PENERAPAN *CONVOLUTIONAL NEURAL NETWORK* UNTUK KLASIFIKASI CITRA PENYAKIT KARDIOMEGALI

TUGAS AKHIR

Diajukan Sebagai Salah Satu Syarat
untuk Memperoleh Gelar Sarjana Komputer pada
Program Studi Sistem Informasi

Oleh:

ALIKA RAHMARSYARAH RIZALDE
12150321730

UIN SUSKA RIAU

FAKULTAS SAINS DAN TEKNOLOGI
UNIVERSITAS ISLAM NEGERI SULTAN SYARIF KASIM RIAU
PEKANBARU
2025

LEMBAR PERSETUJUAN

PENERAPAN *CONVOLUTIONAL NEURAL NETWORK* UNTUK KLASIFIKASI CITRA PENYAKIT KARDIOMEGALI

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12150321730

Telah diperiksa dan disetujui sebagai Laporan Tugas Akhir
di Pekanbaru, pada tanggal 15 Januari 2025

Ketua Program Studi	Pembimbing
Eki Saputra, S.Kom., M.Kom.	**Mustakim, ST., M.Kom.**
NIP. 198307162011011008	**NIK. 130511023**

LEMBAR PENGESAHAN

PENERAPAN *CONVOLUTIONAL NEURAL NETWORK* UNTUK KLASIFIKASI CITRA PENYAKIT KARDIOMEGALI

TUGAS AKHIR

Oleh:

ALIKA RAHMARSYARAH RIZALDE
12150321730

Telah dipertahankan di depan sidang dewan penguji
sebagai salah satu syarat untuk memperoleh gelar Sarjana Komputer
Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau
di Pekanbaru, pada tanggal 10 Januari 2025

Pekanbaru, 15 Januari 2025
Mengesahkan,

Dekan	Ketua Program Studi
Dr. Hartono, M.Pd.	**Eki Saputra, S.Kom., M.Kom.**
NIP. 196403011992031003	**NIP. 198307162011011008**

DEWAN PENGUJI:

Ketua : **Nesdi Evrilyan Rozanda, S.Kom., M.Sc.**

Sekretaris : **Mustakim, ST., M.Kom.**

Anggota 1 : **Dr. Rice Novita, S.Kom., M.Kom.**

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Pekanbaru, 15 Januari 2025
Yang membuat pernyataan,

ALIKA RAHMARSYARAH RIZALDE
NIM. 12150321730

LEMBAR PERSEMBAHAN

Assalamu'alaikum Warahmatullahi Wabarakatuh.

Alhamdulillahi Rabbil 'Alaamiin, segala puji bagi Allah *Subhanahu Wa Ta'ala* sebagai bentuk rasa syukur atas segala nikmat yang telah diberikan tanpa ada kekurangan sedikitpun. *Shalawat* beserta salam tak lupa pula kita ucapkan kepada Nabi Muhammad *Shallallahu 'Alaihi Wa Sallam* dengan mengucapkan *"Allahumma Sholli'ala Sayyidina Muhammad Wa'ala Alihi Muhammad"*. Semoga kita semua selalu senantiasa mendapat syafa'at-Nya di dunia maupun di akhirat, *Aamiin Ya Rabbala'Alaamiin.* Peneliti persembahkan karya kecil ini sebagai salah satu bentuk bakti, rasa terima kasih, dan hormat kepada orang tua Peneliti tercinta.

Ayah dan ibu tersayang, terima kasih atas setiap perjuangan, doa, bimbingan serta dukungan yang diberikan kepada Peneliti. Terima kasih atas segala pengorbanan yang dilakukan. Sampai kapanpun tiada rasa, tiada cara yang dapat membalas semua yang telah kalian lakukan. Untuk itu, Peneliti selalu mendoakan yang terbaik agar ayah dan ibu bahagia dunia dan akhirat serta diberikan tempat istimewa di sisi-Nya kelak sehingga kita bisa berkumpul kembali bersama-sama di Jannah-Nya. Peneliti juga berterima kasih yang tak terhingga kepada saudara kandung tercinta Peneliti yaitu kakak dan adik yang telah memberikan Peneliti pelajaran dan pemahaman mengenai indahnya kehidupan yang damai sebagai saudara.

Terima kasih Peneliti ucapkan kepada Bapak Mustakim, ST., M.Kom selaku pembimbing Tugas Akhir yang telah membimbing dari awal perkuliahan hingga saat ini dengan setulus hati. Terima kasih Peneliti ucapkan kepada Bapak dan Ibu Dosen Program Studi Sistem Informasi yang selama ini sudah mewariskan ilmu, motivasi, dan arahan untuk menyelesaikan studi di Program Studi Sistem Informasi ini. Terima kasih juga Peneliti ucapkan kepada kakak-kakak tingkat dan teman-teman Peneliti yang telah membantu dan memberikan semangat dalam menyelesaikan Tugas Akhir ini.

Wassalamu'alaikum Warahmatullahi Wabarakaatuh.

KATA PENGANTAR

Assalamu'alaikum Warahmatullahi Wabarakatuh.

Alhamdulillahi Rabbil 'Alamin, bersyukur kehadirat Allah *Subhanahu Wa Ta'ala* atas segala rahmat dan karunia-Nya sehingga Peneliti dapat menyelesaikan Tugas Akhir ini. Tidak lupa *shalawat* beriringan salam selalu tercurahkan untuk Nabi Muhammad *Shallallahu 'Alaihi Wa Sallam* dengan melantunkan *"Allahumma Sholli'ala Sayyidina Muhammad Wa'ala Alihi Muhammad"*. Tugas Akhir ini dibuat sebagai salah satu syarat untuk mendapatkan gelar Sarjana Komputer di Program Studi Sistem Informasi Universitas Islam Negeri Sultan Syarif Kasim Riau. Banyak pemangku kepentingan telah berperan dalam mendukung dan membimbing Peneliti pada proses penelitian dan penulisan Tugas Akhir ini. Oleh karena itu, ungkapan terima kasih juga Peneliti ucapkan kepada :

