**Water Marks removal using pix2pix**

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# Motivation

These days, which characterized by loads of fast access information in general and more specifically by many images, it is a very common mechanism to use watermark logo as a mean to mark and protect the image owners’ copyrights.

The reason that this mechanism is so popular is that it enables the consumers to enjoy the image while it ensures that there will be no unauthorized or unlicensed use of it.

As always, where there are mechanisms to protect, there will be someone who tries to break it.

Our project is focusing on try to use a well-known algorithm (pix2pix) to break the watermark mechanism.

This project is not barring a great scientific progression, but it is a great mean to learn the basics of ML and GAN.

# Background

Watermark removal is not a very popular research area. Having that, we did find some methods to use neural networks to remove watermark from images.

<https://github.com/marcbelmont/cnn-watermark-removal> which uses a pre-given rectangle shaped mask in the size of the watermark, than it uses dilated convolution and output the image.

Its results are not that good, and it is very limited due to how this network was implemented.

<https://ai.googleblog.com/2017/08/making-visible-watermarks-more-effective.html>

Google took it another level and characterized the structure of many watermarks.

To do so, they took datasets with the same watermark and used median image + multi-image matting method to estimate how the watermark should be.

By doing so, they could assess which exact watermark (or a very similar one) is being used, then they could detect its pattern and characterization (shadows and color gradient) and remove it.

They get extremely good results.

Even though google found a great way to “hack” the watermark system, our main goal is to use this problem to learn and use the basics of machine learning area and therefor we tried to use a different solution.

# Method

We have examined a few known projects that might work for our goal of a watermark removal:

Attentive Generative Adversarial Network for Raindrop Removal from a Single Image

Single Image Reflection Removal Using Deep Encoder-Decoder Network

Pix2pix algorithm

All the above-mentioned researches are transferring images from domain A to domain B while trying to characterize the differences between these domains.

Due to our very little experience working with GAN, we decided to work with the most known and documented algorithm – pix2pix.

So, most of our work would be to try and use this algorithm to get a good results of watermark removal.

First, we try to find out how big the dataset should be.

Than we try to see if this method is affected by randomization of the watermark.

And last, we try to use a mask which will tell the network exactly where the watermark is and will work on that specific area.

The data set we use originated in the pix2pix dataset where we created the same images with watermark.

# Results

As a first stage, while training the network on \_\_ images, we got unsatisfying results:

After that we multiple the training data set by \_\_ and got much better results:

Now we could try and test it on random locations of the watermark, while training it on \_\_ images:

For a final check, we have tested it with a mask for the specific location of the watermark and got the following results: