

RESEARCH ARTICLE

Efficient Multiclass Classification of Small Datasets Using a Novel Contrast-based Learning Approach

Salma Fayaz¹, Syed Zubair Ahmad Shah^{1,*} and Assif Assad¹

¹Department of Computer Science and Engineering, Islamic University of Science and Technology, Awantipora, Pulwama, Jammu and Kashmir, India

Abstract: *Introduction:* Deep learning models often face challenges in achieving optimal accuracy when classifying multiclass datasets, particularly when the dataset size is limited. This study introduces Contrast Based Learning (CBL), a novel data augmentation technique designed to address data scarcity.

Method: CBL innovatively concatenates multiple image and contrast learning to generate enriched datasets that exhibit a higher diversity of complex features. By focusing on the contrasts between various images, this method enhances the model's ability to learn nuanced features, thereby improving generalization and reducing overfitting.

Results: Unlike traditional data augmentation methods, which rely on basic transformations, CBL dynamically concatenates images from different classes, creating complex inputs that provide the model with a more comprehensive training dataset. Experimental results show that CBL significantly improves classification accuracy and outperforms state-of-the-art methods across multiple small-scale multiclass datasets.

Conclusion: The findings highlight the robustness of CBL in addressing data limitations, demonstrating its potential to advance the classification performance of deep learning models.

Keywords: Artificial Intelligence, deep learning, convolutional neural network, data augmentation, overfitting, accuracy.

ARTICLE HISTORY

Received: August 12, 2024
Revised: September 28, 2024
Accepted: October 09, 2024

DOI:
10.2174/0123520965298906241023110601