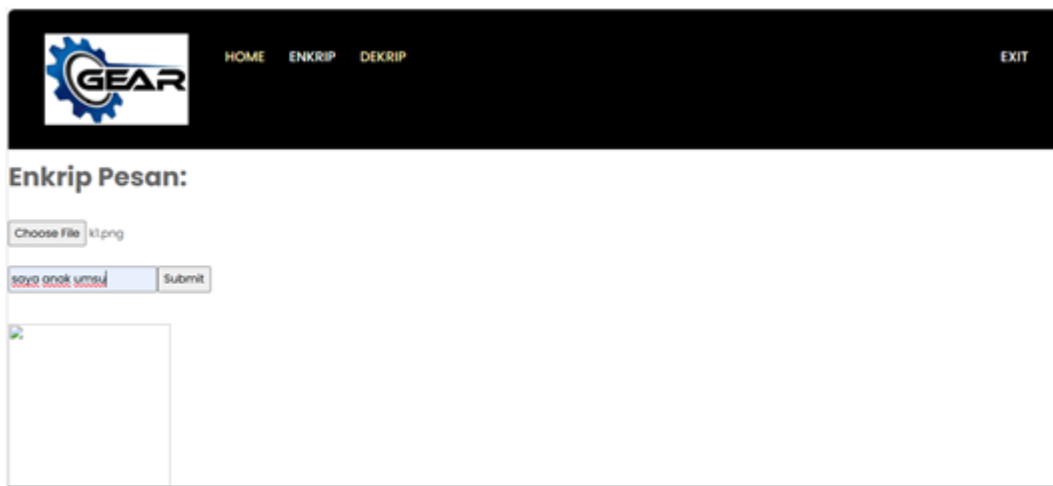


Figure 7. Image Upload Encryption Form View

Then the user can click the submit button so that the message can be inserted and saved in the image as follows:

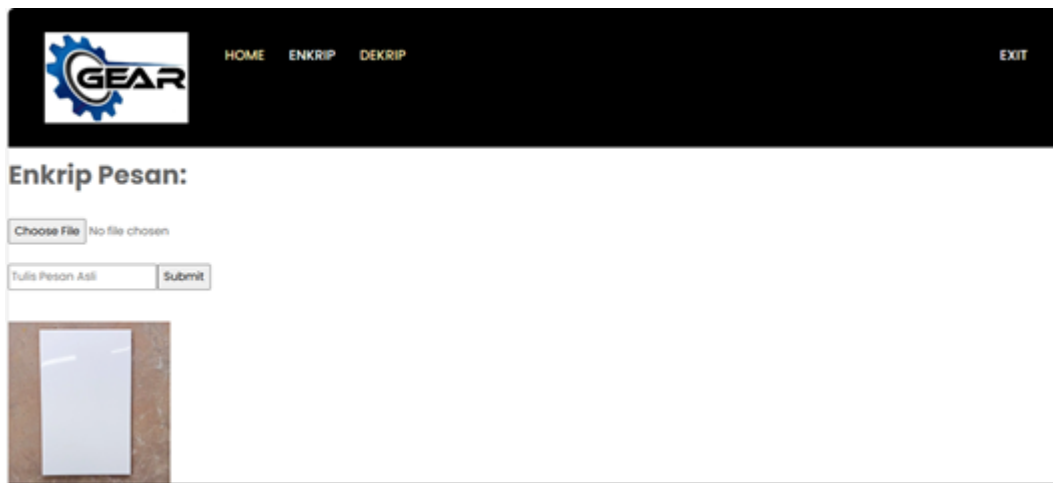


Figure 8. View Insert Result Encryption Form

Users can extract messages and decrypt them by selecting the decrypt menu as shown in Figure 9.

