

Image Completion with Context-Adaptive Diffusion

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Abstract

Image completion is a challenging task, particularly when ensuring that generated content seamlessly integrates with existing parts of an image. While recent diffusion models have shown promise, they often struggle with maintaining coherence between known and unknown (missing) regions. This issue arises from the lack of explicit spatial and semantic alignment during the diffusion process, resulting in content that does not smoothly integrate with the original image. Additionally, diffusion models typically rely on global learned distributions rather than localized features, leading to inconsistencies between the generated and existing image parts. In this work, we propose ConFill, a novel framework that introduces a Context-Adaptive Discrepancy (CAD) model to ensure that intermediate distributions of known and unknown regions are closely aligned throughout the diffusion process. By incorporating CAD, our model progressively reduces discrepancies between generated and original images at each diffusion step, leading to contextually aligned completion. Moreover, ConFill uses a new Dynamic Sampling mechanism that adaptively increases the sampling rate in regions with high reconstruction complexity. This approach enables precise adjustments, enhancing detail and integration in restored areas. Extensive experiments demonstrate that ConFill outperforms current methods, setting a new benchmark in image completion.