1. Bapak Prof. Dr. Hairunas, M.Ag sebagai Rektor Universitas Islam Negeri Sultan Syarif Kasim Riau.
2. Bapak Dr. Hartono, M.Pd sebagai Dekan Fakultas Sains dan Teknologi.
3. Bapak Eki Saputra, S.Kom., M.Kom sebagai Ketua Program Studi Sistem Informasi sekaligus Penguji II Tugas Akhir ini yang telah banyak meluangkan waktu dan memberikan masukan, nasehat, serta motivasinya baik itu dalam penyelesaian Tugas Akhir ini.
4. Ibu Siti Monalisa, ST., M.Kom sebagai Sekretaris Program Studi Sistem Informasi.
5. Bapak Tengku Khairil Ahsyar, S.Kom., M.Kom sebagai Kepala Laboratorium Program Studi Sistem Informasi.
6. Bapak Nesdi Evrilyan Rozanda, S.Kom., M.Sc sebagai Ketua Sidang Tugas Akhir yang telah membantu dan meluangkan waktu dalam proses Sidang Tugas Akhir ini.
7. Bapak Mustakim, ST., M.Kom selaku Dosen Pembimbing Tugas Akhir yang telah berkenan membimbing, mengarahkan, dan meluangkan waktu dalam menyelesaikan Tugas Akhir ini.
8. Ibu Dr. Rice Novita, S.Kom., M.Kom selaku Penguji I Tugas Akhir ini yang telah banyak meluangkan waktu dan memberikan masukan dalam penyelesaian Tugas Akhir ini.
9. Seluruh Pegawai dan *Staff* Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau yang telah membantu dan mempermudah proses administrasi selama perkuliahan ini.

10. Ibu Medyantiwi Rahmawita M, ST., M.Kom sebagai Dosen Pembimbing Akademik Peneliti yang telah banyak memberikan arahan, masukan, dan motivasi.
11. Teristimewa untuk kedua orang tua Peneliti yang selalu memberi *support* dari awal hingga akhir masa perkuliahan untuk Peneliti dalam menyelesaikan segala urusan dalam perjalanan karir serta memberi motivasi agar dapat cepat menyelesaikan kuliah dengan baik dan dapat melanjutkan cita-cita yang ingin dicapai.
12. Teman-teman Kelas B Angkatan SIF’21 Inoordinatus yang selalu membantu dan memberikan semangat kepada Peneliti serta sama-sama berjuang untuk dapat menyelesaikan Tugas Akhir dengan tepat waktu.
13. Semua pihak yang namanya tidak dapat disebutkan yang telah banyak membantu dalam pelaksanaan serta penyelesaian Tugas Akhir ini.

Semoga segala doa dan dorongan yang telah diberikan selama ini menjadi amal kebajikan dan mendapat balasan setimpal dari Allah *Subhanahu Wa Ta’ala.* Peneliti menyadari bahwa penulisan Tugas Akhir ini masih terdapat kekurangan dan jauh dari kata sempurna. Peneliti berharap untuk kritik dan saran yang membangun yang dapat disampaikan melalui *e-mail* 12150321730@students.uin-suska.ac.id. Semoga Laporan Tugas Akhir ini bermanfaat bagi kita semua. Akhir kata Peneliti ucapkan terima kasih.

Wassalamu’alaikum Warahmatullahi Wabarakatuh.

Pekanbaru, 15 Januari 2025

Peneliti,

ALIKA RAHMARSYARAH RIZALDE

NIM. 12150321730

ALIKA RAHMARSYARAH RIZALDE SISTEM INFORMASI <12150321730@students.uin-suska.ac.id>

[ICoCSETI 2025] Your paper #1571101261 ('Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification')

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Kepada: Alika Rahmarsyarah Rizalde <12150321730@students.uin-suska.ac.id>, Mustakim Mustakim <mustakim@uin-suska.ac.id>, Rice Novita <rice.novita@uin-suska.ac.id>, Eki Saputra <Eki.saputra@uin-suska.ac.id>

Dear Ms. Alika Rizalde:

Alika Rahmarsyarah Rizalde, Mustakim Mustakim, Rice Novita and Eki Saputra

Congratulations - your paper #1571101261 ('Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification') for ICoCSETI 2025 has been **Accepted in Batch 2** to be presented and published in The 2025 International Conference on Computer Sciences, Engineering, and Technology Innovation (ICoCSETI) - ICoCSETI 2025, which will be held in Virtual (Jakarta, Indonesia) during January 21, 2025.

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Tanggal : 10 September 2021

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Saya yang bertandatangan di bawah ini :

Nama	:	Alika Rahmarsyarah Rizalde
NIM	:	12150321730
Tempat/ Tgl. Lahir	:	Pekanbaru, 03 Desember 2002
Fakultas/Pascasarjana	:	Sains dan Teknologi
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493C1AMX160847985

Alika Rahmarsyarah Rizalde
NIM.12150321730

**pilih salah satu sesuai jenis karya tulis*

Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification

1st Alika Rahmarsyarah Rizalde
Department of Information System
Faculty of Science and Technology
Universitas Islam Negeri Sultan Syarif Kasim Riau
Pekanbaru, Indonesia
12150321730@students.uin-suska.ac.id

2nd Mustakim
Department of Information System
Faculty of Science and Technology
Universitas Islam Negeri Sultan Syarif Kasim Riau
Pekanbaru, Indonesia
mustakim@uin-suska.ac.id

3rd Rice Novita
Department of Information System
Faculty of Science and Technology
Universitas Islam Negeri Sultan Syarif Kasim Riau
Pekanbaru, Indonesia
rice.novita@uin-suska.ac.id

4th Eki Saputra
Department of Information System
Faculty of Science and Technology
Universitas Islam Negeri Sultan Syarif Kasim Riau
Pekanbaru, Indonesia
eki.saputra@uin-suska.ac.id

