

**ENHANCING PHILADELPHIA MUTATION DETECTION USING
OPTIMIZED IMAGE PRE-PROCESSING FOR CONVOLUTION NEURAL
NETWORK**

By

Jacinthya Stephany Ezralia Harun
11906006

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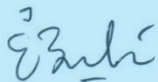


SWISS GERMAN UNIVERSITY
The Prominence Tower
Jalan Jalur Sutera Barat No. 15, Alam Sutera
Tangerang, Banten 15143 - Indonesia

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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.



Jacinthy Stephany Ezralia Harun

Student

31 July 2023

Date

Approved by:



Aulia Arif Iskandar, S.T., M.T.

Thesis Advisor

31 July 2023

Date



Dr. dr. Lyana Setiawan Sp.PK(K)

Thesis Co-Advisor

31 July 2023

Date

Dr. Hery Susanto, S.Si., M.Si.

Dean

31 July 2023

Date

Jacinthy Stephany Ezralia Harun

ABSTRACT

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By

Jacinthya Stephany Ezralia Harun
Aulia Arif Iskandar, S.T., M.T., Advisor
Dr. dr. Lyana Setiawan Sp.PK(K), Co-Advisor

SWISS GERMAN UNIVERSITY

Leukemia is a cancer that have a high mortality rate. Identifying the marker of leukemia could help determine the type of leukemia and its treatment. Philadelphia mutation (Ph) $t(9;22)(q34;q11.2)$ is one of the markers that commonly occurred in acute lymphocytic leukemia-ALL (20-30%) and chronic myelocytic leukemia-CML (90-95%) patients. This marker can be detected by several diagnosis tests, including Karyotyping. However, karyotyping is known to have high errors due to human factors and poor chromosomal shape and band. This research aims to aid medical professionals in detecting Ph mutation by developing an image processing algorithm using Gaussian Blur, Otsu thresholding, CLAHE, Median Blur, and Convolution Neural Network. 400 chromosome images were collected from literature studies, Dharmais Cancer Hospital, RSUPN Dr. Cipto Mangunkusumo (RSCM), and Mitra Keluarga Laboratory as the dataset. The first step was the preprocessing method followed by chromosomal classification by using fine-tuned Inception-ResNet V2 CNN. The step achieved the average accuracy, precision, recall, and F1-score of 92.88%, 84.31 %, 82.55%, and 82.77%, respectively. The final step was detecting Ph mutation and this step obtained

84.6% accuracy. It is concluded that the image processing algorithm potentially detects Ph mutation and aids the detection of Ph mutation in karyotyping.

Keywords: Leukemia, Karyotyping, Philadelphia Chromosome, Convolution Neural Network





DEDICATION

I dedicate this work to my beloved Jesus, family and friends. Furthermore, I dedicate this work to help improve the cytogenetic examination in the clinical pathology laboratory, at Dharmais Cancer Hospital.



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