ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

INVITATION TO A GUEST LECTURE

Gradient Flow Training Dynamics for Infinite-Dimensional Inverse Problems from Finite Measurements

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HS 2

ABSTRACT

We study the convergence of gradient flow for solving linear ill-posed inverse problems via neural network parametrizations. Crucially, we consider finite measurement forward operators, that is maps from infinite to finite dimensions. In particular, the analysis is carried out in a general Banach space setting, with the neural network seen as an interpolant of the true solution function. Under a local Polyak–Łojasiewicz condition, we prove exponential convergence of the loss and show that the network output converges to a solution of the measurement equation, illustrating the implicit regularization of gradient descent. Based on a restricted injectivity property of the forward operator, we derive quantitative error estimates in terms of noise level, optimization error, and the approximation capacity of the network. We further derive sufficient conditions on the network architecture under which the theoretical assumptions are satisfied with high probability for random initialization strategies, and verify the framework on appropriate examples.

We hope to see you there!