World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:18, No:04, 2024

Dynamic Distribution Calibration for Improved Few-Shot Image Classification

Authors : Majid Habib Khan, Jinwei Zhao, Xinhong Hei, Liu Jiedong, Rana Shahzad Noor, Muhammad Imran

Abstract : Deep learning is increasingly employed in image classification, yet the scarcity and high cost of labeled data for training remain a challenge. Limited samples often lead to overfitting due to biased sample distribution. This paper introduces a dynamic distribution calibration method for few-shot learning. Initially, base and new class samples undergo normalization to mitigate disparate feature magnitudes. A pre-trained model then extracts feature vectors from both classes. The method dynamically selects distribution characteristics from base classes (both adjacent and remote) in the embedding space, using a threshold value approach for new class samples. Given the propensity of similar classes to share feature distributions like mean and variance, this research assumes a Gaussian distribution for feature vectors. Subsequently, distributional features of new class samples are calibrated using a corrected hyperparameter, derived from the distribution features of both adjacent and distant base classes. This calibration augments the new class sample set. The technique demonstrates significant improvements, with up to 4% accuracy gains in few-shot classification challenges, as evidenced by tests on miniImagenet and CUB datasets.

Keywords : deep learning, computer vision, image classification, few-shot learning, threshold
Conference Title : ICMLC 2024 : International Conference on Machine Learning and Cybernetics
Conference Location : Chengdu, China
Conference Dates : April 11-12, 2024