



UNDERGRADUATE THESIS

**APPLICATION OF SOFT VOTING ENSEMBLE
LEARNING IN THE CLASSIFICATION OF THE
TINEA CAPITIS SKIN DISEASE USING
RESNET-50 AND EFFICIENTNET-B2**

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FACULTY OF COMPUTER SCIENCE
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SURABAYA
2026**

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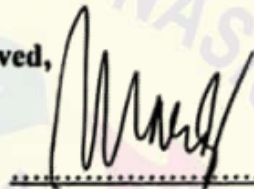
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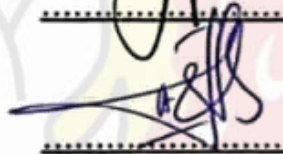
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Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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ABSTRACT

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Thesis Title : Application of Soft Voting Ensemble Learning in the Classification of the Tinea Capitis Skin Disease using ResNet-50 and EfficientNet-B2
Supervisor : 1. Dr. Ir. I Gede Susrama Mas Diyasa, ST. MT. IPU
2. Hendra Maulana, S.Kom., M.Kom.

Tinea Capitis skin disease (scalp ringworm) is a dermatophyte fungal infection with a high prevalence of disease distribution, particularly among the pediatric age group, male gender, and rural communities, characterized by a rapid transmission risk. Diagnosing Tinea Capitis faces challenges involving high dermoscopy equipment costs and the subjectivity of medical image interpretation, exacerbated by visual similarities between inflammatory and non-inflammatory subtypes (Kerion, Pustular Diffuse, Black Dot, and Gray Patch). This study aims to address these issues by proposing a Tinea Capitis subtype classification system based on Deep Learning using the Soft Voting Ensemble Learning paradigm, which combines the predictive strengths of Convolutional Neural Network (CNN) architectures, specifically the ResNet-50 and EfficientNet-B2 models. ResNet-50 architecture was selected for deep textural image feature extraction capabilities via Residual Blocks that mitigate the vanishing gradient problem, while the EfficientNet-B2 architecture was chosen for parameter efficiency and Compound Scaling mechanism, offering a balance between depth, width, and resolution. To maximize the performance of Soft Voting Ensemble Learning, contribution weight combination optimization is applied by comparing the deterministic Grid Search method and the stochastic Random Search method across three dataset splitting scenarios. System testing results indicate that Scenario 1 (70% training : 20% validation : 10% testing) yielded the most robust performance with the highest testing accuracy reaching 89.47%, where the Grid Search optimization proved consistent compared to Random Search in finding the optimal ensemble weight configuration ($w_1 = 0.45$ for ResNet-50 architecture model and $w_2 = 0.55$ for EfficientNet-B2 architecture model), and successfully corrected classification errors in the Pustular Diffuse class. The best architectural model results are subsequently implemented into a web-based interface system utilizing Laravel 12 and Tailwind CSS frameworks to facilitate direct use by medical personnel in the field. Performance evaluation using Accuracy, Precision, Recall, F1-Score, Specificity, and False Positive Rate evaluation metrics concludes that the integration of the optimized Soft Voting Ensemble Learning applied within a medical information system is capable of providing an accurate, efficient, and accessible diagnostic solution for medical personnel.

Keywords : Confusion Matrix, EfficientNet-B2, Grid Search, Random Search, ResNet-50, Ringworm, Soft Voting Ensemble Learning Paradigm, Tinea Capitis.

ACKNOWLEDGMENTS

Praise and gratitude be to God Almighty for His abundant blessings, grace, and mercy, which have enabled the author to complete this undergraduate thesis entitled "**APPLICATION OF SOFT VOTING ENSEMBLE LEARNING IN THE CLASSIFICATION OF THE TINEA CAPITIS SKIN DISEASE USING RESNET-50 AND EFFICIENTNET-B2.**" The primary purpose of this thesis is to fulfill one of the requirements for obtaining the Computer Science Bachelor's degree in Informatics Study Program, Faculty of Computer Science, Universitas Pembangunan Nasional Veteran Jawa Timur.