***Abstract*—The heart plays a very important role for survival as the main organ that functions to pump blood to meet the needs of oxygen and nutrients throughout the body. However, there are several heart diseases that can cause conditions where the heart cannot perform its duties properly, including coronary artery disease, kidney disorders, hypertension, congenital abnormalities, infections, and cardiomyopathy. The result of these various heart diseases can cause cardiomegaly. Cardiomegaly occurs when the size of the heart exceeds 50% of the inner diameter of the rib cage. Cardiomegaly can be diagnosed first. Diagnosis of cardiomegaly is usually done by physical examination, blood tests, and medical imaging such as chest x-ray. Traditional diagnostic methods for heart enlargement usually involve physical examination, electrocardiogram (ECG), and medical imaging such as chest X-ray. Deep learning has emerged as the preferred method for image analysis. Convolutional Neural Network (CNN) is a prevalent deep learning algorithm that is specifically used in various image-related applications. This research uses DenseNet169, InceptionResNetV2, and MobileNetV2 architectures with Adagrad, Nadam, and SGD optimizers, which are evaluated using confusion matrix to determine the performance of model evaluation from each experiment. The experimental results of several models have the highest accuracy value, namely in the DenseNet169 architecture with Nadam optimizer of 90% and also the MobileNetV2 Nadam architecture reaching 87%. These two architectures can be said to be good enough to help detect cardiomegaly with image classification. This research is expected to contribute significant knowledge in the medical field as well as the development of deep learning models.**

Keywords*—*cardiomegaly, deep learning, convolutional neural network, evaluation model

I. INTRODUCTION

The heart is essential for survival, pumping blood to deliver oxygen and nutrients throughout the body [1]. The heart can also beat faster in situations that require a lot of energy when doing activities or sports. Thus, the heart is the source of life for humans and other living things [2]. That way, there are several heart diseases that can cause the conditions where the heart cannot carry out its duties properly, this disease occurs when the blood to the heart is stagnated or blocked, resulting in severe damage to the heart [3]. The consequences of various heart diseases, one of which is cardiomegaly, is a serious health problem for the community, especially in Indonesia. Cardiomegaly occurs when the size of the heart exceeds 50% of the inner diameter of the rib cage. This condition can be caused by various factors, including coronary artery disease, kidney disorders, hypertension, congenital abnormalities, infections, and cardiomyopathy [4]. Heart enlargement is not always diagnosed as heart disease and can also be related to chest wall abnormalities, technical factors, mediastinal abnormalities or lung conditions [5]. Cardiomegaly often goes unnoticed in its early stages as the symptoms are not always obvious. If not detected and treated properly, this condition can lead to serious complications that impact the quality of life of the sufferer. Early and accurate diagnosis is essential to prevent further complications and ensure correct treatment. Diagnosis of cardiomegaly is usually done by physical examination, blood tests, and medical imaging such as chest x-ray [6].

Traditional diagnostic methods for cardiac enlargement usually involve physical examination, electrocardiogram (ECG), and medical imaging such as chest X-ray. Although chest X-ray is a commonly used diagnostic tool, interpretation of X-ray images often requires high radiology expertise and can be inherently subjective, so there is a risk of inaccurate diagnosis [7]. In recent years, deep learning has emerged as the preferred method for image extraction and has significantly influenced the field of medical imaging. To help detect disease, image classification can be done with a deep learning approach [8]. Deep Learning is widely regarded as one of the most groundbreaking approaches in computer vision. It simulates the way neurons in the human brain process information to carry out tasks like image classification, object detection, image generation, and language translation [9][10]. Convolutional Neural Network (CNN) is a Deep Learning algorithm commonly used in image-based applications. This algorithm consists of several interconnected layers of convolution and unification, which allows automatic feature extraction from each pixel of the processed image during training [11]. CNN have been shown to provide superior performance in automatically detecting diseases in X-ray images [12]. CNNs can also be used to diagnose cardiomegaly to obtain high accuracy from chest X- ray images.

In a study conducted by Sorour et al. (2024) by utilizing chest x-ray images to detect cardiomegaly, the accuracy was 99.91% using AdaMax for the CNN model and 99.73% using AdaGrad for the ResNet50 architecture [13]. The same thing was also done by Yoo et al, in 2021, They explored the development of a cardiomegaly diagnosis support model utilizing CNN with ResNet architecture and an interpretable feature map. The ResNet model achieved nearly 80% accuracy in diagnosing cardiomegaly and provided a visually interpretable feature map [14].

For the next, there is a study conducted by Sarpotdar, This research employed a dataset of chest X-ray images to simulate and implement the U-Net model, achieving a diagnostic accuracy of 94%, a sensitivity of 96.2%, and a specificity of 92.5%. These results surpassed the performance of previous pre-trained models in identifying Cardiomegaly [15]. There is also research conducted by Bouslama, et al by conducting research with end-to-end techniques that use U-Net-based Deep Convolutional Neural Network to detect Cardiomegaly disease. Using this method, diagnostic accuracy exceeded 93%, surpassing previously published results for identifying cardiomegaly [16].

This research utilizes the DenseNet169, InceptionResNetV2, and MobileNetV2 architectures. Several studies using these architectures such as those conducted by Kurukshetra (2022) with the DenseNet169 architecture, Adam's optimizer which achieved 93.29% accuracy in detecting brain tumor diseases [17]. Furthermore, research conducted by Ferreira et al. detection of breast cancer classification using InceptionResNetV2 architecture, SGD optimizer gets an accuracy of 76% [18]. And research on robusta coffee leaf disease detection conducted by Aufar and Kaloka (2022) uses several architectures such as MobileNetV2, DenseNet169, ResNet50, and InceptionResNetV2 with Adam's optimizer and the best accuracy is on the MobileNetV2 architecture which achieves a high level of accuracy, up to 99.93% [19].

This research also utilizes the architecture of DenseNet169, InceptionResNetV2, and MobileNetV2 and uses several optimizers to test models such as Adagrad, Nadam, and SGD from the results also use confusion matrix as a model evaluation. This research aims to provide valuable insights into the diagnosis of cardiomegaly and to create avenues for future studies focused on the advancement of deep learning models. The gradual findings of this research were expected to fulfill the objectives of the study, specifically to identify the highest accuracy achieved through the implementation of the model.

II. Research Methodology

There are several stages that will be carried out in this study to facilitate the research process in order to achieve the desired goals. The following research stages can be seen in Figure 1.

A. Data Collection

This research uses the cardiomegaly image dataset contained in Kaggle as a training dataset. The data has 2 classes, namely normal and cardiomegaly disease with a total of about 4438 data available on Kaggle for the cardiomegaly class has a total data of 2219 images equal to the amount of data in the normal class. This research will use these images to train and test the model in recognizing and classifying cardiomegaly disease. The dataset can be seen in Figure 2.

