

Output dimension effects in untrained Neural Networks

Monday 14 December 2020 18:55 (5 minutes)

Untrained asymptotically wide Neural Networks are Gaussian Processes, with a direct correspondence to Euclidean free field theory; deviations of the NN away from GP can be effectively described using Wilsonian EFT. Further, output dimension d shows up as the number of independent species in the free / interacting field corresponding to GP / non-GP NN outputs. Experimentally, we verify Ward identity for n -point correlation functions of Gauss-net architecture in both GP and NGP limit in appropriate regime of validity of EFT description. Resulting $SO(d)$ symmetry has interesting consequences on perturbative corrections to GP correlation functions, in terms of couplings corresponding to interaction terms of EFT action.

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Session Classification: Short talks