



**IMPLEMENTATION OF CONVOLUTIONAL NEURAL
NETWORK AND GRAY-LEVEL CO-OCCURRENCE MATRIX
FOR SKIN DISEASE DETECTION THROUGH IMAGES**

THESIS DEFENSE

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41522010031

UNIVERSITAS

MERCU BUANA

INFORMATICS ENGINEERING STUDY PROGRAM

FACULTY OF COMPUTER SCIENCE

MERCU BUANA UNIVERSITY

JAKARTA 2025



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Submitted as one of the requirements to obtain a bachelor's degree

INFORMATICS ENGINEERING STUDY PROGRAM

FACULTY OF COMPUTER SCIENCE

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JAKARTA 2025

OWN WORK STATEMENT PAGE

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Approved by:

Supervisor



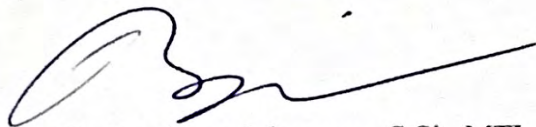
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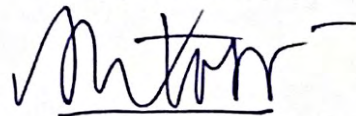
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FOREWORD

All praise and gratitude to God the Almighty, through His grace, mercy, and guidance, I have been blessed with the strength and health to complete this thesis proposal titled "Implementation of Convolutional Neural Network and Gray-Level Co-occurrence Matrix for Skin Disease Detection Through Images." This proposal is submitted as a partial fulfillment of the requirements for the Bachelor's Degree (S-1) in the Informatics Engineering Study Program, Faculty of Computer Science, Universitas Mercu Buana Jakarta.

First and foremost, I would like to express my deepest gratitude to my supervisor, Ilham Nugraha, S.Kom., M.Sc., for the invaluable guidance, time, and motivation provided throughout this journey.

I would also like to express my heartfelt thanks to the following individuals who have contributed to the successful completion of this work:

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3. **Dr. Hadi Santoso, S.Kom., M.Kom**, Head of the Informatics Engineering Department, for his encouragement and leadership.
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5. **Ilham Nugraha, S.Kom., M.Sc.**, Secretary of the International Department of Informatics Engineering, for her assistance throughout my academic journey.
6. **Miss Febi, S.Kom.**, of the International Department of Informatics Engineering, for her contribution and help towards my proposal.

I am fully aware that this proposal is not perfect. Therefore, I humbly welcome any constructive feedback, suggestions, or criticism to help me improve this work. I hope that this research contributes meaningfully to the field of Informatics and serves as a foundation for future technological developments.

Jakarta 12th January 2026



João Nitoivar Ribeiro

Câncio

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ABSTRAK

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Judul Proposal Penelitian : Implementasi Convolutional Neural Network dan Gray-Level Co-occurrence Matrix untuk Deteksi Penyakit Kulit Melalui Gambar
Pembimbing : Ilham Nugraha, S.Kom., M.Sc.

Penyakit kulit merupakan tantangan kesehatan global yang signifikan dan membutuhkan diagnosis yang akurat. Meskipun Convolutional Neural Networks (CNN) unggul dalam pengenalan gambar, CNN seringkali kesulitan dalam menangani lesi yang memiliki warna serupa tetapi tekstur yang berbeda. Penelitian ini mengusulkan kerangka kerja hibrida yang mengintegrasikan ekstraksi fitur spasial CNN dengan deskriptor tekstur Gray-Level Co-occurrence Matrix (GLCM).

Metodologi ini menggunakan arsitektur VGG16 untuk fitur mendalam yang dipadukan dengan empat properti statistik GLCM: Kontras, Homogenitas, Energi, dan Korelasi. Arsitektur input ganda ini menganalisis morfologi global dan granularitas permukaan. Dengan menggunakan pembagian dataset 80/20, hasil eksperimen menunjukkan bahwa model Hybrid CNN-GLCM secara signifikan mengungguli arsitektur VGG16 mandiri. Model yang diusulkan mencapai akurasi pengujian sebesar 92,43%, peningkatan 92,97% dibandingkan dengan baseline. Pendekatan hibrida secara efektif menyelesaikan ambiguitas antara kondisi yang tampak serupa secara visual, membuktikan bahwa penggabungan deskriptor tekstur buatan tangan dengan pembelajaran mendalam menciptakan alat yang lebih kuat, andal, dan mudah diinterpretasikan untuk skrining awal penyakit kulit.

Keywords: Deteksi Penyakit Kulit, Jaringan Saraf Konvolusional (CNN), Matriks Ko-kemunculan Tingkat Abu-abu (GLCM), Model Hibrida, Penggabungan Fitur, VGG16.