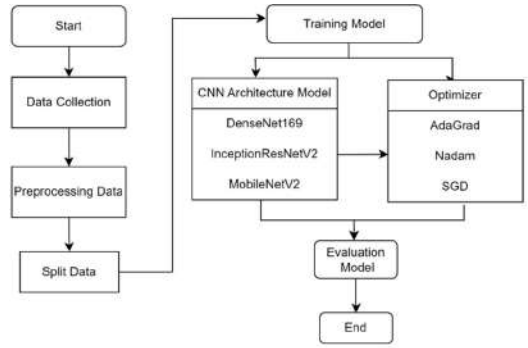


Fig. 1. Research Methodology.

Fig. 2. Images Dataset Visualization.

B. Data Preprocessing

Once the raw data is collected, the next step involves preprocessing. This includes tasks such as resizing, color transformation, normalization, and labeling the images. Preprocessing is a crucial initial phase in the computer vision and image analysis workflow, designed to enhance the quality and uniformity of images, ensuring better outcomes in subsequent analysis or processing [13].

C. Split Data

For the next stage, the dataset is divided into training data, validation data, and testing data. The data division technique used in this context is Holdout which serves to separate the dataset into two or more subsets of this data division using a ratio of 80:20. This technique is commonly used in machine learning and deep learning, especially in models such as CNN. The purpose of the following data division is to ensure that the model built can be evaluated properly.

D. DenseNet169

DenseNet169 is a well-known Convolutional Neural Network (CNN) architecture used for image recognition and computer vision applications. In the DenseNet design, every layer is connected to all subsequent layers. The total number of connections in a network with N layers can be determined using the formula $N(N+1)/2$. DenseNet-169 features an initial set of convolutional and pooling layers, followed by four dense blocks. After each dense block, there is a transition layer, and the network concludes with a classification layer that employs a softmax activation function [20].

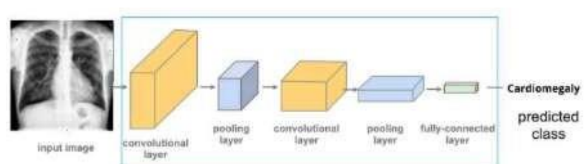


Fig. 3. DenseNet169 Architecture.

E. *InceptionResNetV2*

The Inception-ResNet-v2 method is commonly employed for CT-scan image classification because of its effectiveness in extracting critical features from medical images. This deep learning framework combines the strengths of two well-known architectures, Inception and ResNet. The Inception model is said to excel in extracting features at various scale levels, while ResNet is effective in counteracting the problem of gradient loss during model training. InceptionResNetV2 is created to address the limitations of both models, resulting in improved accuracy in image classification [21]. The Inception-ResNet model has several blocks that contain convolution layers, merging filters, ReLU activation functions, ResNet, and the initial structure [22]. The architectural layout of this block is depicted in Figure 4.

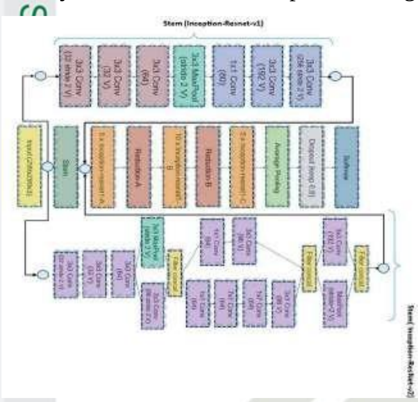


Fig. 4. InceptionResNetV2 Architecture.

F. *MobileNetV2*

MobileNetV2 is a transfer learning architecture based on an inverted residual structure, with thin bottleneck layers acting as input and output residual blocks. It also filters out features in the mid expansion layer using lightweight and deep convolutions [23]. In the image classification experiments, MobileNetV2 achieved higher accuracy compared to MobileNetV1 by using fewer parameters. The architecture of MobileNetV2 can be seen in Figure 5.

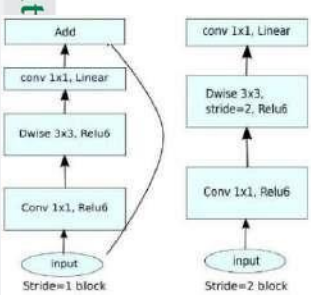


Fig. 5. MobileNetV2 Architecture

G. *Optimizer*

In implementing using CNN, an optimizer is also needed in the model testing process. The role of the optimizer is very important to direct the model training process towards optimal convergence. Optimizers used in this research include AdaGrad, Nadam, and Stochastic Gradient Descent (SGD).

Adagrad adjusts each model parameter by scaling it inversely to the square root of the cumulative sum of all past squared gradient values [24][25]. In cardiomegaly image classification research using CNN, AdaGrad helps handle data that has sparse features, such as specific patterns in X-ray images, by providing a larger learning rate for parameters with small gradients and smaller for parameters with large gradients.

Nadam combines the Nesterov Accelerated Gradient (NAG) with Adam's momentum component, leveraging the benefits of both for deep neural network training. This algorithm updates parameters using one or very few parameters [24]. Nadam excels in reducing gradient oscillations and accelerating learning on complex data such as X-ray images, where important features such as cardiomegaly patterns can be detected more accurately. And SGD is considered to be advantageous in terms of convergence speed regarding model experiments [26]. The main advantages of SGD are its simplicity, computational efficiency, and ability to avoid overfitting when combined with regularization techniques such as dropout.

H. *Evaluation Model*

After conducting several experiments, model evaluation is a critical stage in image classification research, which aims to assess how well the trained model classifies new images. One of the primary instruments employed for this evaluation is the confusion matrix, which offers a comprehensive view of the model's performance. The confusion matrix serves as a tool in machine learning to evaluate the effectiveness of classification models. It aids in understanding how the model generates predictions and the accuracy of those predictions [27].

The outcomes of the confusion matrix reveal Accuracy, Precision, Recall, and F1-score, which are included in the classification report. Precision is calculated to assess the likelihood of a positive classification. Recall measures the percentage of correctly predicted positive instances. F1-score is utilized to evaluate the balance between specificity and recall. The performance metrics are represented in the following equation [28].

$$\text{Accuracy} = \frac{TP+TN}{TP+TN+FP+FN} \quad (1)$$

$$\text{Recall} = \frac{TP}{TP+FN} \quad (2)$$

$$\text{Precision} = \frac{TP}{TP+FP} \quad (3)$$

$$\text{F1 - Score} = \left(\frac{Precision\ x\ Recall}{Precision+Recall}\right) \quad (4)$$

III. Results And Discussion

In this research, the data collection process uses a dataset of 4438 images of cardiomegaly disease which has 2 classes, namely detected cardio and normal or not detected cardio. This dataset is available on the kaggle website as a dataset that is often used for deep learning research. Then data preprocessing is carried out with the image normalization process, namely rescale image pixel values from the range 0-255 to the range 0-1 which aims to make each pixel value have the same data distribution and also change the size of the image so that it has the same size in each image, which is 224x224 pixels. This size is commonly used in CNN modeling.

