Master's Thesis Outline

Generative Data Augmentation using Multi-Agent Diverse GAN's

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14. November 2024

During my thesis with the title “Generative Data Augmentation using Multi-Agent Diverse GAN’s”, I will explore the utilization of Multi-Agent Diverse Generative Adversarial Networks (MAD GANs) for the purpose of extending a training data set for an subsequent classifier on image data.

Points of Research:

The classifier will be a simple CNN. The primary aim is not to improve performance on the datasets mentioned in *Challenges, Risks & Solutions* compared to existing best classifiers. Instead, this work serves as a proof of concept for the potential success of using the MAD GAN architecture for Generative Domain Adaptation (GDA). Consequently, the datasets are deliberately chosen to be less intricate, as the complexity, number of generators, and discriminator sophistication can be scaled as needed.

- Influence of MAD GAN GDA on classifier performance
- Impact of different loss functions on the generated images
- Effect of the number of generators in the MAD-GAN on created images
- Ratio between real and fake samples for subsequent classifier
- Impact of MAD GAN for GDA on imbalanced datasets
- Comparison between MAD GAN GDA, Vanilla GAN GDA and classical data augmentation strategies (cropping, flipping, saturation changes, ...)

Challenges, Risks & Solutions

1. Combining the MAD GANs with conditionality constraint of CGANs
   S: Use auxiliary classifier to label images and check manually
2. High computational costs with high-definition samples and high number of generators
   S: Use low-resolution datasets (e.g. MNIST, Fashion-MNIST, CIFAR-10, ...)
3. Sensitivity to hyperparameters
   S: Automated hyperparameter optimization, curriculum learning, ...
4. Difficulty proving statistical significance of improvements
   S: Perform statistical significance tests (paired T-test, Wilcoxon signed-rank test - depending the on form of the data)