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DAugtify: Revolutionizing Computer Vision Performance with Automated Data Augmentation

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ABSTRACT

The performance of modern Convolutional Neural Networks (CNN) heavily depends on the quality and the volume of the dataset. However, collecting proper training datasets in many real-world domains is well-known to be labor-intensive and expensive. Data augmentation (DA) is a widely accepted solution to improve the low diversity datasets. But selecting optimal DA technique combinations (DA policies) based on the given dataset using traditional trial-and-error approach is time-consuming and requires domain expertise.

In this study, the author attempts to automate the process of selecting optimal DA policies based on the given dataset by further enhancing Automated Data Augmentation (AutoDA) technologies. To achieve this goal, the author redefined the traditional AutoDA search space by reducing the number of hyper-parameters and proposing novel search space exploration strategy that utilizes neural network and gradient decent technologies. Through these modifications, the author was able to bridge the existing research gap of achieving efficiency and effectiveness of AutoDA solutions at the same time.

According to the conducted tests, the Wide ResNet 28x10 CNN model achieves 78% accuracy in 9 hours and 47 minutes on CIFAR10 classification when trained without DA. However, when trained with the proposed AutoDA system, the same network achieves 86% accuracy in 9 hours and 50 minutes on CIFAR10 classification. This suggests that by utilizing the proposed AutoDA system, the CNN model is able to achieve significant performance improvements while maintaining a competitive training time.

Subject Descriptions:

- Machine Learning → Low Diversity Datasets → Low Accuracy & Generalizability
- Improve Low Accuracy & Generalizability → Data Augmentation → Difficulties in Traditional Data Augmentation → Automation in Data Augmentation

Keywords: Data Augmentation, Automated Data Augmentation, Differentiable Programming, Convolutional Neural Network