Next, the data splitting phase is divided into three subsets: training data, validation data, and testing data. This division adheres to an 80:20 ratio, with 80% allocated for training and 20% for testing. Furthermore, the training data is split into training and validation sets, again following an 80:20 ratio, assigning 80% for training and 20% for validation as can be seen in Table 1.

TABLE I. RESULTS OF DATA SHARING

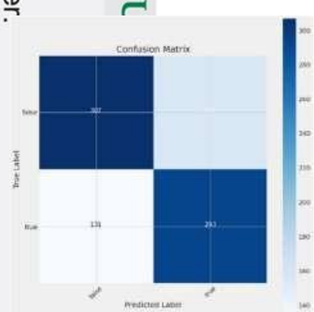
Holdout	80 : 20		
Class	**Data Training**	**Data Validation**	**Data Testing**
Cardiomegaly (true)	1420	355	444
Normal (false)	1420	355	444
Total	**2840**	**710**	**888**

Tests for the following models applied the Adagrad, Nadam, and SGD optimizers with a learning rate of 0.001 and a batch size of 256. The model training process is carried out in 50 epochs, each epoch includes one full session of training, where the model updates its weights based on training data and validation results. Further program evaluation of the model will then be conducted using confusion matrix.

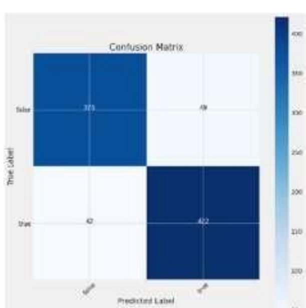
TABLE II. ACCURACY OF THE MODELS

CNN Model	Optimizer	Train Accuracy	Validation Accuracy	Test Accuracy
DenseNet169	Adagrad	66.11%	65.43%	67.57%
	Nadam	92.18%	92.43%	**89.80%**
	SGD	72.33%	72.39%	72.87%
Inception ResNetV2	Adagrad	63.67%	63.86%	64.19%
	Nadam	62.77%	62.85	63.06%
	SGD	49.74%	50.56%	47.84%
MobileNetV2	Adagrad	64.06%	64.16%	63.02%
	Nadam	87.06%	87.10%	**87.03%**
	SGD	68.01%	67.40%	68.20%

The training performed on this model uses 50 epochs. For the results of the highest accuracy value obtained on the testing data, which is 89% using the DenseNet169 model with the Nadam optimizer and then the accuracy value on MobileNetV2 using the Nadam optimizer reaches 87%, the accuracy results obtained are optimal, as can be seen in Table II. The results of the models that have been trained using the DenseNet169, InceptionResNetV2, and MobileNetV2 architectures can be further evaluated using the Classification Report and Confusion Matrix presented in the figures and tables below.



(a)



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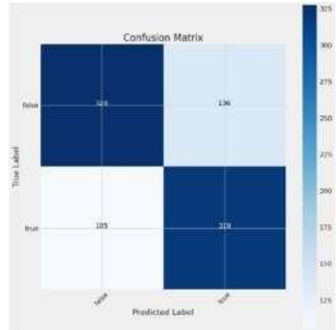
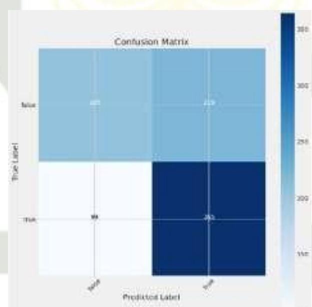


(c)

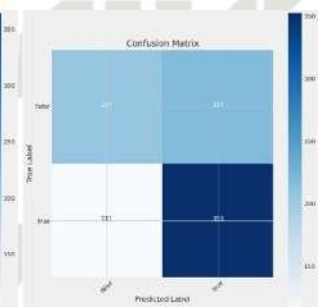
Fig. 6. (a) Confusion Matrix DenseNet169 Adagrad (b) Confusion Matrix DenseNet169 Nadam (c) Confusion Matrix DenseNet169 SGD.

In Figure 6. (a) shows that the evaluation of the DenseNet169 Adagrad model using confusion matrix obtained results, namely in the cardiomegaly class (true) 293 samples were predicted correctly and there were 131 errors. While in the normal class (false) 307 were predicted correctly and 157 were predicted incorrectly. For DenseNet169 Nadam in Figure 6. (b) the cardiomegaly class (true) is predicted to be correct as many as 422 samples and there are errors as many as 42. Then in the normal class (false) is predicted as many as 375 correctly and predicted wrong as many as 49. And for Figure 6. (c) the DenseNet169 optimizer SGD model the cardiomegaly class (true) is predicted to be correct as many as 319 samples and there are errors as many as 105 and the normal class (false) is predicted as many as 328 correctly and predicted wrong as many as 136.

For the DenseNet169 model that is good enough to predict cardiomegaly disease, namely by using the Nadam optimiser with a prediction error of only 42 samples.



