

Paired-D GAN for Semantic Image Synthesis

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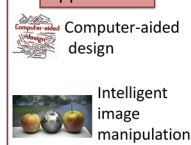
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MOTIVATION

Problem



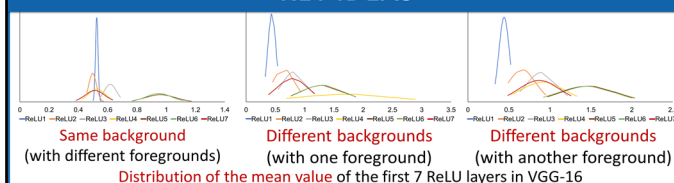
Applications



Challenges

- ❖ Matching text description
- ❖ Retaining background in source image
- ❖ Synthesizing realistic images

KEY IDEAS

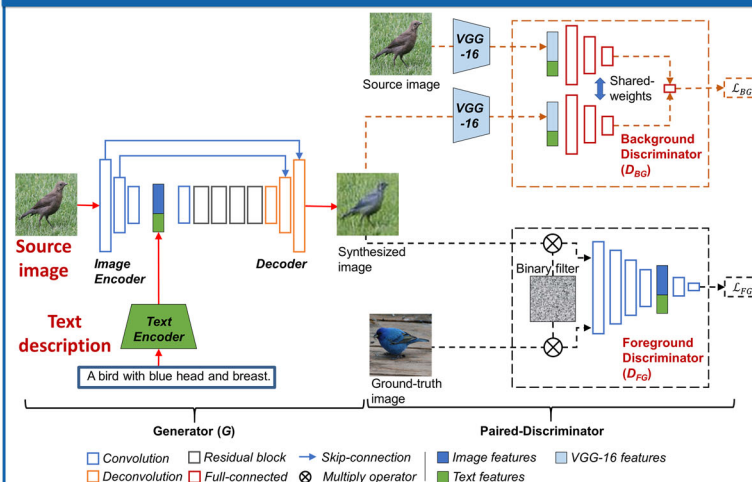


- ❖ Background: Low level features
- ❖ Foreground: High level features

Generator: different level of features for foreground and background

Pair of Discriminators: foreground/background judgement

PROPOSED METHOD



Adversarial learning

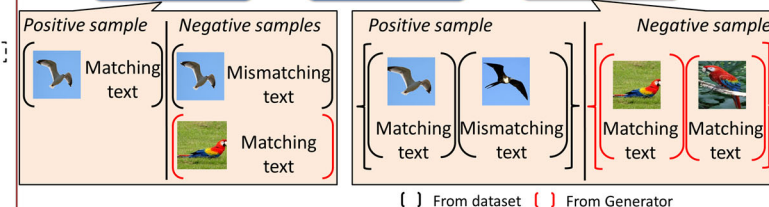
$$\text{Generator loss} = \text{Foreground loss} + \text{Background loss} + \text{Reconstruction loss}$$

