A Geometric Interpretation of Feedback Alignment

Andreas Stckel
University of Waterloo, Waterloo, Ontario, Canada

Terrence Stewart
University of Waterloo, Waterloo, Ontario, Canada

Chris Eliasmith
University of Waterloo, Waterloo, Ontario, Canada

Abstract

Feedback alignment has been proposed as a biologically plausible alternative to error backpropagation in multi-layer perceptrons. However, feedback alignment currently has not been demonstrated to scale beyond relatively shallow network topologies, or to solve cognitively interesting tasks such as high-resolution image classification. In this paper, we provide an overview of feedback alignment and review suggested mappings of feedback alignment onto biological neural networks. We then discuss a novel geometric interpretation of the feedback alignment algorithm that can be used to analyze its limitations. Finally, we discuss a series of experiments in which we compare the performance of backpropagation and feedback alignment. We hope that these insights can be used to systematically improve feedback alignment under biological constraints, which may allow us to build better models of learning in cognitive systems.