



UNDERGRADUATE THESIS

**CLASSIFICATION OF CHRONIC LYMPHOCYTIC
LEUKEMIA USING THE SWIN TRANSFORMER**

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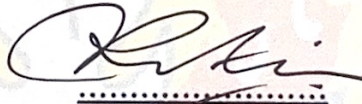
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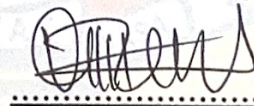
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ABSTRACT

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Delayed diagnosis of Chronic Lymphocytic Leukemia (CLL) in Indonesia occurs due to the limitations of standard medical facilities such as flow cytometry. This study applies the Swin Transformer algorithm (Swin Tiny) for binary classification of normal and CLL white blood cells using 10,216 microscopic images from Mendeley Data. The preprocessing stage includes image size standardization, Z-score normalization, and the application of class weighting. Hyperparameter optimization is conducted via Grid Search, and the best model is integrated into a Streamlit web application featuring Out-of-Distribution (OOD) detection based on Mahalanobis Distance. The results show that the shifted window attention mechanism effectively extracts local and global features, while class weighting successfully prevents data bias. Evaluation indicates accurate and balanced model performance, with accuracy, precision, recall, and F1-score consistently around 91% (specifically an F1-score of 0.9129), supported by a low error rate on the ROC-AUC curve. The system is also successfully implemented in the web application for real-time prediction. These characteristics prove that the developed model is reliable as a digital tool to support clinical decisions in hematology.

Keyword : Chronic Lymphocytic Leukemia, Swin Transformer, Class Weighting, Streamlit, Out-of-Distribution.

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In closing, the author hopes that this thesis will be beneficial to readers, future researchers, and all stakeholders in the advancement of science, particularly in the fields of digital image processing, computer vision, and deep learning.

Surabaya, July 14th 2026



Author

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