Stacked Generative Adversarial Networks

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John Hopcroft, Serge Belongie

Representing Images

Pixel grid

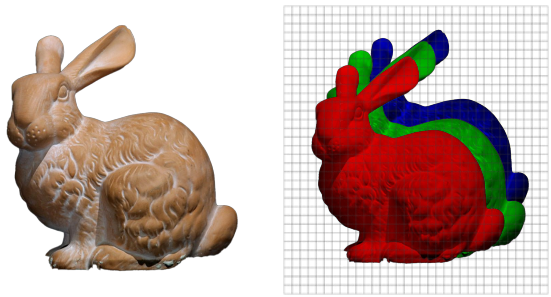
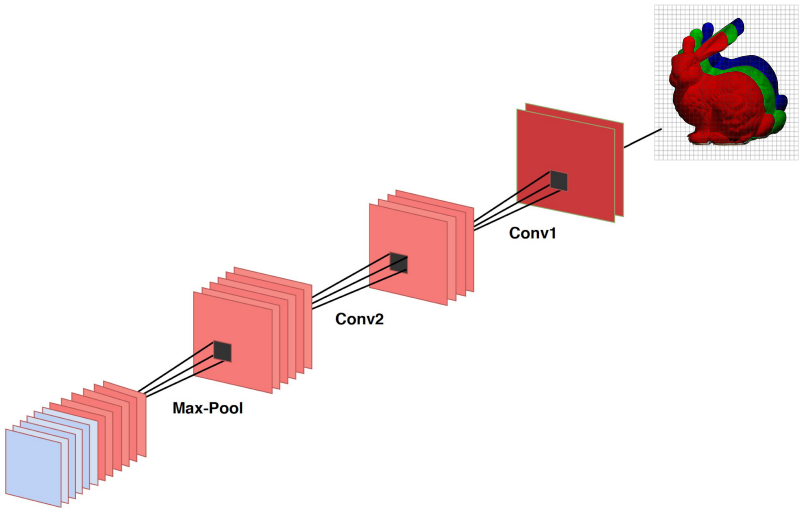
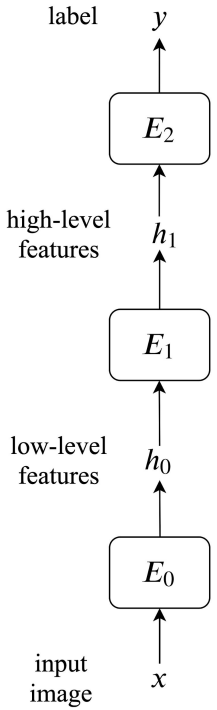


Image Features

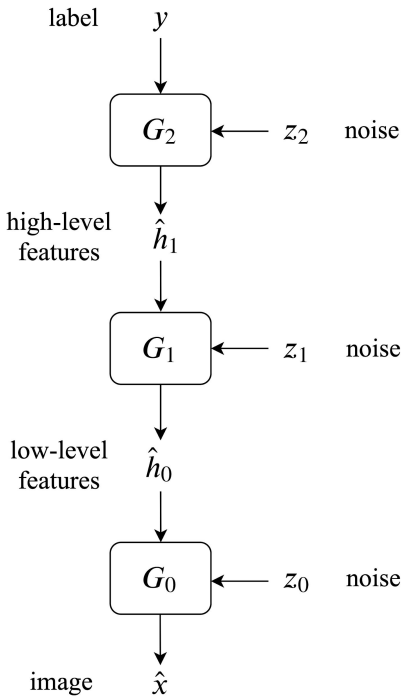


Discriminative Representation



Stacked Generative Adversarial Networks; Huang, Li, Poursaeed, Hopcroft, Belongie; CVPR 2017

Generative Representation



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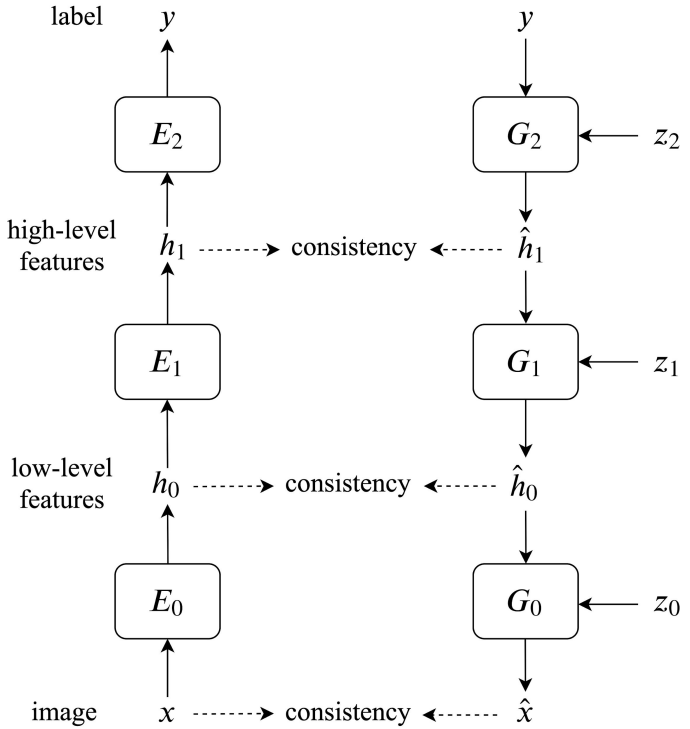
Hybrid Representation

