Art

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Placeholder

- Minimal (~ 0) content is currently present in the body of these slides
  - This is a placeholder for material that may be added at a later date

- References are provided at the end for a subset of key papers
  - Style transfer
  - Variational auto encoders
  - Generative adversarial networks
  - Predictive methods

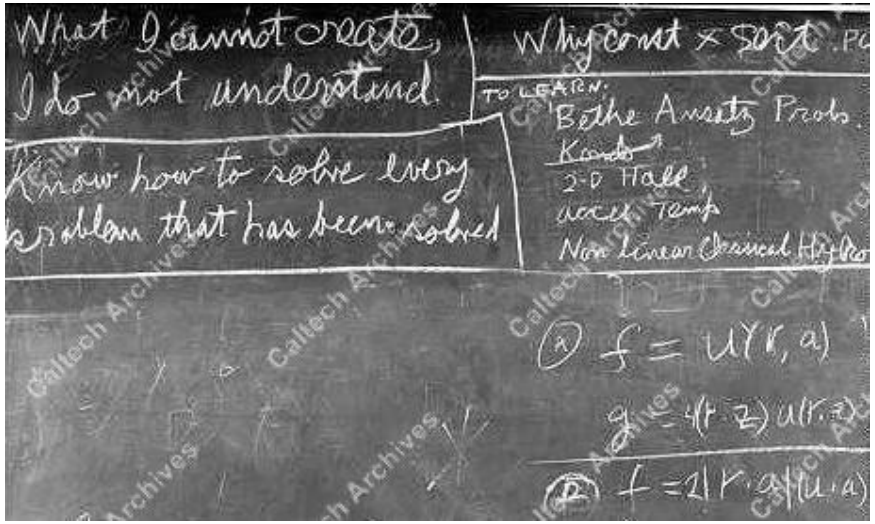
Outline

- Motivation
- Style transfer
- Variational auto encoders
- Generative adversarial networks
- Predictive methods
- References

Motivation

Going The Other Direction

- The vision, speech and language slides used supervised learning to train networks to map from data to information
- The games slides used reinforcement learning to train networks to map from states to values and actions
- This lecture discusses uses ~ unsupervised learning to train networks to map from information to data
  - Generation is like creation and creation is like art
  - Hence the title



Richard Feynman: “What I cannot create, I do not understand.”

Picture from http://archives.caltech.edu/pictures/1.10-29.jpg

Style Transfer

Variational Auto Encoders

Generative Adversarial Networks

Predictive Methods

References

General

- Introduction to generative models and GANs
  - https://zsc.github.io/megvii-pku-dl-course/slides/Lecture%2010_%20Introduction%20to%20Generative%20Models.pdf

Style Transfer

- A neural algorithm of artistic style
  - https://arxiv.org/abs/1508.06576
  - https://github.com/anishathalye/neural-style
  - https://colab.research.google.com/github/tensorflow/models/blob/master/research/nst_blogpost/4_Neural_Style_Transfer_with_Eager_Execution.ipynb
  - https://colab.research.google.com/github/tensorflow/lucid/blob/master/notebooks/differentiable-parameterizations/style_transfer_2d.ipynb
- Texture networks: feed-forward synthesis of textures and stylized images
  - https://arxiv.org/abs/1603.03417
- Perceptual losses for real-time style transfer and super-resolution
  - https://arxiv.org/abs/1603.08155
- Instance normalization: the missing ingredient for fast stylization
  - https://arxiv.org/abs/1607.08022
  - https://github.com/DmitryUlyanov/texture_nets
- A learned representation for artistic style
  - https://arxiv.org/abs/1610.07629
  - https://github.com/tensorflow/magenta/tree/master/magenta/models/image_stylization

Style Transfer

- Exploring the structure of a real-time, arbitrary neural artistic stylization network
  - https://arxiv.org/abs/1705.06830
  - https://github.com/tensorflow/magenta/tree/master/magenta/models/arbitrary_image_stylization
- Photographic image synthesis with cascaded refinement networks
  - https://arxiv.org/abs/1707.09405
  - https://github.com/CQFIO/PhotographicImageSynthesis
- A closed-form solution to photorealistic image stylization
  - https://arxiv.org/abs/1802.06474

- Audio texture synthesis and style transfer
  - https://dmitryulyanov.github.io/audio-texture-synthesis-and-style-transfer/
  - https://github.com/DmitryUlyanov/neural-style-audio-tf
- Audio style transfer
  - https://arxiv.org/abs/1710.11385
- Time domain neural audio style transfer
  - https://arxiv.org/abs/1711.11160

