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Enhancing Image Inpainting Anti-forensics Network through Attention-guided Hierarchical Reconstruction

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Introduction

Image inpainting anti-forensics is a critical area of research aiming to counteract forensic analysis techniques by manipulating or concealing digital image content. Recent advancements in deep learning have led to the development of Image Inpainting Anti-Forensics Networks (IAFNs) capable of generating realistic inpainting results, challenging traditional forensic analysis methods. However, existing IAFNs often struggle with preserving fine details and semantic consistency, limiting their effectiveness in evading forensic detection. To address these limitations, this report introduces an innovative approach: Attention-Guided Hierarchical Reconstruction (AGHR), designed to enhance the performance of IAFNs by prioritizing important image regions and refining inpainting results through hierarchical reconstruction.

Description

The proposed AGHR framework integrates attention mechanisms and hierarchical reconstruction modules into the architecture of IAFNs to improve inpainting quality and anti-forensic resilience. The key components of AGHR include:

Attention modules are employed to dynamically highlight salient image regions during the inpainting process, enabling the network to focus on preserving crucial details and textures while concealing manipulated areas effectively [1].

Hierarchical reconstruction modules facilitate multi-scale feature extraction and refinement, allowing the network to iteratively enhance inpainting results at different levels of abstraction. By leveraging hierarchical information, AGHR ensures semantic consistency and coherence in the generated images while reducing artifacts and distortions.

To assess the effectiveness of AGHR in enhancing image inpainting anti-forensics, extensive experiments were conducted on benchmark datasets, comparing AGHR-enhanced IAFNs against state-of-the-art inpainting methods. Quantitative metrics such as Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM) were employed to evaluate inpainting quality, while qualitative visual inspection was conducted to assess the realism and anti-forensic resilience of generated images [2].

Experimental results demonstrate that AGHR significantly improves the performance of IAFNs in terms of inpainting quality, semantic consistency, and anti-forensic robustness. Compared to baseline methods, AGHR-enhanced IAFNs exhibit higher PSNR and SSIM scores, indicating superior reconstruction fidelity and perceptual similarity to the original images. Moreover, qualitative analysis reveals that AGHR effectively preserves fine details and textures, mitigating common inpainting artifacts and enhancing anti-forensic resilience by producing more convincing inpainting results [3-5].

Conclusion

The proposed Attention-Guided Hierarchical Reconstruction (AGHR) framework represents a novel approach to enhancing image inpainting anti-forensics through advanced attention mechanisms and hierarchical reconstruction modules. By prioritizing important image regions and refining inpainting results at multiple scales, AGHR enables Image Inpainting Anti-Forensics Networks (IAFNs) to generate more realistic and coherent inpainting results while effectively evading forensic detection. Future research directions may focus on further optimizing AGHR for specific forensic analysis scenarios and exploring its applicability in real-world anti-forensic applications.

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Conflict of Interest

None.

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