Paper Reading

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Globally and Locally Consistent Image Completion

Satoshi Iizuka, Edgar Simo-Serra, Hiroshi Ishikawa
Waseda University. In SIGGRAPH ,2017

GitHub https://github.com/satoshiiizuka/siggraph2017_inpainting

https://www.slideshare.net/siizuka/siggraph-2017-globally-and-locally-consistent-image-completion

Input

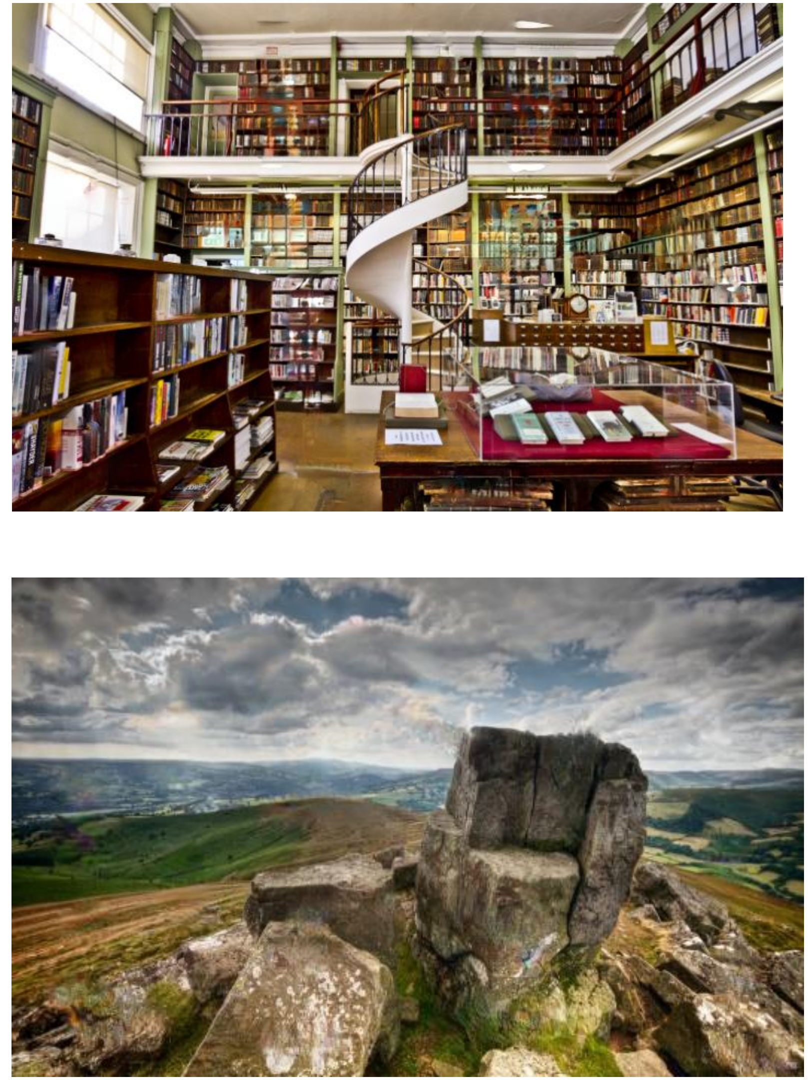
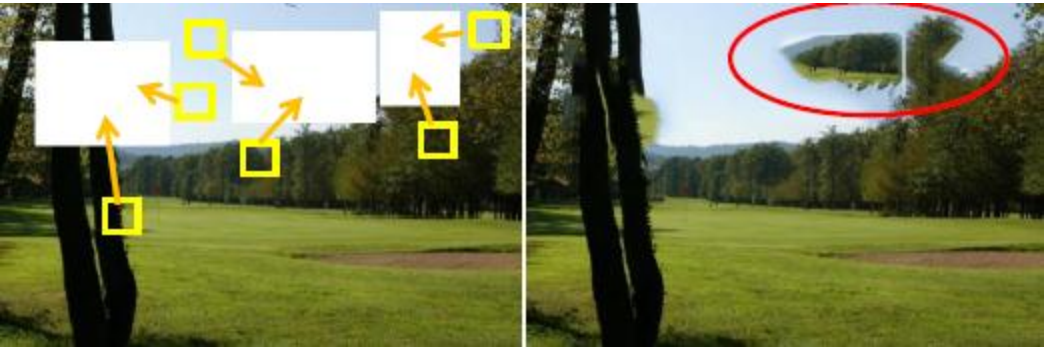


Image Completion

Related Work

- Patch-based inpainting
  - Synthesize texture by collecting small image patches
  - Cannot preserve global structures
  - Cannot generate novel objects



Input Output

Input Output

GitHub https://github.com/satoshiiizuka/siggraph2017_inpainting

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Related Work

- Learning-based inpainting
  - Learning inpainting with GAN
  - Fixed image resolution(128 × 128 pixels)
  - Fixed mask position and size (center, 64 × 64 pixels)
  - Tends to generate texture that is inconsistent with an input image