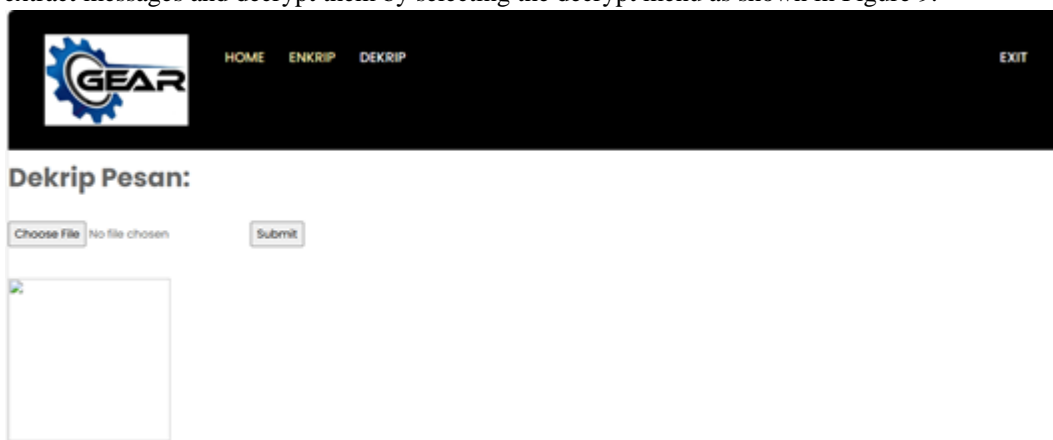


Figure 9. Description Form View

First, the user selects an image that has a message inserted and can be seen in Figure 10.

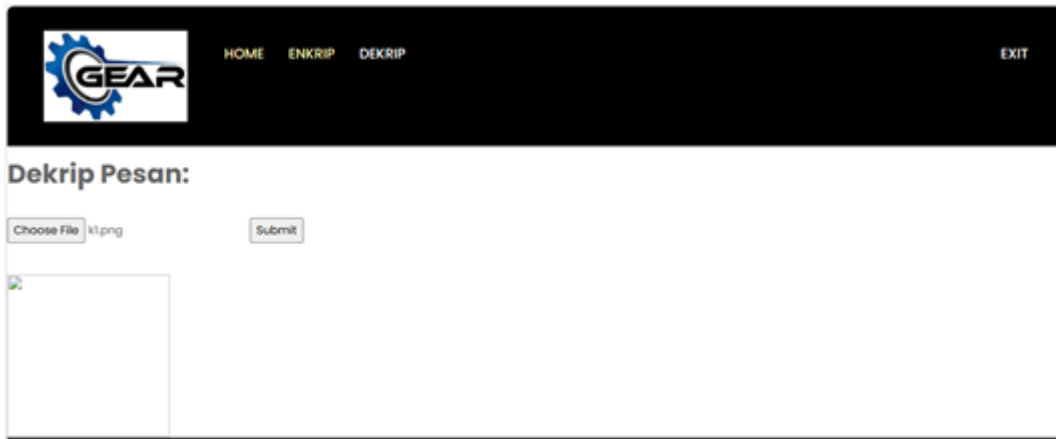


Figure 10. Image Upload Description Form View

Then the user clicks the submit button and it can be seen in Figure 11.

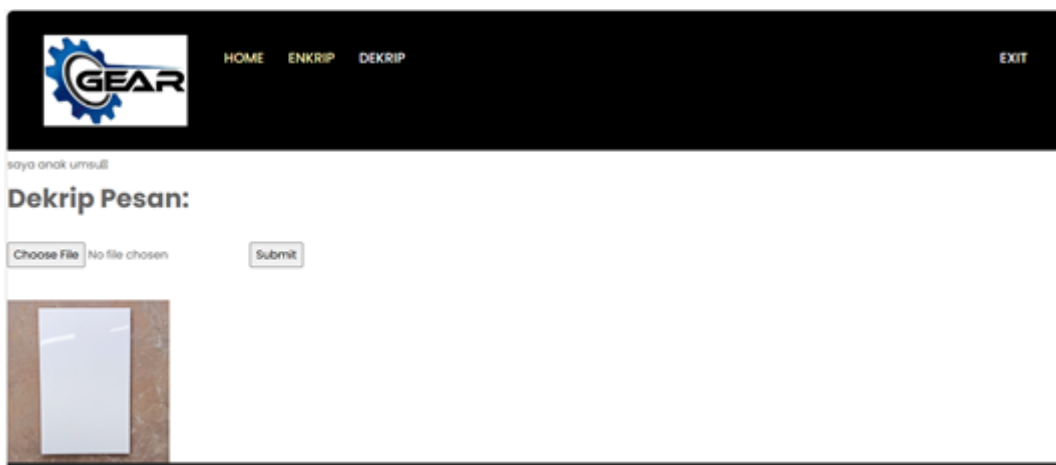


Figure 11. Form Decrypt view opens Message

CONCLUSION

Based on the discussion of the previous chapters that have been carried out, several conclusions can be drawn as follows: With the LSB Method Modification Application for Text Processing in Images using the ROT13 Method, important texts get better data confidentiality. By using the entered text and using the steps and formulas of the ROT13 method, the ROT13 method can be applied for text confidentiality. By using images and the ROT13 method, the LSB can be modified. By using web programming, the LSB Method Modification Application for Text Processing in Images using the ROT13 Method can be produced.

