



PENERAPAN *RESIDUAL NETWORK* SEBAGAI MODEL DETEKSI GLAUKOMA BERBASIS CITRA FUNDUS

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19/443643/TK/48839

Diajukan kepada Departemen Teknik Nuklir dan Teknik Fisika Fakultas Teknik
Universitas Gadjah Mada pada tanggal 5 Januari 2026
untuk memenuhi sebagian persyaratan untuk memperoleh derajat
Sarjana Program Studi Teknik Fisika

INTISARI

Penelitian ini bertujuan untuk mengembangkan model deteksi glaukoma berbasis citra fundus dengan menerapkan variasi arsitektur *Residual Neural Network* (ResNet) sebagai alat bantu untuk diagnosis glaukoma. Model deteksi glaukoma dirancang dan dilatih dengan menggunakan arsitektur ResNet-18 dan ResNet-34. Alat bantu diagnosis glaukoma bertujuan mempermudah akses pendeteksian dini glaukoma.

Proses pelatihan model menggunakan pendekatan *transfer learning* dengan *progressive unfreezing*. Model dilatih dengan menggunakan dataset citra fundus mata publik berupa *Standardized Multi-Channel Dataset for Glaucoma* (SMDG-19) serta dataset citra fundus mata dari Rumah Sakit Dr. Sardjito. Dataset yang digunakan terdiri dari dua kategori, yaitu citra fundus mata terindikasi glaukoma dan citra fundus mata sehat.

Kedua model dapat diterapkan sebagai model deteksi glaukoma. Model dengan arsitektur ResNet-18 memperoleh tingkat akurasi sebesar 86,45%, presisi 85,01%, sensitivitas 86,31%, *F1-score* 85,66%, AUC-ROC 0,9429 dan AUC-PR 0,9379 dalam mendeteksi citra terindikasi glaukoma dengan beban komputasi sekitar 9,4 GFLOPs dan estimasi *peak* RAM sekitar 1,0 GB. Model dengan arsitektur ResNet-34 memperoleh tingkat akurasi 88,46%, presisi 88,65%, sensitivitas 86,45%, *F1-score* 87,54%, AUC-ROC 0,9548, dan AUC-PR 0,9526 dalam mendeteksi citra terindikasi glaukoma dengan beban komputasi sekitar 18,7 GFLOPs dan estimasi *peak* RAM sekitar 1,35 GB. Hasil performa menunjukkan bahwa model dapat dijadikan sebagai salah satu alat bantu diagnosis dini glaukoma.

Kata kunci: Funduskopi, Deteksi Glaukoma, *Convolutional Neural Network*, *Residual Neural Network*

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APPLICATION OF RESIDUAL NETWORK AS A FUNDUS IMAGE- BASED GLAUCOMA DETECTION MODEL

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Submitted to the Department of Nuclear Engineering and Engineering Physics
Faculty of Engineering Universitas Gadjah Mada on January 5th 2026
in partial fulfilment of the requirement for the Degree of
Bachelor of Engineering in Engineering Physics

ABSTRACT

This study aims to develop a fundus image-based glaucoma detection model by applying variations of the Residual Neural Network (ResNet) architecture as an assistive tool for glaucoma diagnosis. The glaucoma detection models were designed and trained using the ResNet-18 and ResNet-34 architectures. The proposed diagnostic support tool is intended to facilitate early glaucoma detection by improving accessibility to screening procedures.

The model training process employed a transfer learning approach with progressive unfreezing. The models were trained using a public fundus image dataset, namely the Standardized Multi-Channel Dataset for Glaucoma, as well as fundus image data obtained from Dr. Sardjito General Hospital. The datasets consisted of two categories: glaucomatous fundus images and healthy fundus images.

Both models demonstrated applicability as glaucoma detection models. The ResNet-18 based model achieved an accuracy of 86.45% in detecting glaucomatous fundus images, with a computational cost of approximately 9.4 GFLOPs and an estimated peak memory usage of 1.0 GB. The ResNet-34 based model achieved an accuracy of 88.46% with a computational cost of approximately 18.7 GFLOPs and an estimated peak memory usage of 1.35 GB. The performance results indicate that the proposed models have the potential to serve as assistive tools for early glaucoma diagnosis.

Keywords: *Funduscopy, Glaucoma Detection, Convolutional Neural Network, Residual Neural Network*

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