On this occasion, the author would like to express deep respect and sincere gratitude to the various parties who have played a significant role in helping to complete this thesis:

1. The author's extended family, from both the father's and mother's sides, the author's biological parents, and the author's biological sister, who have provided immense physical, emotional, and spiritual support during the undertaking and completion of this thesis.
2. Prof. Dr. Ir. Akhmad Fauzi, MMT., IPU., as the Rector of University of National Development "Veteran" East Java, along with the university management, for providing many opportunity and facilities that assisted the author in completing this thesis.
3. Prof. Dr. Ir. Novirina Hendrasarie, M.T., as the Dean of the Faculty of Computer Science, University of National Development "Veteran" East Java, along with the faculty management, for constantly supporting the execution of this thesis.
4. Fetty Tri Anggraeny, S.Kom., M.Kom., as the Head Coordinator of the Informatics Study Program, Faculty of Computer Science, University of National Development "Veteran" East Java, along with all lecturers and academic staff who have imparted their knowledge to the author.

5. Andreas Nugroho Sihananto, S.Kom., M.Kom., as Thesis Coordinator, and Dina Zatusiva Haq, S.Mat., M.Kom., as Deputy Thesis Coordinator of the Informatics Study Program, as well as administrative staff of the Faculty of Computer Science, who have assisted with administrative requirements during the thesis process.
6. The author's thesis advisors, Dr. Ir. I Gede Susrama Mas Diyasa, S.T., M.T., IPU., and Hendra Maulana, S.Kom., M.Kom., for their continuous support, guidance, and direction in undertaking and completing this thesis.
7. The author's thesis assessors, Fetty Tri Anggraeny, S.Kom., M.Kom., M. Muharrom Al Haromainy, S.Kom., M.Kom., and dr. Hasrulliana Ningsih W., SpDVE, FINS DV, FAADV for their constructive criticism and also suggestions regarding this thesis report.
8. The author's academic advisors, Pratama Wirya Atmaja, S.Kom., M.Kom., and Addien Haniefardy, S.Kom., M.Kom., for their support and guidance throughout the author's studies at University of National Development "Veteran" East Java.
9. dr. Tauhid Islamy, Sp. OG., Subsp. K.Fm., as the Director of RSUD Haji Provinsi Jawa Timur, along with board of deputy directors of RSUD Haji Provinsi Jawa Timur, for granting permission to conduct the primary data collection at the hospital.
10. dr. Rachmad Cahyadi, M.Kes., as the Chief Head of the Research and Development Department, and Adi Larasanti, SKM., as the Secretary of the Research and Development Department at RSUD Haji Provinsi Jawa Timur, for their assistance in handling administrative and correspondence needs during the research.
11. dr. Rahimah, Sp.D.V.E, dr. Fitri Abdullah Jawas, Sp.D.V.E, FINS DV, FAADV, dr. Ida Widyastuti, Sp.D.V.E, FINS DV., dr. Hasrulliana Ningsih W., Sp.D.V.E, FINS DV, FAADV, and dr. Firdausi Nurharini, Sp.D.V.E, FINS DV, FAADV as the Medical Staff of Dermatology and Venereology Clinic at RSUD Haji Provinsi Jawa Timur, for allowing the author to study Tinea Capitis skin disease as the research object.

12. The Medical Records Installation Staff at the RSUD Haji Provinsi Jawa Timur, for granting permission to retrieve data from the hospital's medical records as the research instrument.
13. The author's closest friends and companions: Elizabeth, Tarisha, Silvi, Nada, Izzah, Freya, Aurora, Fadli, Rohman, Ridho, Gisan, Nafis, Raditya, Doding, and Rhimba who have provided motivation and mental support during the preparation and completion of this thesis.\
14. Chaniel Community, Elevate Community, and GKA Gloria Galaxy, as brothers and sisters in faith who constantly prayed for the smooth progress and successful completion of this thesis.
15. The author's seniors: Victor, Erwin, Ryan, Iqmal, Ziko, Anwar, Angela, Denis, and Rangga who have provided guidance on the writing process and theoretical aspects during the preparation of this thesis.
16. The author's juniors: Firdaus, Dino, Azrul, Adna, Aldi, Haekal, Dini, Angga, Ade, Hana, Naya, and Milla who provided encouragement and support during the work on this thesis.
17. Fellow friends from the Alumni of Ayo Kita Kuliah Community, fellow students of Informatics Study Program batch 2022, and online colleagues who provided encouragement and support during completion of this thesis.

Through this thesis, the author hopes that readers will gain valuable knowledge and insights from the report. The author is fully aware that this thesis still has many shortcomings. Therefore, the author highly expects constructive criticism and suggestions from readers to further improve this thesis report.

Surabaya, April 1st 2026
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