

Adiabatic superconducting artificial neural network: Basic cells

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Abstract

© 2018 Author(s). We consider adiabatic superconducting cells operating as an artificial neuron and synapse of a multilayer perceptron (MLP). Their compact circuits contain just one and two Josephson junctions, respectively. While the signal is represented as magnetic flux, the proposed cells are inherently nonlinear and close-to-linear magnetic flux transformers. The neuron is capable of providing the one-shot calculation of sigmoid and hyperbolic tangent activation functions most commonly used in MLP. The synapse features both positive and negative signal transfer coefficients in the range $\sim (-0.5, 0.5)$. We briefly discuss implementation issues and further steps toward the multilayer adiabatic superconducting artificial neural network, which promises to be a compact and the most energy-efficient implementation of MLP.

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