

SCORE-BASED DENOISING DIFFUSION MODELS FOR PHOTON-STARVED IMAGE RESTORATION PROBLEMS

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Score-based denoising diffusion models have recently emerged as a powerful strategy to solve image restoration problems. Early diffusion models required problem-specific training. However, modern approaches can combine a likelihood function that is specified during test-time with a foundational pretrained diffusion model, which is used as an implicit prior in a Plug-and-Play (PnP) manner. This approach has been shown to deliver state-of-the-art performance in a wide range of image restoration problems involving Gaussian and mild Poisson noise. In this talk we will present a PnP denoising diffusion method for photon-starved imaging problems. These problems involve highly challenging noise statistics, such as binomial, geometric, and low-intensity Poisson noise, which are difficult because of high uncertainty about the solution and because the models exhibit poor regularity properties (e.g, exploding scores, constraints).