Input Output Input Output

Our Method

- Novel network for globally and locally consistent image completion
  - Completion network that is able to inpaint arbitrary regions
  - Adversarial training with two auxiliary networks
  - Can generate novel objects

Input Output Input Output

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Overview of architecture

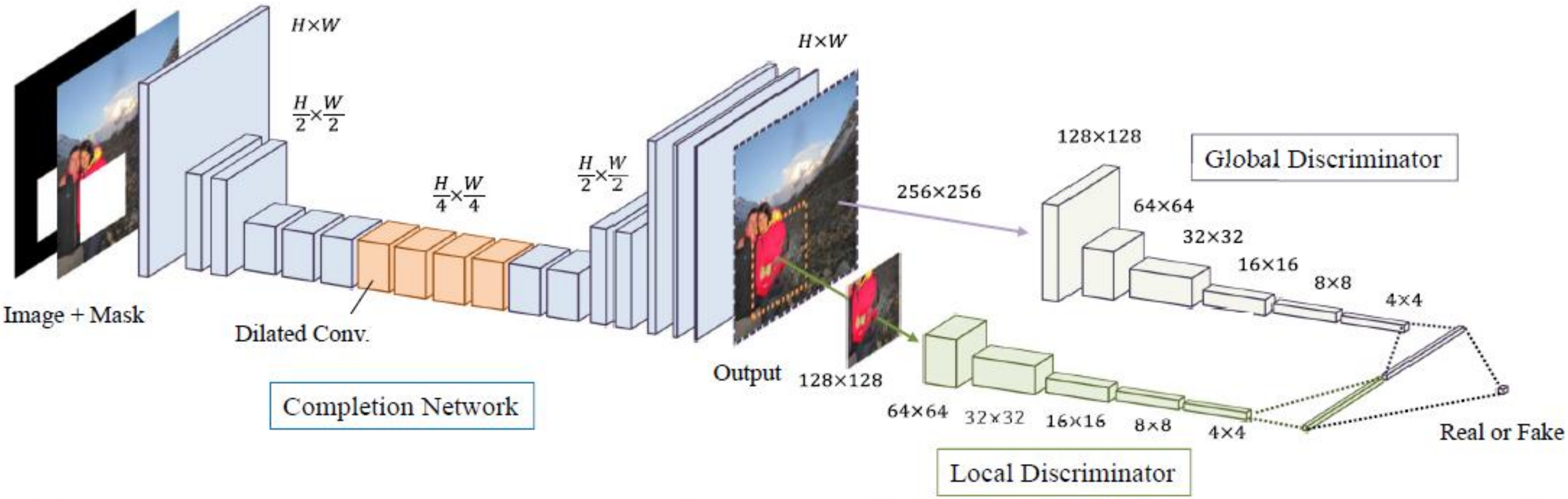

Fig. 2. Overview of our architecture for learning image completion. It consists of a completion network and two auxiliary context discriminator networks that are used only for training the completion network and are not used during the testing. The global discriminator network takes the entire image as input, while the local discriminator network takes only a small region around the completed area as input. Both discriminator networks are trained to determine if an image is real or completed by the completion network, while the completion network is trained to fool both discriminator networks.

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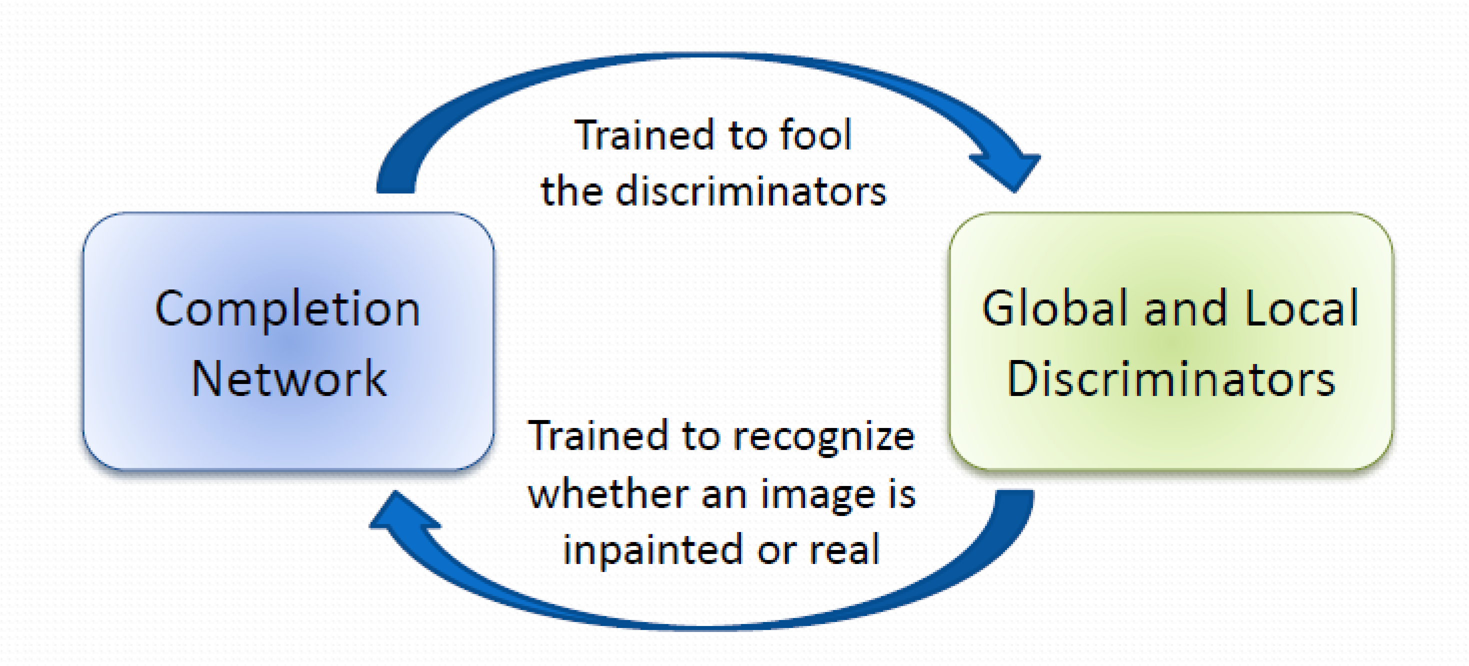
Training

