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Modified symbiotic organisms search optimization for automatic construction of convolutional neural network architectures

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Abstract
Convolutional Neural Networks (ConvNets) have demonstrated impressive capabilities in image classification; however, the manual creation of these models is a labor-intensive and time-consuming endeavor due to their inherent complexity. This research introduces an innovative approach to Convolutional Neural Network (ConvNet) architecture generation through the utilization of the Symbiotic Organism Search ConvNet (SOS_ConvNet) algorithm. Leveraging the Symbiotic Organism Search optimization technique, SOS_ConvNet evolves ConvNet architectures tailored for diverse image classification tasks. The algorithm's distinctive feature lies in its ability to perform non-numeric computations, rendering it adaptable to intricate deep learning problems. To assess the effectiveness of SOS_ConvNet, experiments were conducted on diverse datasets, including MNIST, Fashion-MNIST, CIFAR-10, and the Breast Cancer dataset. Comparative analysis against existing models showcased the superior performance of SOS_ConvNet in terms of accuracy, error rate, and parameter efficiency. Notably, on the MNIST dataset, SOS_ConvNet achieved an impressive 0.31 % error rate, while on Fashion-MNIST, it demonstrated a competitive 6.7 % error rate, coupled with unparalleled parameter efficiency of 0.24 million parameters. The model excelled on CIFAR-10 and BreakHis datasets, yielding accuracies of 82.78 % and 89.12 %, respectively. Remarkably, the algorithm achieves remarkable accuracy while maintaining moderate model size. © 2024

Author Keywords
And deep learning; Convolutional neural network; Neural architecture search; Symbiotic organism search

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