(a)



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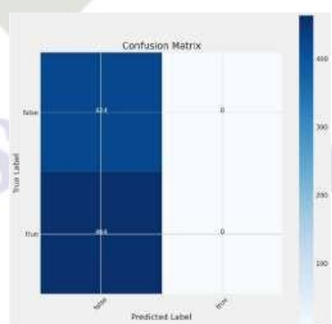
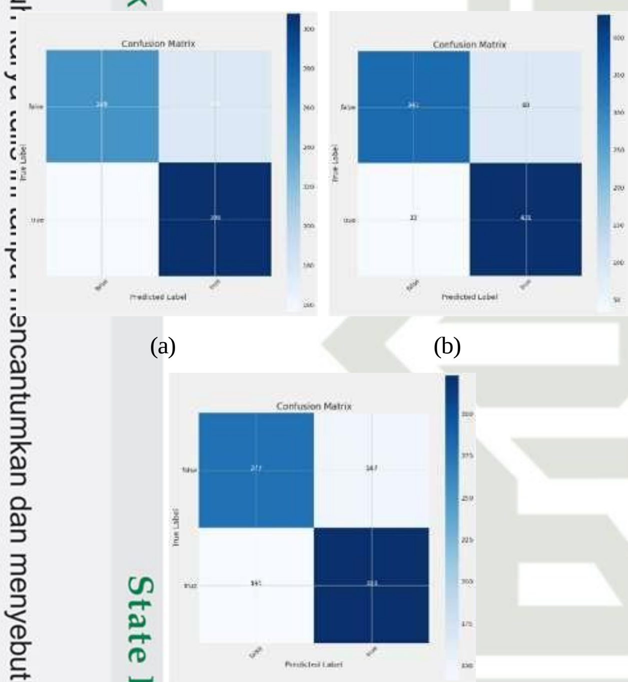


(c)

Fig. 7. (a) Confusion Matrix InceptionResNetV2 Adagrad (b) Confusion Matrix InceptionResNetV2 Nadam (c) Confusion Matrix InceptionResNetV2 SGD.

Figure 7. (a) shows that the evaluation of the InceptionResNetV2 Adagrad model using confusion matrix obtained results, namely in the cardiomegaly class (true) there were 365 samples predicted correctly and 99 samples predicted incorrectly. While in the normal class (false), 205 samples were predicted correctly and 219 samples were predicted incorrectly. For InceptionResNetV2 Nadam in Figure 7. (b) the cardiomegaly class (true) is predicted correctly as many as 353 samples and there are 111 errors. Then the normal class (false) was predicted as many as 207 correctly and 217 samples were wrongly predicted. And for Figure 7. (c) the InceptionResNetV2 optimizer SGD model has no correct samples in the prediction of the cardiomegaly class (true). While the normal class (false) predicted as many as 424 correctly and there were no errors in prediction.

For the InceptionResNetV2 model using the SGD optimizer, it is said that it is not reliable enough to predict the cardiomegaly class.



(a) (b)

(c)

Fig. 8. (a) Confusion Matrix MobileNetV2 Adagrad (b) Confusion Matrix MobileNetV2 Nadam (c) Confusion Matrix MobileNetV2 SGD.

In Figure 8. (a) Adagrad MobileNetV2 model predicted 308 samples as true and actually had true original labels and 156 samples were predicted incorrectly. Then the model correctly predicted 249 samples as normal (false) and the prediction error was 175 samples. For MobileNetV2 Nadam in Figure 8. (b) the model predicted 431 samples as cardiomegaly (true) correctly and there were 33 samples predicted incorrectly. And the model predicted 341 samples as normal (false) which really had the original label normal (false) and the model predicted 83 samples predicted not according to the original label. Furthermore, MobileNetV2 with the SGD optimizer in Figure 8. (c) as many as 323 samples were predicted correctly in the cardiomegaly class (true) and the prediction error was 141 samples and in the normal class (false) as many as 277 were predicted correctly according to the original label and 147 samples had errors in prediction. For the evaluation results of the MobileNetV2 model which is quite good at predicting the cardiomegaly class, namely using the Nadam optimizer because there are only 33 samples that are predicted not according to the original label.

TABLE III. RESULTS OF CLASSIFICATION REPORT VALUE

CNN Model	Optimizer	Precision	Recall	F1-Score	Accuracy
DenseNet169	Adagrad	68%	68%	66%	68%
	Nadam	**90%**	**90%**	**89%**	**90%**
	SGD	73%	75%	73%	73%
Inception ResNetV2	Adagrad	65%	64%	63%	64%
	Nadam	64%	62%	62%	63%
	SGD	24%	50%	32%%	48%
MobileNetV2	Adagrad	63%	66%	63%	63%
	Nadam	**88%**	**87%**	**87%**	**87%**
	SGD	67%	70%	67%	68%

It can be seen in Table III. The results of the model evaluation show a comparison of the performance of three CNN (Convolutional Neural Networks) models namely DenseNet169, Inception ResNetV2, and MobileNetV2 which use three different types of optimizers, namely Adagrad, Nadam, and SGD based on the Precision, Recall, F1-Score, and Accuracy values obtained by the DenseNet169 Nadam optimizer model produces the best performance with the highest accuracy value of 90%. Then the MobileNetV2 model with the same optimizer, Nadam, also provides the best performance with an accuracy value of 87%.

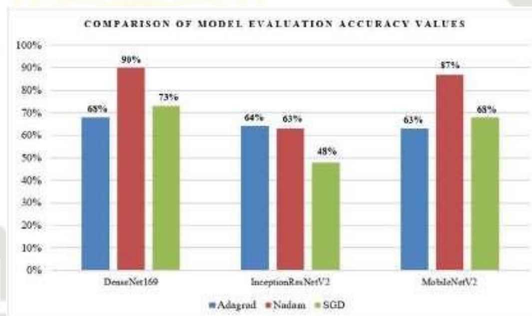


Fig. 9. Model evaluation accuracy value comparison graph.

From the graph displayed in Figure 9, it shows that the experiment with the DenseNet169 optimizer architecture model of Nadam achieved an accuracy value of 90%, which is the highest accuracy. Then the MobileNetV2 architecture optimizer Nadam achieved an accuracy value of 87%, both of these architectures work quite well in detecting cardiomegaly using image datasets. The Nadam optimizer gives the best results on both models, indicating that it works well in balancing exploration and exploitation during training. Whereas, Adagrad and SGD tend to give lower results because they are less adaptive to data that has dynamic gradients or varies between features. In this case, model selection and optimizer play an important role in improving performance in cardiomegaly classification.

IV. CONCLUSION

From the model testing conducted using the DenseNet169, InceptionResNetV2, and MobileNetV2 architectures as well as the Adagrad, Nadam, and SGD optimizers, it can be applied to classify cardiomegaly images with good model evaluation results. The results obtained are that the DenseNet169 architecture with the Nadam optimizer achieved the highest accuracy of 90%, followed by MobileNetV2 with the Nadam optimizer of 87%. These results indicate that DenseNet169 with Nadam optimizer is the most optimal configuration in this study. The architecture is able to capture patterns in the image well, resulting in superior performance. Meanwhile, the performance of MobileNetV2 shows that lighter architectures can also provide competitive results with the right approach.