Classification

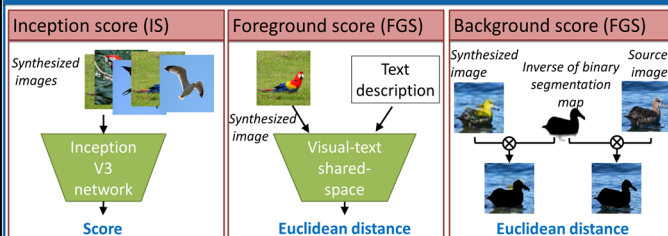
Foreground Discriminator

Verification

Background Discriminator



EVALUATION METRICS



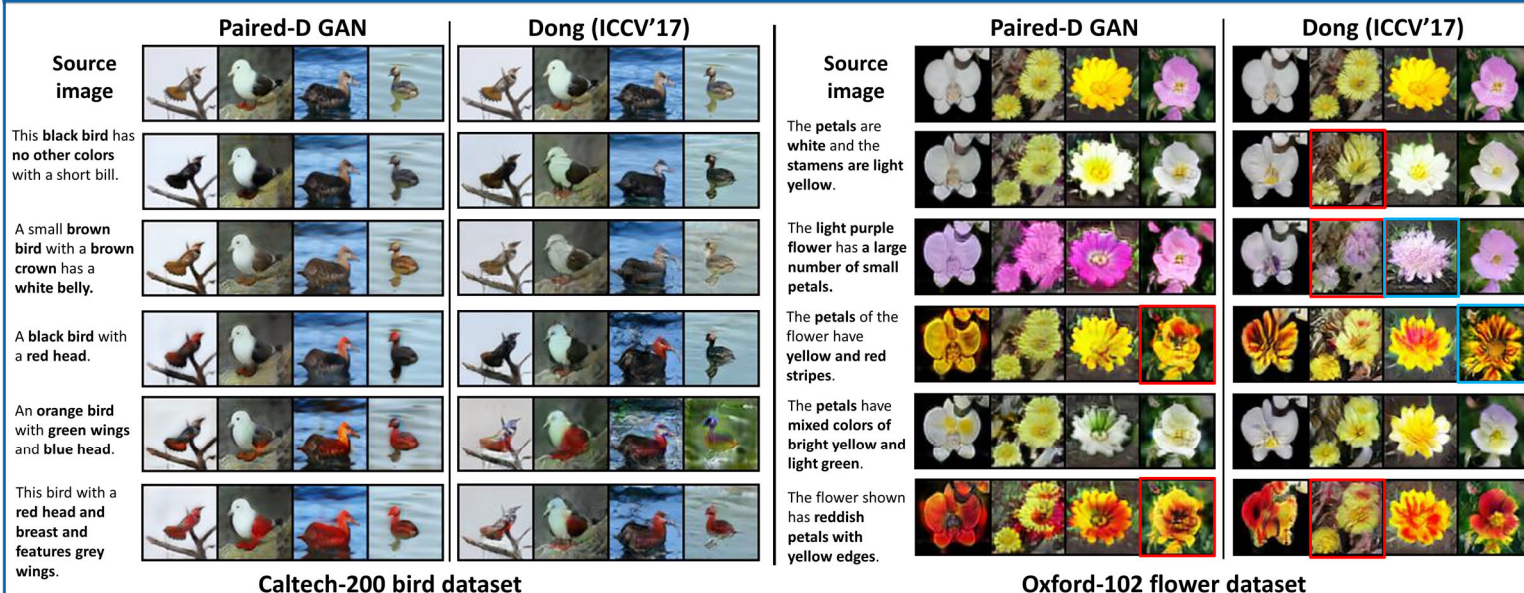
EXPERIMENTS

Quantitative comparison						
Dataset	Caltech-200			Oxford-102		
	IS ($\uparrow$)	FGS ($\downarrow$)	BGS ($\downarrow$)	IS ($\uparrow$)	FGS ($\downarrow$)	BGS ($\downarrow$)
Paired-D GAN	6.39 $\pm$ 0.18	17.26 $\pm$ 0.21	9.03 $\pm$ 0.06	4.41 $\pm$ 0.08	8.81 $\pm$ 0.08	8.87 $\pm$ 0.04
Dong (ICCV'17)	5.56 $\pm$ 0.14	18.60 $\pm$ 0.09	11.83 $\pm$ 0.06	4.03 $\pm$ 0.11	9.71 $\pm$ 0.11	9.47 $\pm$ 0.14
Yang (ICLR'17)	5.92 $\pm$ 1.04	18.34 $\pm$ 0.14	--	3.49 $\pm$ 0.04	10.32 $\pm$ 0.09	--

Ablation study

Ablation study						
Dataset	Caltech-200			Oxford-102		
	IS ($\uparrow$)	FGS ($\downarrow$)	BGS ($\downarrow$)	IS ($\uparrow$)	FGS ($\downarrow$)	BGS ($\downarrow$)
Ours	6.39 $\pm$ 0.18	17.26 $\pm$ 0.21	9.03 $\pm$ 0.06	4.41 $\pm$ 0.08	8.81 $\pm$ 0.08	8.87 $\pm$ 0.04
Ours (full-model)						
Ours (D_{FG} only)	5.83 $\pm$ 0.19	16.74 $\pm$ 0.12	11.89 $\pm$ 0.08	4.21 $\pm$ 0.07	8.52 $\pm$ 0.13	10.02 $\pm$ 0.08
Ours (D_{BG} only)	6.02 $\pm$ 0.15	20.33 $\pm$ 0.11	7.63 $\pm$ 0.08	4.24 $\pm$ 0.10	10.68 $\pm$ 0.14	8.32 $\pm$ 0.15

EXPERIMENTS



CONCLUSION

GAN based end-to-end network for semantic image synthesis: ❖ Foreground discriminator: matching text description. ❖ Background discriminator: retaining background information.