- Alternately update the completion network and discriminators
  - Based on Generative Adversarial Networks
  - MSE(Mean Squared Error)



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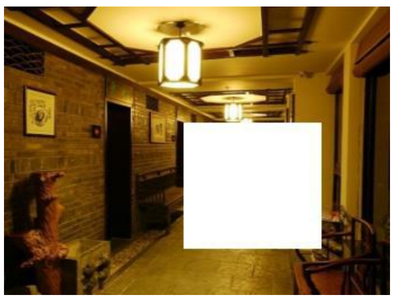
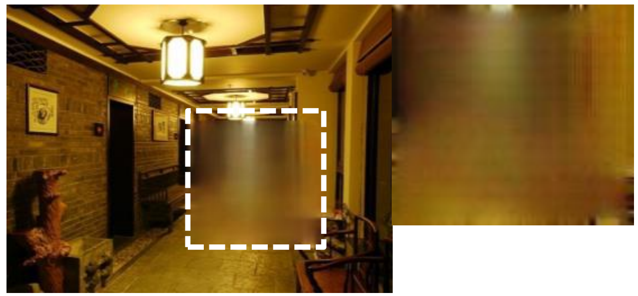
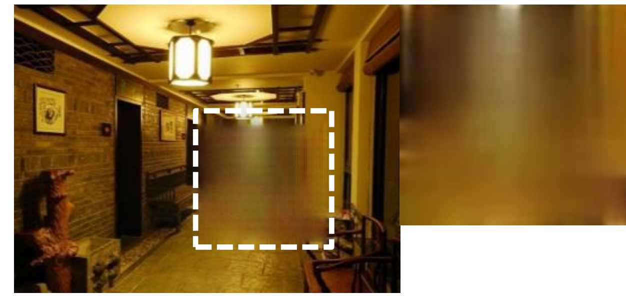
Training with Different Discriminator Configurations



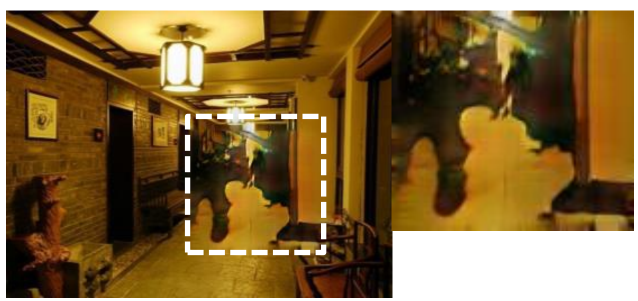
Input



Mean Squared Error(MSE)



MSE + Global discriminator



MSE + Local discriminator

Full method

https://www.slideshare.net/siizuka/siggraph-2017-globally-and-locally-consistent-image-completion

Post-processing

Poisson image blending

(a) Input (b) Output (c) Post-processed

Fig. 7. Effect of our simple post-processing.

Dataset

- Places2 dataset
  - About 8 million images with various scenes
  - Randomly generate a hole for training

Places2 dataset

Input

Ground truth

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Result: Image Completion

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Result: Object Removal

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Application to Specific Dataset

- Fine-tuning the model using a specific dataset
  - Achieves more complicated inpainting

- Face dataset
  - 200,000 training images
  - 2499 test images

Large-scale Celeb Faces Attributes Dataset(CelebA)

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Result: Face Completion

https://www.slideshare.net/siizuka/siggraph-2017-globally-and-locally-consistent-image-completion

Result: Removing Sunglasses

Original Input Output

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Failure Case

Input Ours Ground truth

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Thank you!