

# Exploring Alternate Topologies in Artificial Neural Networks

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## 1 Poster Session Abstract

In this project we explored a novel topology of artificial neural networks, using the techniques of agent-based modeling. Common neural network topologies, such as feed forward networks, do not reflect recent advances in the study of complex biological networks. We have used techniques from agent based modeling to create a neural network that develops a scale-free topology. We modeled the neurons as agents, which enabled us to create and remove connections between the neurons, dynamically adjusting the topology of the network. We built on the work of Barabási *et al*[1] by developing the network structure via local interaction of the neuron agents, utilizing preferential and fitness-based attachment. Recent biological models of the development of the brain suggest significance in both attachment and detachment of neuronal connections[2], and these results have also been incorporated into our model. We demonstrate our simulation, modeled using the RePast framework.

## References

- [1] Albert, Réka and A.-L. Barabási. “Topology of Evolving Networks: Local Events and Universality.” *Physical Review Letters*, Vol 85, No 24, 11 December 2000.
- [2] Chalup, Stephan K. “Issues of Neurodevelopment in Biological and Artificial Neural Networks.” *Proceedings of the Fifth Biannual Conference on Artificial Neural Networks and Expert Systems (ANNES 2001)*, pp. 40-45.