This research reinforces that deep learning-based approaches have great potential in the medical field, especially to help diagnose diseases through medical image analysis. The implementation of artificial neural networks such as CNN is proven to be able to classify cardiomegaly images with good accuracy, thus making a significant contribution to the development of the field of deep learning. To be continued in future research, it can be applied to a more diverse dataset to ensure the reliability of the model in various clinical conditions as well as a combination of various CNN architectures and optimizations.

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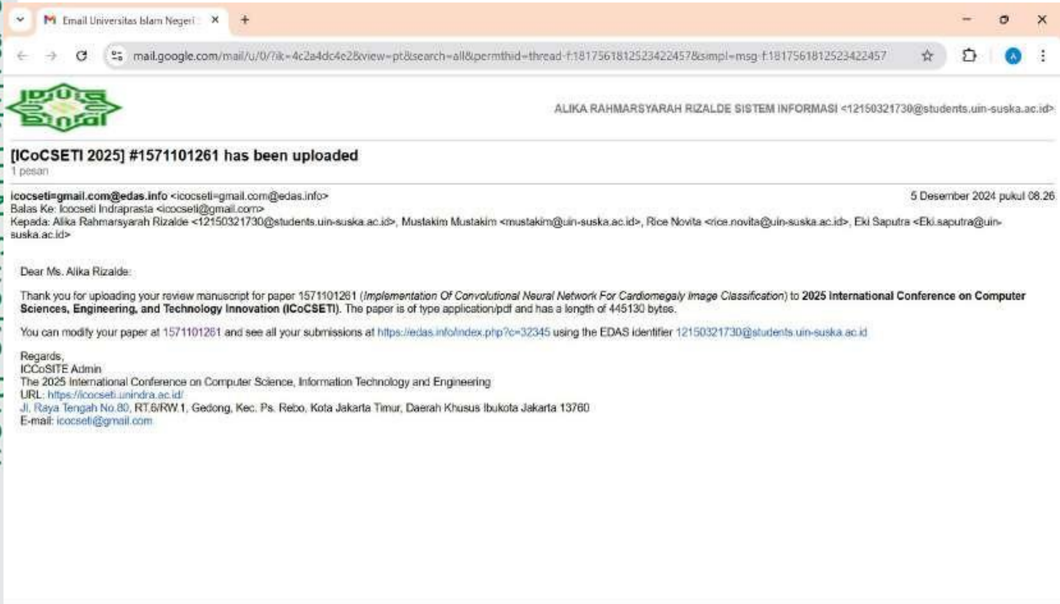
LAMPIRAN A

PROSES SUBMIT HINGGA ACCEPTED

1. Proses Pengajuan Submit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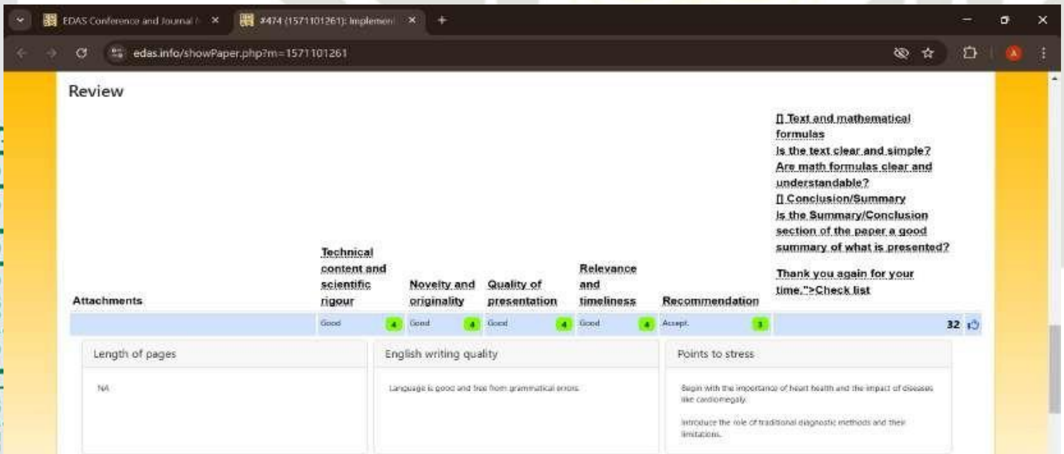
2. Proses Review dari Reviewer

Reviewer 1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Review

Attachments	Technical content and scientific rigour	Novelty and originality	Quality of presentation	Relevance and timeliness	Recommendation	[] Text and mathematical formulas Is the text clear and simple? Are math formulas clear and understandable? [] Conclusion/Summary Is the Summary/Conclusion section of the paper a good summary of what is presented? Thank you again for your time.">Check list
	Good 4	Good 4	Good 4	Good 4	Accept. 3	32

Length of pages	English writing quality	Points to stress
NA	Language is good and free from grammatical errors.	Begin with the importance of heart health and the impact of diseases like cardiomegaly. Introduce the role of traditional diagnostic methods and their limitations.

