

Abstrak

Acne vulgaris merupakan penyakit kulit dengan prevalensi tinggi di Indonesia yang berdampak signifikan pada kualitas hidup penderitanya. Keterbatasan akses layanan dermatologi konvensional dan kurangnya edukasi masyarakat sering kali menyebabkan kesalahan identifikasi dan penanganan dini. Penelitian ini bertujuan untuk merancang dan membangun sistem deteksi *Acne Vulgaris* berbasis *website Single Page Application* (SPA) untuk mengklasifikasikan lima jenis jerawat umum (Komedo, Papula, Pustula, Nodul, dan Kista) secara presisi, sekaligus menyajikan rekomendasi penanganan edukatif. Mesin inferensi dikembangkan menggunakan arsitektur *deep learning* ResNet-50 melalui pendekatan *Transfer Learning (Three-Phase Fine-Tuning)*. Sistem diintegrasikan ke dalam peladen *backend* FastAPI dengan menerapkan *pipeline* visi komputer tingkat lanjut yang memadukan algoritma pemotongan bertumpang-tindih (*9 Overlapping Crops*), pelokalisasi fitur *Grad-CAM*, filter ruang warna kulit (HSV), dan eliminasi duplikasi anotasi menggunakan *Non-Maximum Suppression* (NMS). Sementara itu, antarmuka klien (*frontend*) dibangun menggunakan kerangka kerja React.JS. Evaluasi pada himpunan data uji membuktikan bahwa model mencapai akurasi keseluruhan sebesar 92,95%. Integrasi algoritma pelokalisasi terbukti secara efektif mengeliminasi deteksi positif palsu (*false positive*) dan memproduksi kotak pembatas (*bounding box*) yang akurat. Hasil pengujian *Black Box* menunjukkan fungsionalitas sistem berjalan valid, dan evaluasi kepuasan pengguna (*User Acceptance Testing*) memperoleh kategori "Sangat Baik". Hal ini mengonfirmasi bahwa perangkat lunak yang dibangun tidak hanya fungsional secara komputasi, tetapi juga interaktif, berpusat pada pengguna, dan memiliki keandalan tinggi sebagai alat bantu penyaringan kesehatan kulit.

Kata kunci: *Acne Vulgaris, Deep Learning, ResNet-50, Grad-CAM, Single Page Application, FastAPI.*

Abstract

Acne vulgaris is a highly prevalent skin disease in Indonesia that significantly impacts the sufferers' quality of life. The limited access to conventional dermatological services and the lack of public education often lead to misidentification and incorrect early treatment. This study aims to design and develop a Single Page Application (SPA) website-based Acne Vulgaris detection system to accurately classify five common types of acne (Comedones, Papules, Pustules, Nodules, and Cystic) while providing educational treatment recommendations. The inference engine was developed using the ResNet-50 deep learning architecture through a Transfer Learning (Three-Phase Fine-Tuning) approach. The system is integrated into a FastAPI backend server by implementing an advanced computer vision pipeline that combines the overlapping crops algorithm (9 Overlapping Crops), Grad-CAM feature localization, skin color space filtering (HSV), and annotation duplication elimination using Non-Maximum Suppression (NMS). Meanwhile, the client interface (frontend) was built using the React.JS framework. Evaluation on the test dataset proved that the model achieved an overall accuracy of 92.95%. The integration of the localization algorithm effectively eliminated false positive detections and produced accurate bounding boxes. The Black Box testing results showed valid system functionality, and the user satisfaction evaluation (User Acceptance Testing) obtained a "Very Good" category. This confirms that the developed software is not only computationally functional but also interactive, user-centric, and highly reliable as a skin health screening tool.

Keywords: *Acne Vulgaris, Deep Learning, ResNet-50, Grad-CAM, Single Page Application, FastAPI.*