

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

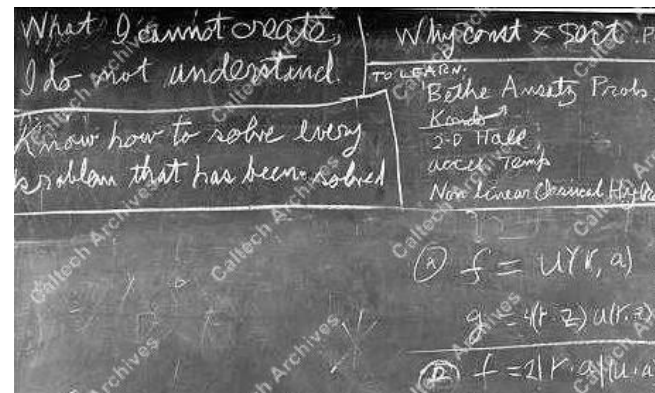
Outline

- 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."

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](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>
- Instance normalization: the missing ingredient for fast stylization
 - <https://arxiv.org/abs/1607.08022>
 - https://github.com/DmitryUlyanov/texture_nets
- Perceptual losses for real-time style transfer and super-resolution
 - <https://arxiv.org/abs/1603.08155>
- A closed-form solution to photorealistic image stylization
 - <https://arxiv.org/abs/1802.06474>

Style Transfer

- 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=Rw55T5A2toQkPbpqSegliToAXjUvIhGZzpdgNRu7&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-pKIP4Q3cimEBfcQvOB_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>
- 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

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](https://deepmind.com/documents/211/Neural_Scene_Representation_and_Rendering_preprint.pdf)