

AIML - Project Proposal

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What is the problem that you will be investigating?

When fine-graining classifier on a more specialized dataset, It is often the case that a significantly smaller dataset is available. We will try to perform a different type of data augmentation using a GAN in order to generate new artificial samples to reinforce the fine-graining process and to improve the classification results.

Why is it interesting?

Classification is one of the main applications of artificial intelligence, and dataset size is a critical factor in deep learning effectiveness. Data augmentation is often used as a strategy to increase the size of the training set, we think generative-based approaches to data augmentation could improve performance, especially on small datasets and fine-graining problems.

What reading will you examine to provide context and background?

We will examine the following papers and code as starting point for our work:

- Conditional Image Synthesis with Auxiliary Classifier GANs (Augustus Odena, et al.)
<https://arxiv.org/pdf/1610.09585.pdf>
- GAN-based Synthetic Medical Image Augmentation for increased CNN Performance in Liver Lesion Classification (Maayan Frid-Adar, et al.)
<https://arxiv.org/pdf/1803.01229.pdf>
- Kaggle dog classification challenge
<https://www.kaggle.com/c/dog-breed-identification/>
- Kaggle dog generation challenge
<https://www.kaggle.com/c/generative-dog-images/overview>
- PyTorch GAN
<https://github.com/eriklindernoren/PyTorch-GAN>

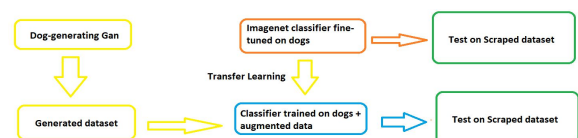
What data will you use?

Imagenet is one of the most comprehensive datasets available. Among the different classes, there are over 100 dog breed classes. This is a well known fine-graining problem, and different implementations are already available.

Moreover we will scrape a new dog breed dataset from the web in order to use it as test set, as we are not sure all the test images are not used to pre-train the classifier or the generative model. We decided to use the dog dataset instead of other fine-graining dataset because it requires less domain knowledge.

What method or algorithm are you proposing?

We are proposing the following methodology to test the impact of our data augmentation technique on the classifier performance, we will start from an Auxiliary Classifier GAN as it seems to have the properties we are looking for. We will test the result on the classifier trained on both the dog dataset and the augmented dog dataset.



How do you plan to improve or modify existing implementations?

We will select the best performing classification and generative models among the ones we find in literature and then we will try to improve the classifier enlarging the train-set trying to achieve a better accuracy score.

How will you evaluate your results qualitatively?

Even if not critical for testing our hypothesis, we will examine some of the image outputs of the generative model and qualitatively evaluate it manually.

How will you evaluate your results quantitatively?

We will examine the accuracy on the scraped test set both on the starting classifier and on the same classifier trained on GAN-augmented dog dataset to understand if our hypothesis was plausible.