ABSTRACT

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Research Proposal Title : Implementation of Convolutional Neural Network and Gray-Level Co-occurrence Matrix for Skin Disease Detection Through Images
Supervisor : Ilham Nugraha, S.Kom., M.Sc.

Skin diseases pose a significant global health challenge requiring accurate diagnosis. While Convolutional Neural Networks (CNNs) excel in image recognition, they often struggle with lesions sharing similar colours but different textures. This research proposes a hybrid framework integrating CNN spatial feature extraction with Gray-Level Co-occurrence Matrix (GLCM) textural descriptors.

The methodology employs a VGG16 backbone for deep features fused with four GLCM statistical properties: Contrast, Homogeneity, Energy, and Correlation. This dual-input architecture analyses both global morphology and surface granularity. Using an 80/20 dataset split, experimental results show the Hybrid CNN-GLCM model significantly outperforms a standalone VGG16 architecture. The proposed model achieved a testing accuracy of 92.43%, a 92.97% improvement over the baseline. The hybrid approach effectively resolved ambiguities between visually similar conditions, proving that fusing handcrafted texture descriptors with deep learning creates a more robust, reliable, and interpretable tool for preliminary skin disease screening.

Keywords: Skin Disease Detection, Convolutional Neural Network (CNN), Gray-Level Co-occurrence Matrix (GLCM), Hybrid Model, Feature Fusion, VGG16.

LIST OF CONTENTS

OWN WORK STATEMENT PAGE.....	ii
TURNITINE TEST RESULT CERTIFICATE PAGE.....	iii
APPROVAL PAGE.....	iv
FOREWORD	v
FINAL PROJECT PUBLICATION APPROVAL STATEMENT PAGE FOR THE UNIVERSITY REPOSITORY	vi
ABSTRAK.....	vii
ABSTRACT.....	viii
LIST OF CONTENTS	ix
LIST OF TABLES.....	xi
LIST OF FIGURES	xii
APENDIX LIST.....	xiii
CHAPTER I INTRODUCTION.....	1
1.1 Background.....	1
1.2 Problem Statement.....	7
1.3 Research Objective.....	8
1.4 Research Benefits.....	8
1.5 Problem Scope.....	8
CHAPTER II LITERATURE REVIEW.....	9
2.1 Supporting Theories.....	9
2.1.1 Skin Diseases.....	9
2.1.2 Image Classification.....	10
2.1.3 Convolutional Neural Network for Skin Disease Classification.....	11
2.1.4 GLCM-Based Texture Feature Extraction for Skin Disease Detection.....	12
2.2 Previous Research.....	14
CHAPTER III METHODOLOGY.....	29
3.1 Research Type.....	29
3.2 Data Collection Method.....	29
3.3 Research Stages.....	30
CHAPTER IV EXPERIMENT AND RESULT	33
4.1 Experiment Setup.....	33
4.2 Training and Validation Result.....	33

4.3 Testing Results and Comparative Analysis.....	35
4.4 Qualitative Results and Visualization.....	36
CHAPTER V RESULT AND DISCUSSION.....	38
5.1 Discussion.....	38
5.1.1 Addressing the Texture-Color Limitation.....	38
5.1.2 Model Performance and Problem Resolution.....	38
5.1.3 Comparison with Previous Research.....	39
5.2 Conclusion.....	39
5.3 Recommendation for Future Work.....	40
5.4 Challenges Faced During the Research.....	41
REFERENCES.....	42
ATTACHMENT.....	46



LIST OF TABLES

Table 1 Journal Research.....	14
Table 2 Comparative Testing Metrics.....	35



LIST OF FIGURES

Figure 1. The proposed hybrid CNN-GLCM detection workflow	31
Figure 2 Training accuracy and loss performance curves without GLCM.....	34
Figure 3 Training accuracy and loss performance curves CNN-GLCM.....	34
Figure 4 Spatial feature extraction using Convolutional Neural Network (CNN) layers.....	35
Figure 5 Textural analysis and feature extraction using Gray-Level Co-occurrence Matrix (GLCM).....	35
Figure 6 CNN + GLCM Skin Disease Detection Result Visual Analysis of 20 Random Samples.....	36



APENDIX LIST

Attachment 1. Assistance Card.....	46
Attachment 2 Journal Article Manuscript.....	47
Attachment 3. Curriculum Vitae.....	48
Attachment 4 Statement and Transfer of Intellectual Property Rights (HAKI).....	49
Attachment 5. Certificate IBM.....	51
Attachment 6. Revision Note.....	52

