

# Runtime Analysis of Evolutionary Neural Architecture Search Algorithms

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***Abstract***—The performance of neural architectures highly relies on their architectures. In order to design a neural architecture with promising performance, extensive manual experiments are required. To address this issue, neural architecture search (NAS) has been widely studied, with the goal of finding good architectures automatically. Evolutionary NAS (ENAS) employs evolutionary algorithms to solve this difficult problem, and has achieved great success. However, compared to the application, its theoretical analysis has been rarely touched. This work goes a preliminary step towards running time analysis of ENAS. In particular, we consider an advanced ENAS algorithm based on simple blocks to evolve the topology of a simple neural network, and define a binary classification problem to be solved by the network. We conduct rigorous runtime analyses on the proposed ENAS algorithm to search for an optimal network. Our results show that the proposed algorithm is generally efficient in automatically finding the optimal network for the binary classification problem.

***Index Terms***—Neural architecture search (NAS), evolutionary NAS (ENAS), theory, runtime analysis