Presentation on "Unsupervised Representation Learning with Deep Convolutional Generative Adversarial Networks," by Alec Radford, Luke Metz, and Soumith Chintala

John Hancock

Florida Atlantic University

jhancoc4@fau.edu

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Overview

Definitions

Subject

Architecture

How did they do it?

- Run their MNIST Example

Background

A generative adversarial network (GAN) is a neural network with two components:

- a *generator* that learns to transform vectors of random numbers into output values. In the context of this paper, the outputs are images. However, researchers use GAN's where the generators create

A deep convolutional generative adversarial network is

Subject

The authors of the paper make several contributions they...

- invent an architecture for deep convolutional generative adversarial network (DCGAN),
- apply the components of a DCGAN to a classification problem,
- demonstrate that after training the DCGAN, its filters learn how to represent images, and
- present a method of doing arithmetic using DCGAN filters to do inferences *à la* Word2Vec [6].

Architecture

A high-level overview of the architecture:

- they use convolutions
- they use de-convolutions
- subsequent work [10] [11] suggests one should employ dropout, but we do not find that the authors of this paper use it when inspecting the code in [2].

How did they do it?

The code for this paper, as well as many others in the references and that one may find in the course of research, is on Github in the dcgan_code project [2].
This code is a bit outdated, however the dcgan_code Github project has a link to the DCGAN-tensorflow [4] project that we find more accessible.

Datasets

- The authors use three datasets for training:
  - Large Scale Scene Understanding (LSUN),
  - Imagenet 1-K, and
  - Faces.
- The authors two datasets for evaluating unsupervised learning:
  - Canadian Institute for Advanced Research (CIFAR) 10
  - StreetView House Numbers (SVHN)
- Note: the authors mention that they heuristically removed duplicate images from LSUN to prevent the DCGAN from memorizing images.

LSUN

- The authors used images of bedrooms from the LSUN dataset [3] as input to their model.

How did they do it?

The authors of the paper make several contributions: Here reference github code implementation How to run their mnist example:

- Use AWS Ubuntu Deep Learning Instance
- - Expensive $\approx$ \$0.65 per hour!
  - Configure an alarm to shut the instance down after 3 hours!
- Create virtual environment
- - Use pip to install libraries
  - force install of Theano 0.9.0 (pip install -I Theano 0.9.0)
- - Paper dcgan_code repository does not have MNIST data,
  - Download MNIST data from `https://github.com/Manuel4131/GoMNIST/tree/master/data`, and change location in lib/config.py

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