

**DEVELOPMENT OF A COMPACT MULTI-LAYER PERCEPTRON MODEL
FOR ARRHYTHMIA DETECTION ON ARM MICROCONTROLLER**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



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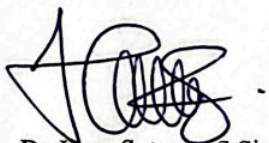


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ABSTRACT

DEVELOPMENT OF A COMPACT MULTI-LAYER PERCEPTRON MODEL FOR ARRHYTHMIA DETECTION ON ARM MICROCONTROLLER

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Arrhythmia, a prevalent heart condition, impacts a substantial portion of the global population, resulting in severe complications if left untreated. Precise arrhythmia recognition is heavily reliant on electrocardiogram (ECG) measurements. However, nowadays automated identification through machine learning models, such as the multi-layer perceptron (MLP) are attaining attention. Nonetheless, a significant number of machine learning models are computationally complex, limiting their application in resource-limited devices. To overcome this challenge, this research provides a lightweight MLP model for arrhythmia detection designed particularly for low-resource microcontrollers. The MLP model developed was trained on ECG data from the MIT-BIH Arrhythmia Database and features two hidden layers. The model acquires high precision and recall across various arrhythmia classes, covering atrial fibrillation (AFIB), pre-excitation syndrome (PREX), ventricular tachycardia (VT), supraventricular tachyarrhythmia (SVTA), and normal sinus rhythm (NSR), achieving an accuracy of 95.74% and an F1 score of 0.96. Additionally, the Raspberry Pi Pico 2W microcontroller successfully validated real-time inference, demonstrating the model's feasibility for embedded, cost-effective deployment. This research demonstrated that in environments with limited computational resources, lightweight MLP models may offer a practical and efficient solution for arrhythmia detection.

Keywords: arrhythmia detection, image processing, artificial neural network, multi-layer perceptron, microcontroller



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DEDICATION

I dedicate this work to Indonesian people, especially those in underprivileged and remote regions, with the hope that this study could contribute to raising the quality and accessibility of healthcare services throughout the country.



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