Variational Auto Encoders

- Auto-encoding variational bayes
  - https://arxiv.org/abs/1312.6114
  - https://colab.research.google.com/github/tensorflow/docs/blob/master/site/en/r2/tutorials/generative/cvae.ipynb
- Tutorial on variational autoencoders
  - https://arxiv.org/abs/1606.05908
- Towards deeper understanding of variational autoencoding models
  - https://arxiv.org/abs/1702.08658
- Delta-encoder: an effective sample synthesis method for few-shot object recognition
  - https://arxiv.org/abs/1806.04734
- Deep generative models and variational auto-encoders
  - https://bcourses.berkeley.edu/courses/1453965/files/70020222/download?verifier=Rw55T5A2toQkPbpqSegIiToAXjUvIhGZzpdgNRu7&wrap=1

Generative Adversarial Networks

- Adversarial nets papers
  - https://github.com/zhangqianhui/AdversarialNetsPapers
- GANs awesome applications
  - https://github.com/nashory/gans-awesome-applications
- NIPS 2016 tutorial: generative adversarial networks
  - https://arxiv.org/abs/1701.00160
  - https://media.nips.cc/Conferences/2016/Slides/6202-Slides.pdf
- CVPR 2018 tutorial on GANs
  - https://sites.google.com/view/cvpr2018tutorialongans/
- Ian Goodfellow presentations
  - http://www.iangoodfellow.com/slides/

Generative Adversarial Networks

- Generative adversarial networks
  - https://arxiv.org/abs/1406.2661
- Unsupervised representation learning with deep convolutional generative adversarial networks
  - https://arxiv.org/abs/1511.06434
  - https://github.com/tensorflow/tensorflow/blob/r1.11/tensorflow/contrib/eager/python/examples/generative_examples/dcgan.ipynb
- Improved techniques for training GANs
  - https://arxiv.org/abs/1606.03498
- Image-to-image translation with conditional adversarial networks
  - https://arxiv.org/abs/1611.07004
  - https://colab.research.google.com/github/tensorflow/tensorflow/blob/master/tensorflow/contrib/eager/python/examples/pix2pix/pix2pix_eager.ipynb
- Unpaired image-to-image translation using cycle-consistent adversarial networks
  - https://arxiv.org/abs/1703.10593
  - https://colab.research.google.com/drive/1Enc-pKlP4Q3cimEBfcQv0B_6hUvjVL3o?sandboxMode=true#forceEdit=true&offline=true&sandboxMode=true

Generative Adversarial Networks

- Progressive growing of GANs for improved quality, stability, and variation
  - https://arxiv.org/abs/1710.10196
  - https://colab.research.google.com/github/tensorflow/hub/blob/master/examples/colab/tf_hub_generative_image_module.ipynb#scrollTo=v4XGxDrCkeip
  - https://github.com/tkarras/progressive_growing_of_gans
  - https://www.youtube.com/watch?v=XOxxPcy5Gr4
- High-resolution image synthesis and semantic manipulation with conditional GANs
  - https://arxiv.org/abs/1711.11585
  - http://www.vision.ee.ethz.ch/ntire18/talks/Ming-YuLiu_pix2pixHD_NTIRE2018talk.pdf
  - https://github.com/NVIDIA/pix2pixHD
- Self-attention generative adversarial networks
  - https://arxiv.org/abs/1805.08318
- Large scale GAN training for high fidelity natural image synthesis
  - https://arxiv.org/abs/1809.11096
  - https://colab.research.google.com/github/tensorflow/hub/blob/master/examples/colab/biggan_generation_with_tf_hub.ipynb

Generative Adversarial Networks

- Semantic image synthesis with spatially-adaptive normalization
  - https://arxiv.org/abs/1903.07291
  - https://github.com/NVlabs/SPADE
  - https://nvlabs.github.io/SPADE/

Predictive Methods

- Pixel recurrent neural networks
  - https://arxiv.org/abs/1601.06759
- Conditional image generation with PixelCNN decoders
  - https://arxiv.org/abs/1606.05328
- WaveNet: a generative model for raw audio
  - https://arxiv.org/abs/1609.03499
- Image transformer
  - https://arxiv.org/abs/1802.05751
- Glow: generative flow with invertible 1x1 convolutions
  - https://arxiv.org/abs/1807.03039
- Generating high fidelity images with subscale pixel networks and multidimensional upscaling
  - https://arxiv.org/abs/1812.01608
- Text generation using a RNN
  - https://github.com/tensorflow/tensorflow/blob/r1.11/tensorflow/contrib/eager/python/examples/generative_examples/text_generation.ipynb

Predictive Methods

- Neural scene representation and rendering
  - https://deepmind.com/blog/neural-scene-representation-and-rendering/
  - https://deepmind.com/documents/211/Neural_Scene_Representation_and_Rendering_preprint.pdf