Motivation

Image resolution can be enhanced from a single image using convolutional neural networks. This can be used for:

- Old personal photos
- Digital zoom
- Accelerated medical imaging

Goal: Given a low resolution image, output a high resolution version.

Methods

An SRCNN was implemented with 3 convolutional layers and ReLU activation [3, 4]. Networks were trained on luminance-only and full RGB data sets. Randomized search of filter hyperparameters was made.

Anisotropic total variation was included in loss function in attempt to speed up training.

$$TV = \frac{\lambda}{N} \sum_{i,j,k,c} (D_y y^{(i)}_{jkc})^2 + (D_x y^{(i)}_{jkc})^2$$

$$Loss = MSE \ or \ MSE + TV$$

Dataset

The Flikr2K dataset [1,2] is sampled into 128x128 high res image patches. Corresponding low res patches are then formed following:

$$LR = (HR \ast K(\sigma_{blur})) \downarrow + N(\mu_{add})$$

Then upscaled to size using bicubic interpolation (BI). These pairs are the input and labels for our model.

References