

ABSTRAK

Klasifikasi etnisitas berbasis citra wajah merupakan salah satu tugas dalam bidang *computer vision* yang memiliki tingkat kompleksitas tinggi akibat kemiripan fitur visual antar kelompok etnis yang sering kali bersifat halus dan saling tumpang tindih. Penelitian ini bertujuan untuk menganalisis dan membandingkan kinerja dua arsitektur *Convolutional Neural Network* (CNN), yaitu VGG19 dan ResNet101, dalam tugas klasifikasi etnisitas berbasis citra wajah menggunakan dataset FairFace yang mencakup enam kategori etnisitas: *Caucasian, Negroid, East Asian, Southeast Asian, India*, dan *Middle Eastern*. Metodologi penelitian mengikuti kerangka CRISP-DM dengan skema pelatihan yang seragam, meliputi strategi *transfer learning, partial freezing*, dan kepala klasifikasi kustom yang identik pada kedua arsitektur. Untuk menangani ketidakseimbangan distribusi kelas, tiga metode penyeimbangan data dievaluasi, yaitu *oversampling* dengan augmentasi agresif, *undersampling*, dan *class weight*. Hasil eksperimen menunjukkan bahwa metode *oversampling* menghasilkan performa terbaik pada kedua model. Pada kondisi tersebut, VGG19 mencapai akurasi *test set* sebesar 72,87% dan mengungguli ResNet101 yang memperoleh akurasi 69,83%. Dari sisi efisiensi komputasi, ResNet101 membutuhkan waktu pelatihan lebih singkat dibandingkan VGG19. Berdasarkan hasil evaluasi, VGG19 terbukti lebih unggul dibandingkan ResNet101 dengan perolehan akurasi *test set* 72,87%.

Kata Kunci: *Convolutional Neural Network, VGG19, ResNet101, klasifikasi etnisitas, citra wajah, transfer learning, FairFace*

ABSTRACT

Ethnicity classification based on facial images is a highly complex task in the field of computer vision, owing to the subtle and often overlapping visual features among different ethnic groups. This study aims to analyze and compare the performance of two Convolutional Neural Network (CNN) architectures, VGG19 and ResNet101, in facial image-based ethnicity classification using the FairFace dataset, which encompasses six ethnicity categories: Caucasian, Negroid, East Asian, Southeast Asian, Indian, and Middle Eastern. The research methodology follows the CRISP-DM framework with a uniform training scheme, including transfer learning strategies, partial layer freezing, and identical custom classification heads applied to both architectures. To address class distribution imbalance, three data balancing methods were evaluated: oversampling with aggressive augmentation, undersampling, and class weighting. Experimental results demonstrate that the oversampling method consistently yielded the best performance across both models. Under this condition, VGG19 achieved a test set accuracy of 72,87%, outperforming ResNet101 which obtained 69.83%. In terms of computational efficiency, ResNet101 required nearly half the training time compared to VGG19. Based on the evaluation results, VGG19 outperformed ResNet101, achieving a test set accuracy of 72,87% and demonstrating more consistent performance.

Keywords: Convolutional Neural Network, VGG19, ResNet101, ethnicity classification, facial image, transfer learning, FairFace

