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## Smearing is a neural network

*Tuesday, 27 July 2021 13:00 (15 minutes)*

We develop a gauge covariant neural network for four dimensional non-abelian gauge theory, which realizes a map between rank-2 tensor valued vector fields. We also find the conventional smearing procedures for gauge fields can be regarded as this neural network with fixed parameters. We developed a formula to train the network as an extension of the delta rule, which is used in machine learning context. In addition, we perform simulation with self-learning hybrid Monte-Carlo (SLHMC) in 4 dimension for  $SU(N)$  with dynamical fermions as a demonstration of the network and the training formula. SLHMC, which is an exact algorithm, uses parametrized force in the molecular dynamics step, and we employed neural network parametrized action and we obtained consistent results with HMC. This talk is based on arXiv:2103.11965 and some additional materials.

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