GA-based Training-Free NAS Algorithm with Hybrid Score Function

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2023

1 Abstract

Most neural architecture searches (NASs) are time-consuming caused by the fact that, during the searching, a candidate architecture must be trained to evaluate how good of this architecture. This is why some of training-free NAS algorithms have been proposed in recent years.

Although the training-free NASs are typically faster than training-based NAS method, however, the correlation between score value and the result of an architecture is not well enough in most cases.

To address this problem, we propose a genetic-based training-free NAS algorithm with hybrid training-free score function, which combines three highly heterogeneous training-free score functions to evaluate an architecture. In this method, the genetic algorithm plays a role to guide the searches of NAS algorithm while the hybrid training-free score function plays the role to evaluate a new candidate architecture during the convergencr process of GA. More precisely, the first score function is noise immunity for neural architecture search without search (NINASWOT), as an evaluation of pattern recognition ability, second one is maximum-entropy detection (MAE-DET), as an evaluation of the entropy of an architecture and the third one is condition number of neural tangent kernel (NTK), as an evaluation of the speed of converge.

To evaluate the performance of the proposed algorithm, we compared it with several NAS algorithms, including weight-sharing methods, non-weight-sharing methods, and neural architecture search without training (NASWOT). We expect develope a faster and more accurate training-free NAS algorithm.

References