

IMPLEMENTING DATA AUGMENTATION USING DEEP CONVOLUTIONAL GENERATIVE ADVERSARIAL NETWORKS TO ENHANCE CNN PERFORMANCE IN WEB-BASED SPICE IMAGE CLASSIFICATION

Andre Daegal

*Data Science Study Program, Faculty of Science and Technology
University of Technology Yogyakarta
Jl. Ringroad Utara Jombor Sleman Yogyakarta
E-mail: andre.daegal@gmail.com*

ABSTRACT

Adequate data availability is critical in developing effective machine learning models, especially in image classification tasks. This study addresses the challenge of limited training data by applying generative AI-based augmentation using Deep Convolutional Generative Adversarial Networks (DCGAN). The method successfully generated 500 synthetic images for each spice category, doubling the dataset size from 2,000 to 4,000 images. A Convolutional Neural Network (CNN) classification model demonstrated notable improvements, with training accuracy increasing by 8.03% (from 91.27% to 99.30%) and test accuracy rising by 9.60% (from 89.00% to 98.60%). For the ginger class, precision improved from 0.74 to 0.96, with a stable recall and an increase in F1-score from 0.83 to 0.98. The aromatic ginger (kencur) class showed precision growth from 0.91 to 0.99, recall improved to 0.97, and F1-score rose from 0.81 to 0.98. Turmeric retained maximum precision with a slight drop in recall to 0.98 and an F1-score of 0.99. Meanwhile, galangal achieved perfect scores in precision, recall, and F1-score. These findings highlight the significant role of generative AI, particularly DCGAN, in enriching limited datasets and substantially boosting the performance of CNN-based image classification models in web-based applications.

Keywords: *Augmentation, Data, DCGAN, Image, CNN.*