

Modifying Synaptic Connections On The Spiking Neural Network Architecture (SpiNNaker) In Real-Time

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Abstract—Artificial Neural Networks is a promising approach to study human brain computation. Recent computer architecture design of a low-power 72-core processor by the University of Manchester (SpiNNaker) has made it easier to study highly parallel networks. We designed an algorithm on the SpiNNaker chip to enable synaptic removal, addition, and randomization on a neural network topology during run-time. Additionally, we explored scalability issues and unintended pitfalls with this approach.

Keywords—Neural Networks, Synaptogenesis, SpiNNaker

I. INTRODUCTION

THE human brain is fast and low in energy. [TODO: Matt] blah blah blah. One property of the brain is it's plasticity (cite Lashley, or some Psyc studies). Our approach to neural networks is greatly influenced by this biological idea, and we want to enable networks to self-modify. With energy efficiency in mind, we enable this functionality on the Spiking Neural Network Architecture (SpiNNaker) provided by the University of Manchester.

A. SpiNNaker

[TODO: Matt] The SpiNNaker is cool. Here's why. It's so epic. And we have one. And we added a cool functionality to it.

B. Synaptogenesis

[TODO: Matt] Define Synaptogenesis and explain why it's cool. Here's why. Explain it's previous success from Levy's work.

[TODO: Matt] We're combining the two. And it's gonna be super useful.

II. IMPLEMENTATION DESIGN

WE designed a programming framework within SpiNNaker's C-language API to enable synaptic disconnection and formation between two neurons, allowing synaptogenesis to occur while learning occurs.

III. PITFALLS

SOME disadvantages are present when considering our approach for synaptogenesis on the SpiNNaker. [TODO: Matt] Blah blah.

IV. FURTHER STUDY

THIS paper reveals multiple questions that still need to be examined further.

V. CONCLUSION

The conclusion goes here.

APPENDIX A SHANNON'S ENTROPY

Appendix one text goes here.

APPENDIX B CALCULATION OF MUTUAL INFORMATION

Appendix one text goes here.

APPENDIX C CALCULATION OF STATISTICAL DEPENDENCE

Appendix two text goes here.

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