

GAN Implementation and Regret Minimization

Group - 2 - NgNearS

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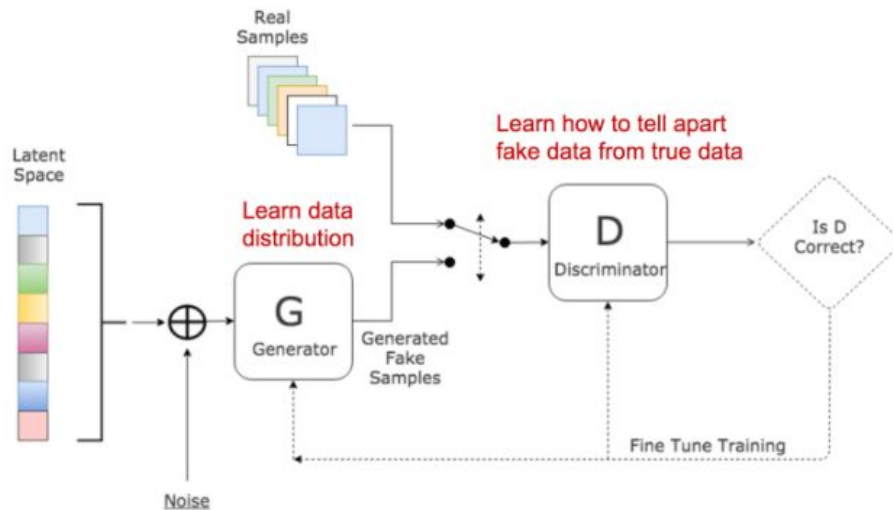
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Introduction

- GAN: Two neural networks contesting with each other in a zero sum game



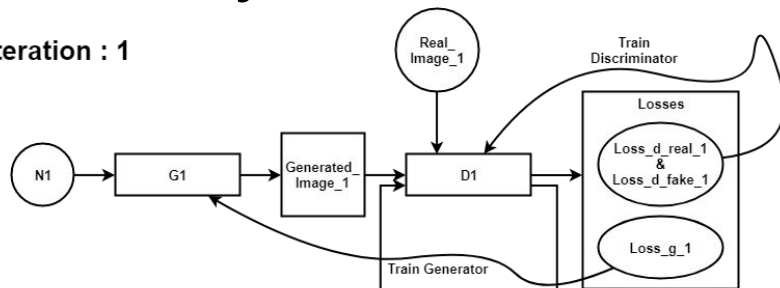
- Learner makes the decision and the adversary gives back the loss function back to the learner for that particular decision

Motivation

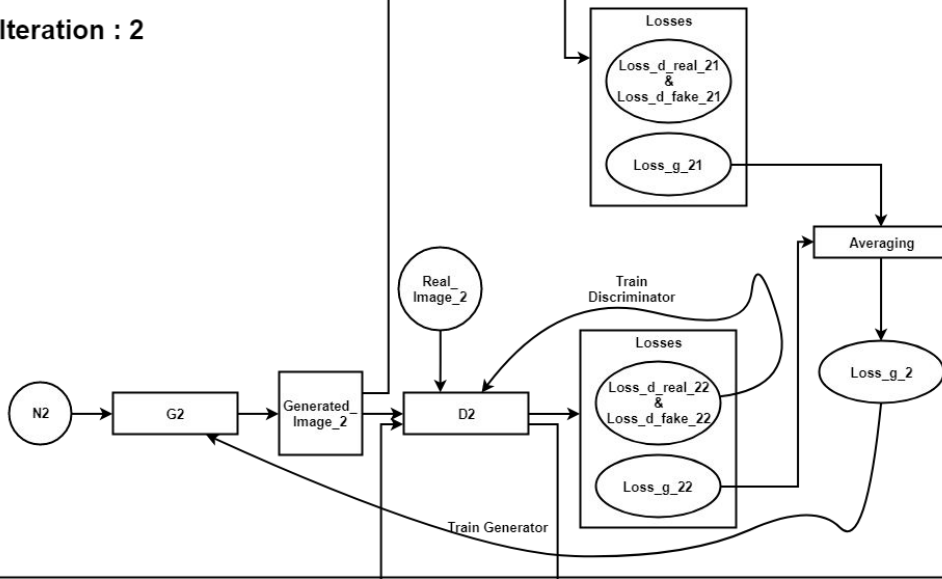
- We attempted to generate MNIST dataset using DCGAN by using notion of regret minimization.
- Computing global minima for non-convex functions is computationally intractable. The main motivation was to attempt to implement computationally tractable notion of regret minimization in non-convex repeated games like adversarial(GAN) training.
- The objective of generative modelling is to help understand the world around us and in that process, create a representation of objects in the world, which enable us to use data better.

