Models of Neural Systems (WiSe 2018/2019)
Final Project - Computer Practical
Biologically Plausible Deep Learning

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Abstract

Backpropagation is the backbone of the success story of Deep Learning.

1 Introduction

2 Credit Assignment in Deep Layered Structures

Backpropagation: A Successful Deep Learning Perspective

Backpropagation: A Critical Neuroscience Perspective

Synaptic Integration via Compartmental Dendrites

Guerguiev et al. [2] - A Plausible Alternative?

3 Empirical Investigations

Scalability Across Datasets

Hyperparameter Robustness

4 Related Literature

Lillicrap et al. [3]

Bartunov et al. [1]

Sacramento et al. [4]

5 Outlook and Critique

*This progress report was submitted as part of the final project of .

References

[1] BARTUNOV, S., A. SANTORO, B. RICHARDS, L. MARRIS, G. E. HINTON, AND T. LILLICRAP (2018): "Assessing the scalability of biologically-motivated deep learning algorithms and architectures," in *Advances in Neural Information Processing Systems*, 9389–9399.

[2] GUERGUIEV, J., T. P. LILLICRAP, AND B. A. RICHARDS (2017): "Towards deep learning with segregated dendrites," *ELife*, 6, e22901.

[3] LILLICRAP, T. P., D. COWNDEN, D. B. TWEED, AND C. J. AKERMAN (2016): "Random synaptic feedback weights support error backpropagation for deep learning," *Nature communications*, 7, 13276.

[4] SACRAMENTO, J., R. P. COSTA, Y. BENGIO, AND W. SENN (2018): "Dendritic cortical microcircuits approximate the backpropagation algorithm," in *Advances in Neural Information Processing Systems*, 8735–8746.