Hierarchical Mixtures of Generators for Adversarial Learning

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Generative Adversarial Networks

\[ G(z; \theta) \]

\[ z \sim p(z) \]

\[ x \sim \{x^{(1)}, x^{(2)}, \ldots, x^{(N)}\} \]

\[ D(x; \phi) \]

\[ x_{fake} \]

\[ x_{real} \]

\[ 0.3 \]
Problems with GANs

• Vanishing or exploding gradients: $\log(1 - D(G(z)))$ or $-\log D(G(z))$

• Mode Collapse

Solution Approaches

• Architecture change: DCGAN, ProgGAN

• Objective change: LSGAN, WGAN

• Regularization methods: Spectral normalization
Combining Multiple Generators in GANs

- Multi-agent diverse GAN (MADGAN, Ghosh et al. 2018)
- Mixture GAN (MGAN, Hoang et al. 2018)
- Mixture of experts GAN (MEGAN, Park et al. 2018)
Hierarchical Mixture of Generators (HMoG)

\[ \sigma_1(z) = \frac{1}{1 + \exp[-(v_1z + v_{10})]} \]

\[ G_1(z) = W_1z + w_{10} \]
Flat Mixture of Generators (MoG)

\[ a(z) = \text{softmax}(vz + v_0) \]

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MADGAN

MGAN

MEGAN

MoG (ours)

HMoG (ours)

LEVEL 1

LEVEL 2

LEAVES

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ICPR 2020, December, 2020
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Hierarchical Mixture of Generators for Adversarial Learning

ICPR 2020, December, 2020
MNIST

FashionMNIST

UTZap50K

Oxford Flowers

CelebA
Conclusion

- We propose hierarchical mixtures of generators (HMoG).

- HMoG performs better than other multiple generator frameworks based on FID and 5-NN classifier tests.

- HMoG can be easily integrated with other GAN architectures.

- HMoG is interpretable to some extent.
alpera.xyz/hmog

Thank you for your time.

Questions and comments are welcome!