

INTISARI

KLASIFIKASI KANKER KULIT BERBASIS CITRA DAN DATA DEMOGRAFI MENGGUNAKAN EFFICIENTNETV2 DAN SWIN TRANSFORMER

Oleh

Arya Veda Alviantoro

21/477217/PA/20639

Klasifikasi kanker kulit merupakan tantangan penting dalam diagnosis dini, di mana *deep learning* menawarkan potensi solusi non-invasif. Namun, evaluasi sistematis performa arsitektur modern seperti EfficientNetV2 dan Swin Transformer, terutama dampak integrasi data demografi klinis dan pengaruh skala dataset ISIC, masih terbatas, sehingga mendorong dilakukannya penelitian ini untuk menganalisis faktor-faktor tersebut.

Penelitian ini mengevaluasi varian EfficientNetV2 (S, M, L) dan model hibrida (EfficientNetV2-S + Swin-Base) menggunakan dataset citra dermoskopi ISIC (gabungan 2017-2020 dan ISIC 2020 saja) serta data demografi klinis pasien (diolah via MLP). Model dilatih menggunakan *transfer learning* dengan strategi bertahap yang adaptif dan dievaluasi berdasarkan metrikseperti AUC Biner/Multikelas dan Akurasi Biner/Multikelas, dilengkapi analisis interpretabilitas Grad-CAM.

Hasil utama menunjukkan integrasi data demografi secara signifikan meningkatkan kemampuan diskriminatif (misalnya, AUC Biner hingga 0.9509 dengan EffNetV2-M+Meta) dan presisi, meski sedikit mengorbankan *recall* biner. Pelatihan pada dataset gabungan ISIC (~58rb citra) terbukti esensial untuk generalisasi *robust*, jauh mengungguli model yang dilatih hanya pada ISIC 2020 (~33rb citra). *Ensemble learning* heterogen (post-hoc) lebih lanjut meningkatkan kinerja, mencapai AUC Biner 0.9615 dan Akurasi Biner 95.13%.

Kata Kunci: Klasifikasi Kanker Kulit, *Deep Learning*, EfficientNetV2, Swin Transformer, Integrasi Data Demografi, Dataset ISIC, *Ensemble Learning*.

ABSTRACT

SKIN CANCER CLASSIFICATION BASED ON IMAGES AND DEMOGRAPHIC DATA USING EFFICIENTNETV2 AND SWIN TRANSFORMER

By

Arya Veda Alviantoro

21/477217/PA/20639

Skin cancer classification is a critical challenge for early diagnosis, where deep learning offers potential non-invasive solutions. However, systematic evaluations of modern architectures like EfficientNetV2 and Swin Transformer, particularly regarding the impact of clinical demographic data integration and ISIC dataset scale, remain limited, motivating this research to analyze these factors.

This study evaluates EfficientNetV2 variants (S, M, L) and a hybrid model (EfficientNetV2-S + Swin-Base) using ISIC dermoscopic image datasets (combined 2017-2020 and ISIC 2020 only) along with patient clinical demographic data (processed via MLP). Models were trained using transfer learning with an adaptive staged strategy and evaluated based on key metrics such as Binary/Multiclass AUC and Accuracy, supplemented by Grad-CAM for interpretability analysis.

The main results indicate that demography data integration significantly enhances discriminative ability (e.g., Binary AUC up to 0.9509 with EffNetV2-M+Meta) and precision, albeit at the cost of slightly reduced binary recall. Training on the larger combined ISIC dataset (~58k images) proved essential for robust generalization, vastly outperforming models trained solely on ISIC 2020 (~33k images). Post-hoc heterogeneous ensemble learning further boosted performance, achieving a Binary AUC of 0.9615 and 95.13% Binary Accuracy.

Keywords: Skin Cancer Classification, Deep Learning, EfficientNetV2, Swin Transformer, Demographic Data Integration, ISIC Dataset, Ensemble Learning.