THE UNIVERSITY OF CHICAGO | DEPARTMENT OF STATISTICS

Master's Thesis Presentation

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"Kernel Metrics and Relative Density-Ratio Divergence for Reliable Assessment of Image Generators"

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Abstract

Deep generative models have made remarkable strides in synthesizing high-resolution, photorealistic images. However, these models often exhibit geometric inconsistencies that reveal a lack of true understanding of real-world physical relationships. A notable example is perspective error, where parallel lines in a generated image fail to converge at the same vanishing point. Such geometric errors are visually subtle and often go unnoticed by common machine learning metrics. Widely used metrics, such as Inception Score and Fréchet Inception Distance, are prone to calibration issues, especially in high-dimensional feature spaces. In this work, we investigate statistical metrics, including kernel metrics and relative density-ratio divergence, to more robustly assess feature distributional alignment between real and generated images.