REFERENCES

Book: Single Author

- [1] Indah Purnama Sari. Algoritma dan Pemrograman. Medan: UMSU Press, 2023, pp. 290.
- [2] Indah Purnama Sari. Buku Ajar Pemrograman Internet Dasar. Medan: UMSU Press, 2022, pp. 300.
- [3] Indah Purnama Sari. Buku Ajar Rekayasa Perangkat Lunak. Medan: UMSU Press, 2021, pp. 228.

Book: Two or More Authors

- [4] Janner Simarmata Arsan Kumala Jaya, Syarifah Fitrah Ramadhani, Niel Ananto, Abdul Karim, Betrisandi, Muhammad Ilham Alhari, Cucut Susanto, Suardinata, Indah Purnama Sari, Edson Yahuda Putra. Komputer dan Masyarakat. Medan: Yayasan Kita Menulis, 2024, pp.162.
- [5] Mahdianta Pandia, Indah Purnama Sari, Alexander Wirapraja Fergie Joanda Kaunang, Syarifah Fitrah Ramadhani Stenly Richard Pungus, Sudirman, Suardinata Jimmy Herawan Moedjahedy, Elly Warni, Debby Erce Sondakh. Pengantar Bahasa Pemrograman Python. Medan : Yayasan Kita Menulis, 2024, pp.180

- [6] Zelvi Gustiana Arif Dwinanto, Indah Purnama Sari, Janner Simarmata Mahdianta Pandia, Supriadi Syam, Semmy Wellem Taju Fitrah Eka Susilawati, Asmah Akhriana, Rolly Junius Lontaan Fergie Joanda Kaunang. *Perkembangan Teknologi Informatika*. Medan: Yayasan Kita Menulis, 2024, pp.158

Journal Article from the Internet

- [7] Sari, I.P., Hariani, P.P., Al-Khowarizmi, A., Ramadhani, F., Sulaiman, O.K., Satria, A., & Manurung, A.A. (2024). CLUSTERING HIV/AIDS DISEASE USING K-MEANS CLUSTERING ALGORITHM. *Proceeding International Seminar on Islamic Studies* 5 (1), 1668-1676
- [8] Sari, I.P., Ramadhani, F., Satria, A., & Sulaiman, O.K. Leukocoria Identification: A 5-Fold Cross Validation CNN and Adaboost Hybrid Approach. *2023 6th International Seminar on Research of Information Technology and Intelligent Systems (ISRITI)*, 486-491
- [9] Manurung, A.A., Nasution, M.D., & Sari, I.P. (2023). Implementation of Fuzzy K-Nearest Neighbor Method in Dengue Disease Classification. *2023 11th International Conference on Cyber and IT Service Management (CITSM)*, 1-4
- [10] Sari, I.P., Ramadhani, F., Satria, A., & Apdilah, D. (2023). Implementasi Pengolahan Citra Digital dalam Pengenalan Wajah menggunakan Algoritma PCA dan Viola Jones. *Hello World Jurnal Ilmu Komputer* 2 (3), 146-157
- [11] Sari, I.P., Al-Khowarizmi, A, Sulaiman, O.K., & Apdilah, D. (2023). Implementation of Data Classification Using K-Means Algorithm in Clustering Stunting Cases. *Journal of Computer Science, Information Technology and Telecommunication Engineering* 4 (2), 402-412
- [12] Sulaiman, O.K & Batubara, I.H. (2021). Implementation Data Mining For Level Analysis Traffic Violation By Algorithm Association Rule. *Al'adzkiya International of Computer Science and Information Technology (AIoCSIT) Journal* 2 (2), 128-135
- [13] Sari, I.P., Batubara, I.H., & Al-Khowarizmi, A. (2021). Sensitivity Of Obtaining Errors In The Combination Of Fuzzy And Neural Networks For Conducting Student Assessment On E-Learning. *International Journal of Economic, Technology and Social Sciences (Injects)* 2 (1), 331-338
- [14] Sari, I.P., Al-Khowarizmi, A., & Batubara, I.H. (2021). Cluster Analysis Using K-Means Algorithm and Fuzzy C-Means Clustering For Grouping Students' Abilities In Online Learning Process. *Journal of Computer Science, Information Technology and Telecommunication Engineering* 2 (1), 139-144
- [15] Apdilah, D., & Sari, I.P. (2021). Optimization Of The Fuzzy C-Means Cluster Center For Credit Data Grouping Using Genetic Algorithms. *Al'adzkiya International of Computer Science and Information Technology (AIoCSIT) Journal* 2 (2), 156-163