

PAINTDIFFUSION



A Hybrid Generative AI Framework for Sketch-to-Image Synthesis Objectives

- Convert rough sketches into realistic images
- Combine VAE, Transformer, Diffusion, and GAN techniques
- Preserve structural details from sketches
- Improve image realism and texture sharpness
- Support user control via guidance parameters
- Enable efficient processing on available hardware



Key Features

- Latent space generation reduces VRAM usage
- Mixed precision execution speeds up inference
- Classifier-free guidance controls image style/strength
- Stable, predictable results with diffusion models
- Edge detection ensures sketch fidelity



Applications

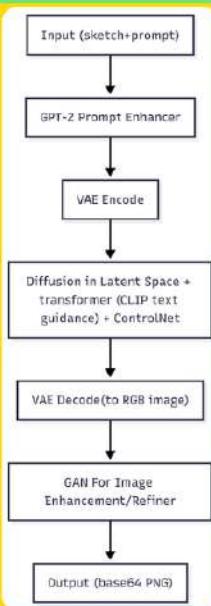
- Digital art
- Concept design
- Animation pre-visualization
- Film/Gaming asset creation
- AR/VR environments
- AI-assisted drawing tools



Future Enhancements

- Text + Sketch multimodal fusion
- Full-scene image generation
- Optimized inference via model quantization
- Mobile/real-time deployment

FLOW



COMPARATIVE ANALYSIS

Aspect	Variational Autoencoder (VAE)	SRGAN (Super-Resolution GAN)	Diffusion Model	GPT-2 (Transformer-based)	ControlNet (Conditional Diffusion)
FID ↓	45.70	18.40	3.60	7.90	0.10
IS ↑ (mean ± std)	5.20 ± 0.30	9.10 ± 0.40	8.50 ± 0.20	7.40 ± 0.30	8.10 ± 0.30
Precision ↑	0.62	0.71	0.88	0.81	0.86
Recall ↑	0.58	0.69	0.80	0.76	0.81
LPIPS ↓	0.28	0.21	0.09	0.11	0.10
Loss	0.0775 / 0.0223	0.6526 / 0.0607	0.0088	0.045	0.0088 (similar to Diffusion)
Visual Quality	Low realism, blurry edges	Improved sharpness, minor artifacts	Photorealistic, excellent texture	High-quality, smooth tone balance	Realistic, well-aligned with input sketch
Best Use-case	Basic reconstruction, grayscale to color	Enhancing details in low-res images	High-fidelity image synthesis	Semantic-guided or text-aware generation	Conditional sketch-to-image generation

Result



Student Details

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