Reviewer 2

	Below Average	2	Average	3	Average	3	Good	4	Possible Accept	2	12

Length of pages	English writing quality	Points to stress
The number of pages is already 6 pages, but the discussion needs to be clarified to make it easier for readers to understand in this manuscript.	Overall, the writing is clear enough, but some long sentences could be condensed to improve readability. Check the whole thing. For example: Abstract: Sentence: "This research also utilizes DenseNet169, InceptionResNetV2, and MobileNetV2 architectures in diagnosing cardiomegaly to obtain high accuracy and using several optimizers such as Adagrad, Nadam, and SGD from the results obtained also using the confusion matrix as a model evaluation." Could be shortened to: "This research employs DenseNet169, InceptionResNetV2, and MobileNetV2 architectures with Adagrad, Nadam, and SGD optimizers, evaluated using confusion matrices to diagnose cardiomegaly with high accuracy." Introduction: Sentence: "The heart is very important for survival as the main organ that functions to pump blood to meet the needs of oxygen and nutrients throughout the body." Should be rewritten as: "The heart is essential for survival, pumping blood to deliver oxygen and nutrients throughout the body."	The Abstract must have the problem discussed in the research, the solution/method used, the purpose and contribution of the research. The introduction explains details about cardiomegaly disease and traditional diagnostic methods without directly leading to the research solution, and the main problem is not explicitly explained at the beginning. The introduction states that the novelty in this study is "a comparison of various CNN model architectures to determine the highest accuracy results in classifying images related to cardiomegaly disease". This is not a novelty, because it compares the performance of various existing architectures without additional modifications or innovations. It can be called a novelty if you make modifications or adjustments to the architecture. For example: adding layers, attention mechanisms, or special fine-tuning techniques to improve performance on cardiomegaly data. In the Methodology there is no discussion of why a particular architecture is more suitable for this task. Add architectural visualizations such as DenseNet169 and MobileNetV2 block diagrams. Explain the reasons for choosing certain optimizers such as Nadam and Adagrad. In the Results and Discussion there is no critical analysis of why a particular model performs better. An analysis containing a summary of the results, advantages and disadvantages of each method needs to be added. The conclusion simply summarizes the results without providing new insights, and no practical steps are suggested for further research. Figures and tables support the data, but some could be summarized (e.g., the model accuracy comparison table). References include relevant literature, but most need to be updated with recent studies.

Reviewer 3

Review attachment (show)	Size	Changed	Delete											
	33.33 KB	Dec 14, 2024		Good	4	Average	3	Good	4	Good	4	Accept	3	17

Length of pages	English writing quality	Points to stress
The number of pages used has met the specified criteria.	Consistency in Tense Maintain consistent use of past tense when describing the results of the study. This ensures clarity and adherence to academic writing standards.	Abstract Have you intended to perform a comparison among three CNN-based architectures? If so, the title should include "Comparison" to emphasize the purpose of your study. Additionally, the dataset used for achieving such high accuracy has not been explained. A clear explanation of the dataset is necessary to provide context for the reported accuracy. Methodology The manuscript does not mention the source and size of the dataset used for training and testing. Since the performance of each algorithm can vary significantly depending on the dataset, providing detailed information about the dataset is critical for reproducibility and validation, especially in image-based algorithms.

3. Email Accepted

ALIKA RAHMARSYARAH RIZALDE SISTEM INFORMASI <12150321730@students.uin-suska.ac.id>

[ICoCSETI 2025] Your paper #1571101261 ('Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification')

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Kepada: Alika Rahmarsyarah Rizalde <12150321730@students.uin-suska.ac.id>, Mustakim Mustakim <mustakim@uin-suska.ac.id>, Rice Novita <rice.novita@uin-suska.ac.id>, Eki Saputra <Eki.saputra@uin-suska.ac.id>

Dear Ms. Alika Rizalde:

Alika Rahmarsyarah Rizalde, Mustakim Mustakim, Rice Novita and Eki Saputra

Congratulations - your paper #1571101261 ('Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification') for ICoCSETI 2025 has been **Accepted in Batch 2** to be presented and published in The 2025 International Conference on Computer Sciences, Engineering, and Technology Innovation (ICoCSETI) - ICoCSETI 2025, which will be held in Virtual (Jakarta, Indonesia) during January 21, 2025.

The double-blind review process has already been taken from three reviewers, and the results are attached to this email. You have to revise your paper aligned with the review results.

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Implementation Of Convolutional Neural Network For Cardiomegaly Image Classification

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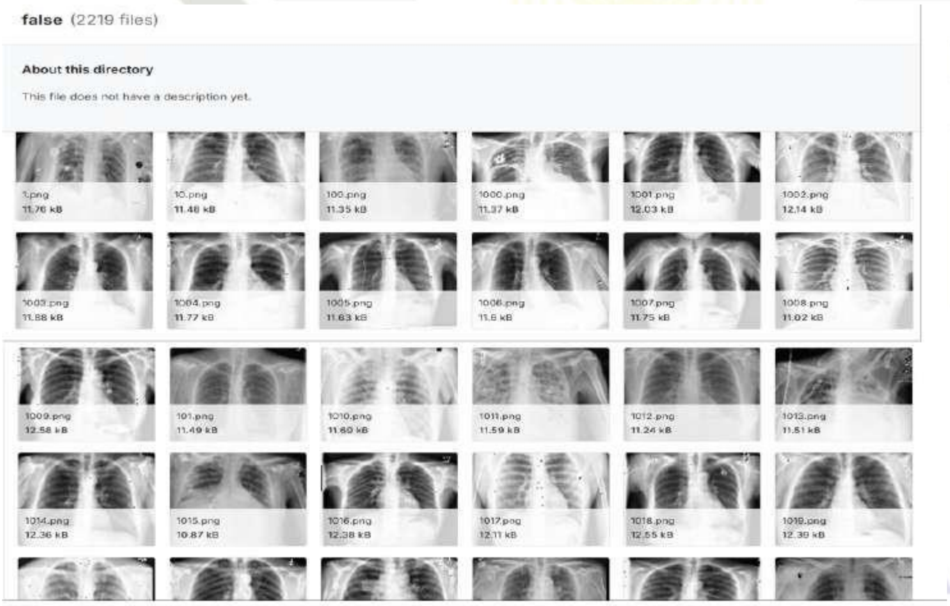

DAFTAR RIWAYAT HIDUP

Peneliti bernama Alika Rahmarsyarah Rizalde lahir di Pekanbaru, 03 Desember 2002. Peneliti merupakan anak dari Bapak Yusrizal dan Ibu Dewi Yudianti. Peneliti anak kedua dari tiga bersaudara. Pada tahun 2007 Peneliti memulai pendidikan dengan masuk TK An Namiroh dan lulus pada tahun 2008. Lalu melanjutkan pendidikan Sekolah Dasar di SD Negeri 105 Pekanbaru pada tahun 2009 dan lulus pada tahun 2015. Setelah menyelesaikan pendidikan Sekolah Dasar Peneliti melanjutkan pendidikan di SMP Negeri 08 Pekanbaru dan selesai pada tahun 2018. Kemudian menyelesaikan pendidikan Sekolah Menengah Atas di SMAN 12 Pekanbaru pada tahun 2021. Peneliti melanjutkan pendidikan dengan menjadi mahasiswa Program Studi Sistem Informasi Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau dan Peneliti menyelesaikan kuliah Strata Satu (S1) tersebut pada tahun 2025.