

A Study in GANs

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PROJECT OVERVIEW

The project runs along 2 tracks

1. Standard for most people - implement pre existing models using torchGAN, do literature review. End with models like discogan and stargan
2. NLPGAN - (difficult) Design a framework to handle gans with recurrent nets. Ideally people with some software dev experience and ml background should take this. Aim is to design something similar to torchgan but explicitly for nlp. The aim is to strike a balance between teaching theory and practice, with the goal that upon completion, mentees are able to read, understand and easily implement a significant fraction of the current literature on GANs

ROADMAP

- Deep Learning Primer with an emphasis on Generative Models
- Introductory lecture on GANs with a Primer on PyTorch
- Writing your first GAN model using TorchGAN
- GAN Losses: Theoretical Insight and Experimentation
- Metrics of GAN performance and practical advice on evaluating and training GAN models. As an exercise at this checkpoint, mentees shall be expected to present a quantitative comparison of various GAN losses
- Semi Supervised Learning and Class Conditional Models with a quantitative comparison of various class conditional models
- Domain Application: Neural Style Transfer and CycleGAN
- Domain Application: Image Super Resolution and SRGAN

WEEKWISE PROGRESS

Week 1-2 :Going through the video lectures of CS231 , understanding Deep Convolutional Neural Networks and implementing them on basic MNIST and CIFAR-10 dataset . Implementing Resnet, VGG and DenseNet .

Week 3: Going through research papers of GAN , DCGAN and ACGAN . Understanding the basic functionality of a GAN and implementing them using Pytorch . Get familiar with Torchgan by reading its documentation and tutorials and then implementing DCGAN , ACGAN and CYCLEGAN using torchgan Trainer .

Week 4: Writing custom datasets for datasets like CelebA and CityScapes which are not in torchvision and implementing yaml config files similar to Facebook's Maskrcnn benchmark for Torchgan to make it a much better research framework for training GANs .

Week 5: Making Parser for Torchgan which would accept a yaml file , path of the dataset and start training of the GAN models. All the respective parameters and hyperparameters needs to be mentioned by the user in the yaml file .

Week 6: Studied papers of CycleGAN , DiscoGAN and StarGAN and implemented them in Pytorch and got good results.

Week 7: Studied two of the special GANs , SRGAN and SAGAN .SRGAN is used to create super resolution images from low resolution images and SAGAN uses a unique model architecture which is explained in the report

Week 8: Studied stability methods for training vision based GANs and studied papers of NLP GANs and deep dived into why NLP GANs fail to produce good results .

TASKS COMPLETED

Implemented the following Classification based Convolutional neural networks:

- RESNET
- DENSENET
- VGG

Implemented the following GAN models

- Basic Fully Connected GAN
- DCGAN
- CGAN (including AnimeGAN using CGAN architecture)
- ACGAN
- INFOGAN
- CYCLEGAN
- DISCOGAN
- STARGAN
- SRGAN
- SAGAN

Made following things for Torchgan framework :

- Progress bar (Merged)
- Dataloader (To be merged)
- Parser for yaml files(To be merged)

FUTURE PROSPECTS

- Studying NLP GANs
- Generalising Parser and Dataloader for Torchgan framework .