CONTINUOUS GENERATIVE MODELS FOR NONLINEAR INVERSE PROBLEMS

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We present a data-driven approach to solve inverse problems based on generative models. Taking inspiration from well-known convolutional architectures, we construct and explicitly characterize a class of injective generative models defined on infinite dimensional functions spaces. The construction is based on wavelet multi resolution analysis: one of the key theoretical novelties is the generalization of the strided convolution between discrete signals to an infinite dimensional setting. After an off-line training of the generative model, the proposed reconstruction method consists in an iterative scheme in the low-dimensional latent space. The main advantages are the faster iterations and the reduced ill-posedness, which is shown with new Lipschitz stability estimates. We also present an extension of this method that allows us to learn manifolds with nontrivial topologies. We also present numerical simulations validating the theoretical findings for linear and nonlinear inverse problems such as electrical impedance tomography. This is a joint work with G.S. Alberti and S. Sciutto (University of Genoa) and J. Hertrich (University College London).