ABSTRAK

PENDETEKSIAN PENYAKIT *DIABETIC RETINOPHATY* MELALUI CITRA FUNDUS MENGGUNAKAN MODEL *CNN INCEPTIONRESNET-V2*

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Diabetic Retinopathy (DR) adalah komplikasi serius diabetes melitus yang dapat menyebabkan kebutaan. Deteksi dini melalui analisis citra fundus sangat penting, tetapi keterbatasan jumlah *ophthalmologist* mendorong pengembangan metode otomatis berbasis kecerdasan buatan. Penelitian ini mengembangkan model deteksi DR berbasis *CNN InceptionResNet-V2* untuk mengklasifikasikan lima tingkat keparahan DR. Model dianalisis menggunakan *input* 3 kanal RGB, kanal hijau (murni dan RGB tiruan), serta dampak prapemrosesan citra seperti CLAHE*, Sharpening,* dan *Super Resolution.*Evaluasi kinerja dilakukan dengan akurasi*, sensitivitas, spesifisitas, AUC, F1-score, Confusion Matrix,* dan waktu komputasi. Percobaan dengan berbagai *batch size* (8, 16, 32, 64) menguji stabilitas dan efisiensi model. Model tanpa prapemrosesan (3 kanal RGB) mencapai akurasi 86%, tetapi kesalahan signifikan terjadi pada kelas mayoritas dan minoritas dibanding percobaanlainnya. Sebaliknya, model dengan kanal hijau RGB tiruan mencapai akurasi 96% dan *F1-score* 95,91%, dengan stabilitas terbaik pada *batch size* 16 sebagai konfigurasi optimal. Kombinasi kanal hijau RGB tiruan dengan CLAHE dan *Sharpening* memberikan kinerja terbaik. Sementara itu, kanal hijau murni menawarkan waktu komputasi lebih cepat tetapi kinerja kurang konsisten. Penelitian ini menegaskan pentingnya pemilihan teknik prapemrosesan dan konfigurasi *batch size* dalam meningkatkan akurasi deteksi otomatis DR. Hasil ini mendukung pengembangan sistem diagnosis berbasis CNN yang efisien untuk membantu deteksi dini DR dalam pengambilan keputusan medis.

Kata kunci : *Diabetic Retinopathy (DR),InceptionResNet-V2*, Citra fundus, Kanal Hijau

ABSTRACT

DETECTION OF DIABETIC RETINOPATHY THROUGH FUNDUS IMAGES USING THE CNN INCEPTIONRESNET-V2 MODEL

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Diabetic Retinopathy (DR) is a serious complication of diabetes mellitus that can lead to blindness. Early detection through fundus image analysis is crucial, but the limited number of ophthalmologists drives the development of automated methods based on artificial intelligence. This study developed a DR detection model using CNN InceptionResNet-V2 to classify five levels of DR severity. The model was analyzed using 3-channel RGB inputs, green channel (pure and synthetic RGB), as well as the impact of image preprocessing techniques such as CLAHE, Sharpening, and Super Resolution.Performance evaluation was conducted using accuracy, sensitivity, specificity, AUC, F1-score, Confusion Matrix, and computation time. Experiments with various batch sizes (8, 16, 32, 64) tested the model's stability and efficiency. The model without preprocessing (3-channel RGB) achieved an accuracy of 86%, but significant errors were observed in majority and minority classes compared to other experiments. In contrast, the model with synthetic RGB green channel achieved an accuracy of 96% and an F1-score of 95.91%, demonstrating the best stability with batch size 16 as the optimal configuration. The combination of synthetic RGB green channel with CLAHE and Sharpening produced the best performance. Meanwhile, the pure green channel offered faster computation time but less consistent performance. This study highlights the importance of selecting appropriate preprocessing techniques and batch size configurations to enhance the accuracy of automated DR detection. The findings support the development of efficient CNN-based diagnostic systems to aid early DR detection in medical decision-making.

Keywords: Diabetic Retinopathy (DR), InceptionResNet-V2, Fundus Image, Green Channel