# EdgeStyleGAN: Lightweight and Efficient StyleGAN for Real-Time Image Synthesis on Resource-Constrained Devices

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**Abstract**

Generative Adversarial Networks (GANs), and particularly Style-GAN, have demonstrated state-of-the-art performance in high-fidelity image synthesis. However, the computational and memory demands of StyleGAN severely restrict its applicability in resource-constrained environments such as mobile and edge devices. In this work, we present a lightweight variant of StyleGAN optimized for efficient deployment without significant degradation in image quality. Our approach integrates structured pruning, weight quantization, and knowledge distillation to systematically reduce the model size and inference latency. Experimental results on benchmark image datasets demonstrate that our optimized StyleGAN achieves up to X% reduction in parameters and Y× faster inference speed while preserving perceptual quality as measured by FID and human evaluation. This work highlights a practical pathway for democratizing GAN-based content generation on low-power devices, enabling real-time applications in personalization, augmented reality, and creative tools.