System Architecture

Iteration : 1



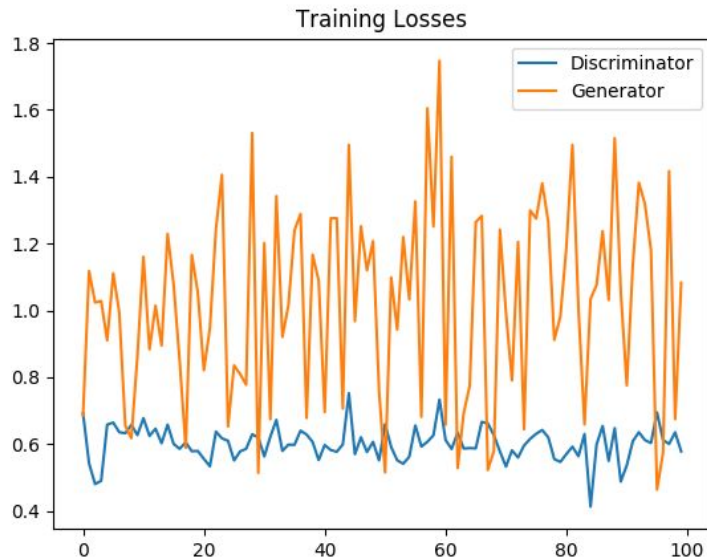
Iteration : 2



Challenges faced

- **Understanding regret minimization algorithm**
 - Altering optimizer or multiple loss functions?
- **Decide application to apply regret minimization approach**
 - Text to Image conversion
- **Decide type of GAN**
 - Simple GAN
 - Deep convolutional GAN
- **Implementation challenges:**
 - Work with tensorflow
 - Incorporate notion of regret in tensorflow (minimizing average loss over specified window size)
 - Storing and restoring weights for future experiments

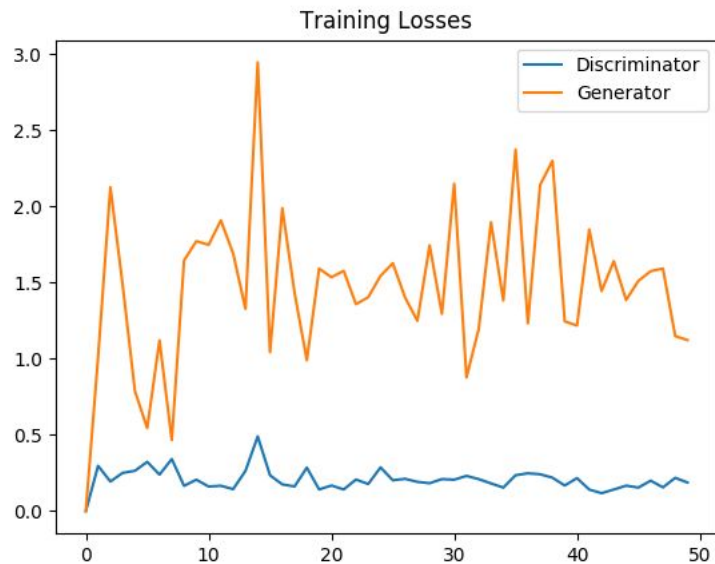
Results: Non-Regret, DCGAN (w=1, GradientDescent)



Results: Regret, DCGAN (w=2, GradientDescent)



Results: Regret, DCGAN (w=3, RMSProp)



Results: Regret vs Non-Regret, Vanilla GAN

($w=2$, Adam)

Non-Regret



Regret



Analysis

- Regret minimization in GAN converge faster(in terms of image) than simple(non-regret) gradient descent in GAN.
- RMSProp Optimizer generates better images faster than GradientDescent, but it doesn't guarantee that the image generated will be better than immediate previous image.
- Maximum value of loss in DCGAN is less than the maximum value of loss in Simple GAN.
- Value of loss in DCGAN (Regret Minimization) using GradientDescent is almost bound to 1 (it hardly goes beyond 1) while in Non-Regret method many a times it goes beyond 1.

Conclusion

- For MNIST Dataset, Regret-Minimization method works efficiently in comparison with Non-Regret method.

Future scope

- Implement regret minimization approach for Caltech-UCSD Birds 200' Dataset for performing “Text to Image conversion”

Thank You!