Application Matrix of Families of Generative Models for Computer Vision

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Table 1: Application Matrix of Families of Generative Models for Computer Vision

Models	Applications						
	Data Augmentation	Super Resolution	Inpainting	Denoising	Style Transfer	Object Transfiguration	Image Colorization
VAEs	🟢	🔴	🔴	🔴	🔴	🔴	🔴
GANs	🟢	🔴	🔴	🔴	🟢	🟢	🔴
Flow-based Models	🟢	🔴	🔴	🔴	🟡	🟡	🟡
Auto-regressive Models	🟢	🔴	🔴	🔴	🟡	🟡	🟡
Hybrid Models	🟢	🔴	🔴	🔴	🟡	🟡	🟡
Diffusion Models	🔴	🔴	🔴	🔴	🔴	🔴	🔴
Other notable models	🔴	🟢	🟡	🟡	🔴	🔴	🔴

- 🟢 Model fits the application
- 🔴 Model doesn't fit the application
- 🟡 Unexplored application

Variational Autoencoders (VAEs)

- Vanilla VAE
- β-VAE
- VQ-VAE
- VAE-GAN
- CVAE (Conditional VAE)
- DFC-VAE (Disentangled Feature Control VAE)
- HiVAE (Hierarchical VAE)
- VLAE (Variational Lossy Autoencoder)
- AdaVAE (Adaptive VAE)
- SCVAE (Semi-Supervised Conditional VAE)
- AAE (Adversarial Autoencoder)

Generative Adversarial Networks (GANs)

- Vanilla GAN
- DCGAN (Deep Convolutional GAN)
- CGAN (Conditional GAN)
- WGAN (Wasserstein GAN)
- LSGAN (Least Squares GAN)
- CycleGAN
- StyleGAN
- ProGAN (Progressive GAN)
- BigGAN
- SNGAN (Spectral Normalization GAN)
- GLO (Generative Latent Optimization)
- MSG-GAN (Multi-Scale Gradient GAN)
- RGAN (Relativistic GAN)

- BiGAN (Bidirectional GAN)
- TripleGAN
- MoCoGAN (Motion Conditioned GAN)
- StarGAN
- DALL-E (GAN-based image generation model by OpenAI)
- Swapping Autoencoder GAN (SWAGAN)

Flow-based Models

- RealNVP (Real-valued Non-Volume Preserving)
- Glow (Generative Flow with Invertible 1x1 Convolutions)
- FFJORD (Free-form Jacobian Adversarially Regularized Dynamics)
- CNFs (Continuous Normalizing Flows)
- MAF (Masked Autoregressive Flow)
- IAF (Inverse Autoregressive Flow)
- Neural Spline Flows
- DAF (Denoising Autoencoder Flow)
- AugVAE (Augmented VAE)

Auto-regressive Models

- PixelRNN
- PixelCNN
- WaveNet
- NADE (Neural Autoregressive Distribution Estimation)
- RNADE (Rectified NADE)
- MD-RNN (Mixture Density RNN)
- DRAW (Deep Recurrent Attentive Writer)
- CoNADE (Compositional NADE)
- Transformer-based autoregressive models (e.g., Image Transformer)

Hybrid Models

- VQ-VAE-2 (Vector Quantized VAE)
- GANs with VAEs (e.g., β-VAE-GAN)
- JEM (Joint Energy-Based Model)

Diffusion Models

- Noise-Contrastive Estimation (NCE)
- Score-Based Generative Models (e.g., PixelSNAIL)

Other notable models

- Adversarial Autoencoders
- ALI (Adversarially Learned Inference)
- Adversarial Variational Bayes (AVB)
- GANomaly
- Skip-GANomaly
- URGANS (Unitary Evolution Recurrent GAN)
- VAE-ResNet
- OpenAI's CLIP (Contrastive Language-Image Pretraining)
- Energy-based Models (EBMs) like PixelSNAIL, PixelDTN, etc.