GAN Research Paper Write-Up

By: Megan Reid

Generative Adversarial Nets

By: Ian J. Goodfellow, Jean Pouget-Abadie, Mehdi Mirza, Bing Xu, David Warde-Farley,Sherjil Ozair, Aaron Courville, Yoshua Bengio

<https://papers.nips.cc/paper/5423-generative-adversarial-nets.pdf>

- What are the main innovations of the paper?

* Proposes a new framework for estimating generative models which consists of two models:
  + Generative Model – captures the data distribution
  + Discriminative Model – tries to determine whether the input data is real or generated data
* Performed experiments to prove the usefulness of the new framework

- What do the authors claim as their contributions to the literature of deep learning?

* Deep learning is trying to discover the models that represent groups of data including images, audio, symbols, and video
* While discriminative models have made great progress, generative models had been lacking the same useful results at the time of this paper
  + The author claims the lack of progress thus far was due to “the difficulty of leveraging the benefits of piecewise linear units in the generative context”
* This paper overcomes the difficulty of generative networks by introducing the discriminative model, in which one model trains to create new data while the other discriminative model tries to label generated data as real or fake.
  + Thus the generative model gets better and better, while the discriminative model also gets better and better
  + “Competition in this game drives both teams to improve their methods until the counterfeits are indistinguishable from the genuine articles.”
* Previous models were dependent upon gradient approximation likelihood, while the new model is not dependent upon this and can generate samples without it

- What datasets do they use to test their results?

* They used the MNIST data set (handwritten numbers data set)
* TFD (Toronto Face Data Set?)
* CIFAR-10 (established computer-vision dataset used for object recognition)
* Used noise as the bottom most layer of the generator network
* Estimated the probability of the test data using a Guassiann Parzen window

- Why do you think these results are (or are not) exciting / successful / important?

* I think this paper is very important because quickly reading through many other GAN papers I realized that most of them referred to this paper. It seems that this paper introduced a new methodology for deep learning that many other papers modeled after.
* The work in this paper is exciting because it uses competition to drive better results, and it is easily understandable once you get the general premise of how the generative and discriminative models work

- How do you think the contributions described in the paper could be used for your own project?

* I want to generate novel super car images, by training using the methodology presented in this paper.
* If possible I would also like to tell the generator which supercar images are cool looking, and take this input into account to generate better and better images.
* It seems to me that if GAN’s became powerful enough to create really interesting novel content they could help designers to come up with new ideas and/or gain inspiration.