ADRL 2024 - Assignment 1

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1. Train a DC GAN (with an architecture of your choice) on the given data with the usual GAN loss. Plot the loss curves for the Generator and Discriminator losses.
2. Plot a 10 by 10 grid of images for generated images.
3. Vary the number of times the generator and discriminator is trained and document the outcome.
4. Write a code for computing the FID and compute FID by sampling 1000 data-points from both the true and the generated data distributions.
5. Implement two types of latent space traversals and plot the outcomes. Latent space traversal refers to randomly sampling two input vectors and generating images via (Linear or non-linear) interpolations.
6. Implement conditional generation by randomly choosing 20 subclasses in the data.
7. Modify the loss and the Critic network to optimize the Wasserstein metric and plot a 10 by 10 grid of generated images. Recompute the FID and compare it with Vanilla GAN.
8. Implement a decoder network - with input as generated images that outputs the input random variable in the GAN. Add a norm-based reconstruction loss between the input to the generator and the output of the decoder. Train it simultaneously along with regular GAN losses.
9. Obtain the decoder output (trained in the previous step) for all the input images. Train an MLP to solve a classification task by taking these decoded vectors as input. Compute and report the classification accuracy and the F1 score.
10. Implement a classifier on the given data by fine-tuning a Resnet (32 or 50) pre-trained on imagenet. Compute and report the classification accuracy and the F1 score and compare it with the MLP trained before on the decoded latents.

11. Take the 20-class subset of the data (as taken in problem (6)), train a resnet-based classifier, and report the metrics.

12. Use the c-GAN trained in problem (6) to generate 100 more images per each of the 20-classes. Use these augmented data to retrain the classifier in the previous question. Compare the results with the previous classifier without augmentation.

General Instructions:

1. We use only one dataset for this assignment.
2. The dataset can be found here - data
3. The dataset consists of 5400 Animal Images Across 90 Classes images.
4. You need to resize all images to 128x128 pixels before implementing.
5. Use Google collab with Jupiter notebook for all the computing.
6. You are supposed to submit a single Jupiter notebook with all the solutions made into separate blocks.
7. Use Pytorch for building neural networks. You are supposed to directly use the off-the-shelf functions for the models asked.
8. A report has to be submitted that would list all the experiments, results, and observations. This should be embedded in the Jupiter notebook itself.
9. Use matplotlib for plotting.
10. The final evaluation **does not** depend on the accuracy metrics but is based on the **quality of your experiments and observations thereof**.
11. We will run a plagiarism check on the codes. Any suspicion of copying would lead to a harsh penalty from negative marks in the assignment to a failing grade in the course, depending upon the severity. Therefore, kindly refrain from copying others' codes and/or reports.