Assignment 7

Submitted by:
Anirban Ghosh - 3279100 - s6anghos@uni-bonn.de
Kajal Puri - 3305398 - s6kapuri@uni-bonn.de
Shilpa Chaterjee - 404788-shilpa.chatterjee@rwth-aachen.de

Course: *Visual Data Analysis (MA-INF 2222)* – Professor: *Dr. Thomas Schultz*
Submission Date: *June 15th, 2020*

Exercise 2

a) As explained in the paper, GANs aim to find a mapping that transforms random noise into a distribution that is as similar as possible to the distribution of a given reference dataset. Which part of the interface allows you to check visually whether this goal has been met? Which number that is displayed in the interface quantifies this?

Answer. The discriminator D, takes the input and discriminates if the result is real or fake. Here the value of D(x) represents the probability that if x is real or fake which is the displayed quantity.

b) Run the training from scratch (without using the pre-trained model), with the default dataset ("mixture of Gaussians") and settings, for exactly 1000 epochs. Take a screenshot and repeat the experiment. Did you obtain the same result in both cases? Why?
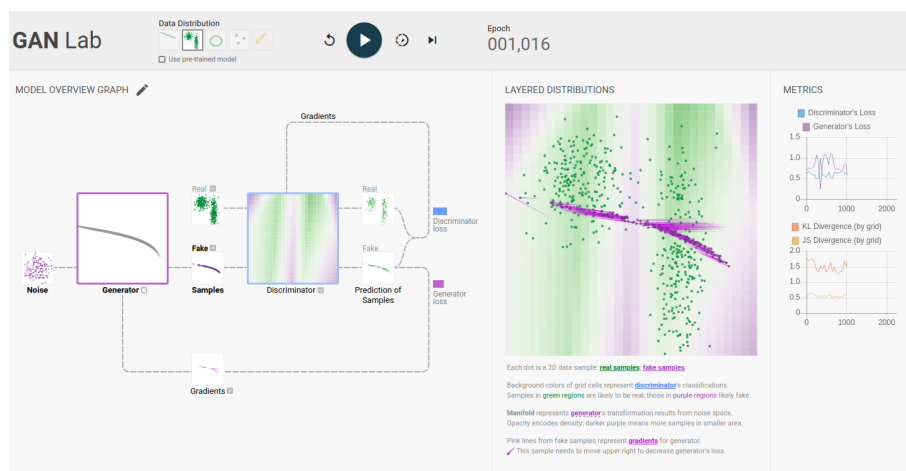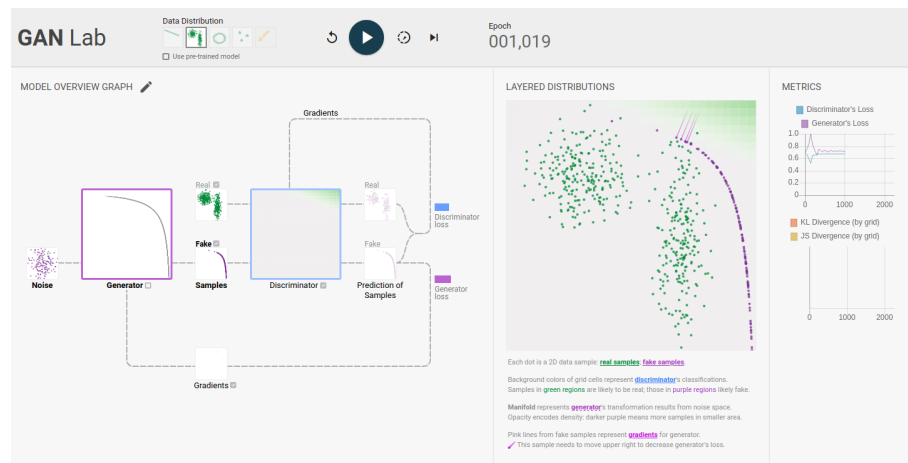

Figure 1: 1st go

Figure 2: 2nd go

Answer. The clear difference in the results can be seen observed since the GAN model improves its results at every iteration to generate a fake results which is closer to the real result.

---

c) Watch a few epochs in slow-motion mode. Focus on the gradients (pink lines) and the movement of the pink points from iteration to iteration. Do the pink points always follow the gradient direction? Why?

Answer. No, The fake samples gradient directions are always pointed towards the classification's Green regions, meaning that the generator leverages information from the discriminator to make fake samples less distinguishable from the real ones.

---

d) When training a neural network for classification, successful training goes along with a substantial reduction in loss. However, this is not what we observe in this interface. Briefly explain why.

Answer. The reason being in this interface only the fake samples are used when computing the loss.

---

e) Continue running the training with the default parameters, for a large number of epochs (e.g., 5000). Did it converge to a stable state? Propose a strategy to improve the convergence behavior.

No, for around 5000 iterations the fake data is not very similar to real data. One improvement as suggested in the paper is to provide some kind of feedback similar to GoodFellow's minmax algorithm.

Answer.

Anirban Ghosh - 3279100 - s6anghos@uni-bonn.de
Kajal Puri - 3305398 - s6kapuri@uni-bonn.de
Shilpa Chaterjee - 404788-shilpa.chatterjee@rwth-aachen.de

f) As explained in the paper, mode collapse is a frequent problem in the training of GANs. In the "three disjoint region" dataset, it happens when all generated samples fall into a single cluster (Note: They do not necessarily have to collapse into a single point, as in the example shown in the paper.). Can you reproduce this problem? Can you provoke this even in the "mixture of Gaussians"? Please submit corresponding screenshots, and briefly describe what you did.
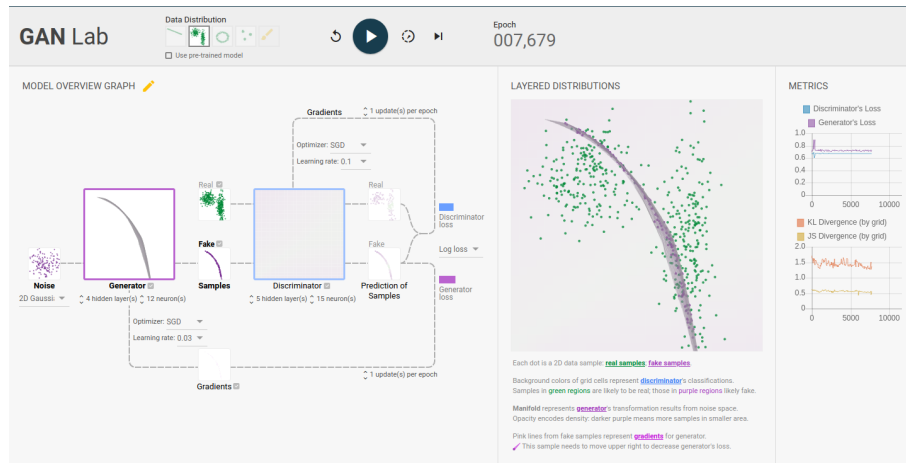

Figure 3: 1st go

Answer. Could not replicate the mode collapse problem where the fake data would collapse to a single point post few iterations. For "misture of gaussians" tried to increase the number of layers and neurons in both the generator and discriminator. And played with as well but lead to no success.

Anirban Ghosh - 3279100 - s6anghos@uni-bonn.de
Kajal Puri - 3305398 - s6kapuri@uni-bonn.de
Shilpa Chaterjee - 404788-shilpa.chatterjee@rwth-aachen.de