Leveraging the powerful discriminative representations to guide a generative model



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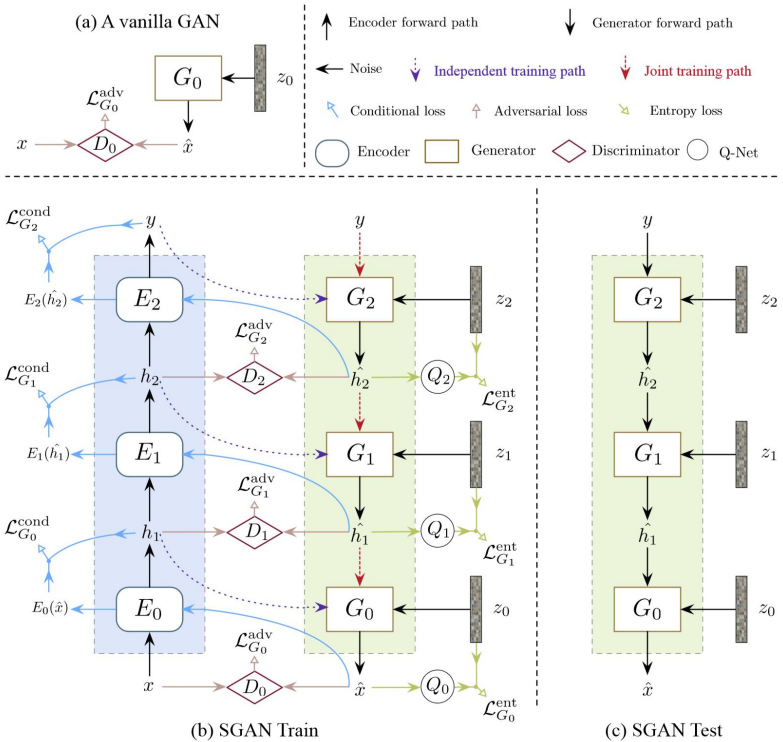
Stacked Generative Adversarial Networks

Architecture

A **stack** of GANs, each GAN generates lower-level representations conditioned on the representations generated by the upper GAN

Each GAN is trained with 3 loss terms

- ❏ Adversarial loss
- ❏ Conditional loss
- ❏ Entropy loss



Results: MNIST

Generated

Real

Stacked Generative Adversarial Networks; Huang, Li, Poursaeed, Hopcroft, Belongie; CVPR 2017

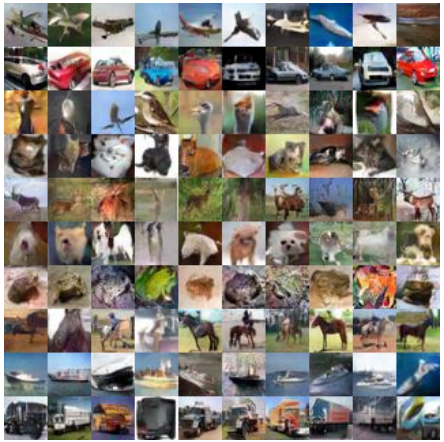
Results: SVHN

Generated

Real

Stacked Generative Adversarial Networks; Huang, Li, Poursaeed, Hopcroft, Belongie; CVPR 2017

Results: CIFAR-10



Generated

Real

Method	Score
Infusion training [1]	4.62 ± 0.06
ALI [10] (as reported in [65])	5.34 ± 0.05
GMAN [11] (best variant)	6.00 ± 0.19
LR-GAN [67]	6.11 ± 0.06
EGAN-Ent-VI [4]	7.07 ± 0.10
Denoising feature matching [65]	7.72 ± 0.13
DCGAN† (with labels, as reported in [63])	6.58
SteinGAN† [63]	6.35
Improved GAN† [54] (best variant)	8.09 ± 0.07
AC-GAN† [44]	8.25 ± 0.07
DCGAN (L^{adv})	6.16 ± 0.07
DCGAN ($L^{adv} + L^{ent}$)	5.40 ± 0.16
DCGAN ($L^{adv} + L^{cond}$)†	5.40 ± 0.08
DCGAN ($L^{adv} + L^{cond} + L^{ent}$)†	7.16 ± 0.10
SGAN-no-joint†	**8.37** ± 0.08
SGAN†	**8.59** ± 0.12
Real data	11.24 ± 0.12

† Trained with labels.

Table 1: **Inception Score on CIFAR-10.** SGAN and SGAN-no-joint outperform state-of-the-art approaches.

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