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# Accelerated training convergence in superposed quantum networks

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## Abstract

We outline an adaptive training framework for artificial neural networks which aims to simultaneously optimize both topological and numerical structure. The technique combines principal component analysis and supervised learning and is descended from the mathematical treatment for continuous evolution of discrete structures as introduced in quantum topology [1, 2]. The formalism of the training algorithm, first proposed in [3], is optimal for tasks in associative processing and feature extraction. The procedure is unique in harnessing a coherent ensemble of discrete topological configurations of neural networks, each of which is formally merged into the appropriate linear state space via superposition. Training is carried out within this coherent state space, allowing for parallel revision of differing topological configurations at each step.

The primary feature of our model is that network topologies are represented as specific states of the simulator. Network training results in convergence to a stable attractor. Once this state has been found, the Rota algebraic spatialization procedure [4] is applied, enabling conversion of the simulator state to a conventional neural network upon measurement. Superposed adaptive quantum networks allow for simultaneous training of both single-neuron activation functions and optimization of whole-network topological structure. Our mathematical formalism provides quantitative, numerical indications for optimal reconfiguration of the network topology. We will review candidate physical implementations for the model drawn from recent developments in condensed matter physics and solid-state quantum computing.

## References

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