

Self-Supervised Deep Equilibrium models: learning from limited data

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Deep learning has emerged as a powerful tool for solving inverse problems in imaging, including computed tomography (CT). However, most approaches require paired training data with ground truth images, which can be difficult to obtain, e.g., in medical applications. In this talk, I present a self-supervised Deep Equilibrium (DEQ) framework for sparse-angle CT reconstruction that trains directly on undersampled measurements. Under suitable assumptions, it is possible to establish theoretical guarantees (i.e., self-supervised updates match those of fully-supervised training), for the case of non-unitary operators like that of CT. Numerical experiments on sparse-angle CT data demonstrate that this approach outperforms existing self-supervised methods while matching the performance of supervised approaches, achieving state-of-the-art results with as few as 16 projection angles.