Diffusion-Based Priors for Inverse Problems

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Abstract:
In inverse problems, we want to recover an unknown quantity from indirect and noisy measurements. These problems are typically ill-posed and therefore require regularization or, in a Bayesian setting, a suitable prior. Diffusion- and flow-based models are the state of the art in image generation and are widely used as data-driven priors for such problems. In this talk, we cover different techniques for conditional sampling with pre-trained diffusion and flow models. We then study their properties from the perspective of regularization theory, e.g., for vanishing noise or more informative measurements. Finally, we discuss the performance and the different requirements of reconstruction methods for natural images and scientific imaging domains, such as computed tomography.

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