

## INTISARI

### ANALISIS KOMPARATIF MODEL CNN DALAM KLASIFIKASI DEFORMITAS DAUN TELINGA PADA BAYI BARU LAHIR

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Deformitas daun telinga pada bayi baru lahir merupakan kondisi bawaan yang dapat memengaruhi fungsi pendengaran, perkembangan mental-sosial, dan kualitas hidup anak. Diagnosa yang akurat dan cepat sangat penting untuk intervensi dini, namun seringkali terhambat oleh keterbatasan tenaga ahli dan subjektivitas penilaian manual.

Penelitian ini bertujuan untuk mengevaluasi performa tiga model *Convolutional Neural Network* (CNN), yaitu EfficientNet-B4, ResNet50, dan DenseNet121, dalam mengklasifikasikan deformitas daun telinga bayi baru lahir menggunakan dataset BabyEar4K dengan jumlah data 3.827 gambar yang mencakup lima kelas: normal, *lop ear*, *Stahl's ear*, *helical deformities*, dan *cup ear*. Metode penelitian melibatkan dua tahap klasifikasi: (1) klasifikasi biner (normal vs. abnormal) dan (2) klasifikasi multikelas untuk menentukan jenis deformitas. Model dilatih dengan variasi strategi *preprocessing* seperti augmentasi data dan penyeimbangan kelas (*balancing*), serta dioptimasi menggunakan teknik *fine-tuning* dan *transfer learning*.

Evaluasi dilakukan berdasarkan metrik akurasi, *precision*, *recall*, dan *F1-score* pada dua konfigurasi data uji yang berbeda. Hasil penelitian menunjukkan bahwa EfficientNet-B4 mencapai performa terbaik dalam klasifikasi biner dengan akurasi 70% (*F1-score* 0.69), sementara klasifikasi multikelas masih menghadapi tantangan dengan akurasi tertinggi 50% (*F1-score* 0.45). Sistem *pipeline* dua tahap mengalami akumulasi kesalahan, terutama pada kelas deformitas dengan karakteristik visual mirip seperti *cup ear* dan *helical deformities*. Analisis lebih lanjut mengungkap bahwa ketidakseimbangan data dan kompleksitas fitur menjadi faktor utama yang memengaruhi kinerja model.

**Kata Kunci:** Deformitas daun telinga, bayi baru lahir, CNN, *balancing*,  
klasifikasi citra, *ResNet50*, *DenseNet121*, *EfficientNet-B4*



## ABSTRACT

### COMPARATIVE ANALYSIS OF CNN MODELS IN CLASSIFICATION OF EAR DEFORMITIES IN NEWBORNS

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Newborn ear deformity is a congenital condition that can affect hearing function, mental-social development, and the child's quality of life. Accurate and rapid diagnosis is essential for early intervention, but it's often hindered by the limited availability of experts and the subjectivity of manual assessment.

This research aims to evaluate the performance of three Convolutional Neural Network (CNN) models, namely EfficientNet-B4, ResNet50, and DenseNet121, in classifying newborn ear deformities using the BabyEar4K dataset. This dataset comprises 3,827 images covering five classes: normal, lop ear, Stahl's ear, helical deformities, and cup ear. The research methodology involves two classification stages: (1) binary classification (normal vs. abnormal) and (2) multiclass classification to determine the type of deformity. The models were trained with various preprocessing strategies such as data augmentation and class balancing, and were optimized using fine-tuning and transfer learning techniques.

Evaluation was performed based on metrics like accuracy, precision, recall, and F1-score across two different test data configurations. The results showed that EfficientNet-B4 achieved the best performance in binary classification with an accuracy of 70% (F1-score 0.69), while multiclass classification still faced challenges with the highest accuracy at 50% (F1-score 0.45). The two-stage pipeline system experienced error accumulation, particularly in deformity classes with visually similar characteristics, such as cup ear and helical deformities. Further analysis revealed that data imbalance and feature complexity were the main factors affecting the model's performance.

**Keywords:** Ear Deformity, Newborns, CNN, Balancing, Image  
Classifications, *ResNet50*, *DenseNet121*, *EfficientNet-B4*