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Learned SVD - Deep Learning Decomposition for Inverse Problems

Our world is full of digital twins and physics-informed data science where data manifolds need to be learned and mapped effectively. There is an increasing demand for understanding combined model-driven and data-driven learning methods. We propose a nonlinear, learned singular value decompositions (SVD), which combines autoencoders that simultaneously learn and connect latent codes for parameter and measurement space. Classical solution methods for inverse problems are based on regularization techniques via SVD and variational methods. An open question in deep learning for inverse problems is how to effectively combine model reduction and data dimensionality reduction to achieve a regularized inversion. We show that we automatically obtain the key building blocks of learned inversion maps and improved performance towards the black-box counterpart.

This is joint work with Yoeri Boink and Srirang Manohar.