

EqPropNEAT

Extending NEAT with equilibrium propagation

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Abstract—Artificial neural networks have been employed successfully to solve a great variety of tasks over the past decade. In most applications, network architecture is usually decided with a trial-and-error process, relying on empirical experience. The neuroevolution of augmenting topologies algorithm (NEAT) proposes a solution to finding well fitting network architectures to a given task, however for learning weights, it only uses a simple genetic mutation rule.

This paper proposes an extension of NEAT with an additional learning step employing equilibrium propagation for learning edge weights. We claim that the resulting novel technique needs less iterations for convergence, as weights are adjusted by a method which was specifically invented for such task. Our experimental results show a significant reduction in training times on common neural network benchmark tasks, while achieving similar prediction quality.

Index Terms—neuroevolution, neat, equilibrium propagation.

I. INTRODUCTION

THE process of designing neural network models always involves deciding on a particular network architecture. In order to avoid both overfitting as well as subpar prediction quality, the right amount of network complexity has to be found for a particular learning task. Over the years, a great amount of experience has accumulated regarding this decision, however these rules are more about empirical know-how, than proven theorems.