Single Image Reflection Removal
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Introduction

- Reflection removal is an unsolved problem.
- Training data is hard to collect and usually not enough.
- I have a solution that outperforms baseline model [1] on test images from benchmarking dataset [3].
- The key to solve the problem is focusing on data.

Data

- I combined the training set of [1] and [3].
- Only one sample is kept per scene.
- Only use real images, instead of real + synthetic.
- Number of training samples increases to 189, but still too few.

Why do I decide to only train with real images?
Baseline performs bad on test images from [3]. Test images provided by [1] look like synthetic images. The synthetic reflections are on different distribution from the regular reflections in real scenes. I have t-SNE to illustrate the difference on distribution.

Method

- End-to-end Dilated Convolutional network.
- Input image, plus edge features computed with VGG-19 model, as the input.
- L1 loss on reflection layer, a feature loss against VGG-19 model parameters, an adversarial loss from a GAN discriminator and an exclusion loss in the gradient domain to separate the reflection and ground truth, similar as [1]

Experiments

- Train with only real images - fail or overfit
- Train with only real images and parameters initialized from baseline model - succeed
- Add WGAN with gradient penalty and more augment methods - slightly better performance on dev set and test set

Discussion

- We should focus on the real world scenes.
- Synthetic images still help.
- Prepare and organize date is more critical, as the ML/DL method works well if we have proper data.
- If we cannot get enough data, focus on the data in the scenes that we care more.

Reference