

# MSc. Thesis - Deep Restoration Progress Updates

May 3, 2017

## 1 May 3.

### 1.1 Completed

- step to later layers, for simplicity with vgg first.
- adapt code to allow stacking models (somewhat hacked together, needs rework later)
- evaluate which model (cd, dc, dd) works best on alexnet and vgg
- reproduce cd runs on alexnet
- vary learning rate
- redo vgg experiments with BGR mean order
- test artificial data with uniform areas to test vggnet
- track source of black spots, try renormalizing again
- rework run logging, so used parameters can be read off
- unify vvg and alexnet layer inversion classes
- track validation set loss
- find good way to log loss per channel
- pretty up plotting functions (should be sufficient for now)

### 1.2 Results

This week has yielded two major findings:

1. the first three layers of Vgg16 (two convolutions and one pooling layer) can be inverted with decent results using three stacked convolution-deconvolution models trained individually.

2. both deconvolution-convolution and double deconvolution model (where the first operation has stride) yield fewer artifacts when inverting the first alexnet layer (conv+relu)

Also, the grey spots and color inaccuracies found in last weeks results were apparently owed to the model's slow learning of color biases and disappear entirely, when the normalized BGR image is used as a target.

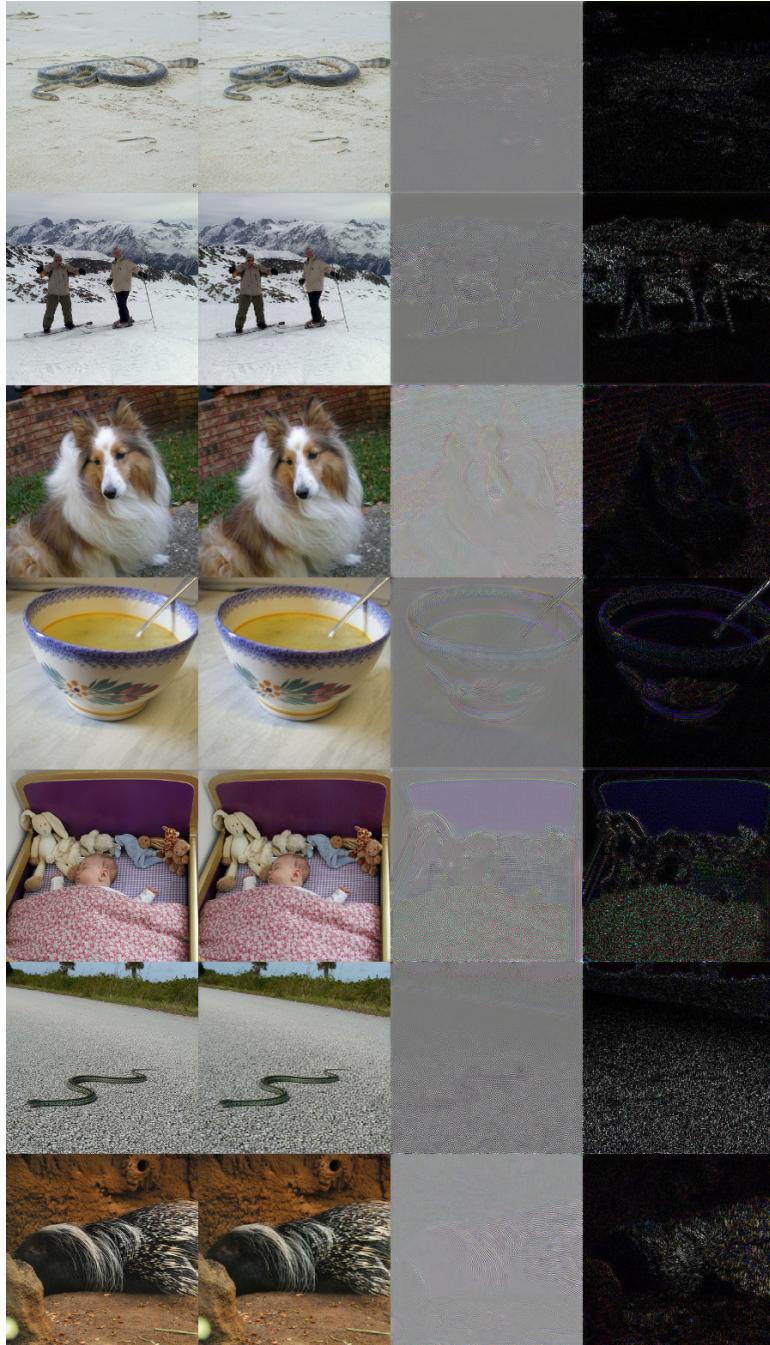


Figure 1: reconstruction from pool1 layer by 3 stacked conv-deconv models. Left to right: Image, reconstruction, color accurate error, relative intensity accurate error

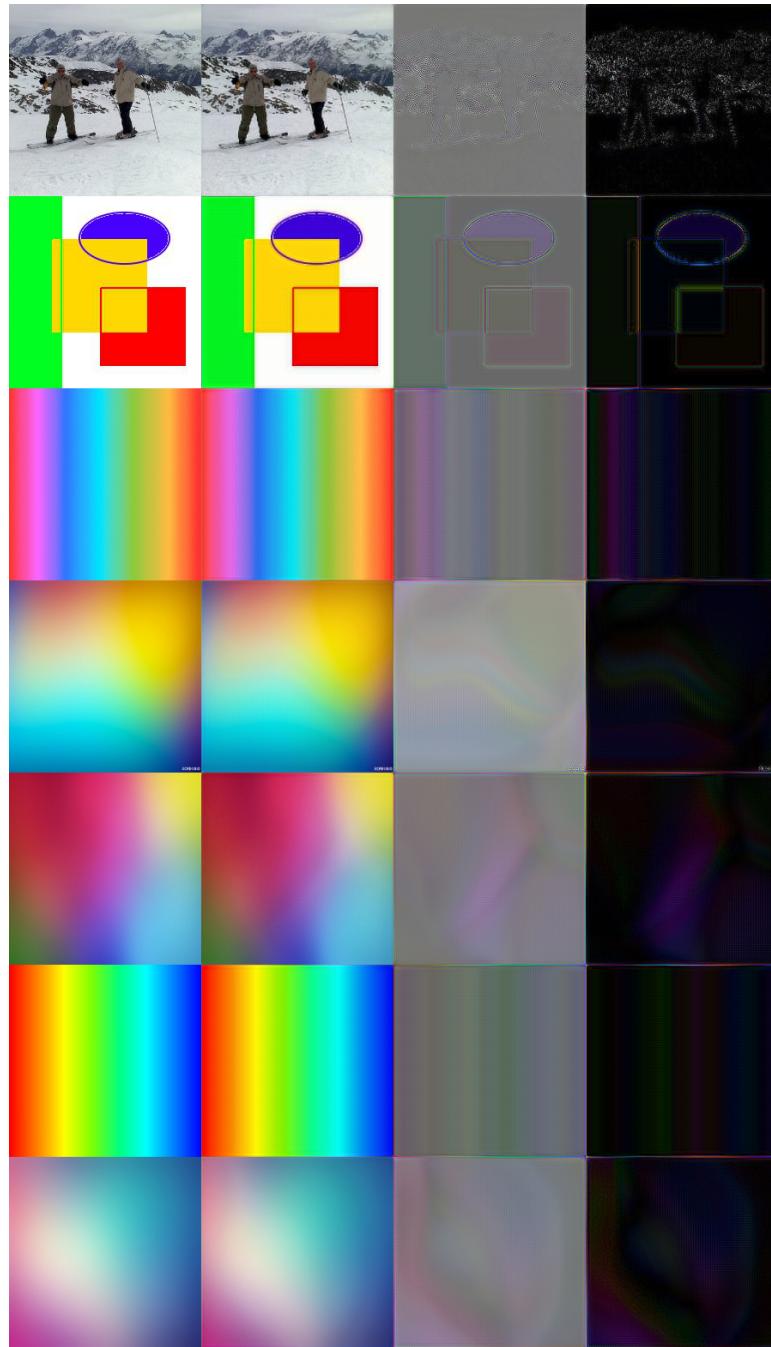


Figure 2: more reconstructions from pool1 layer by 3 stacked conv-deconv models

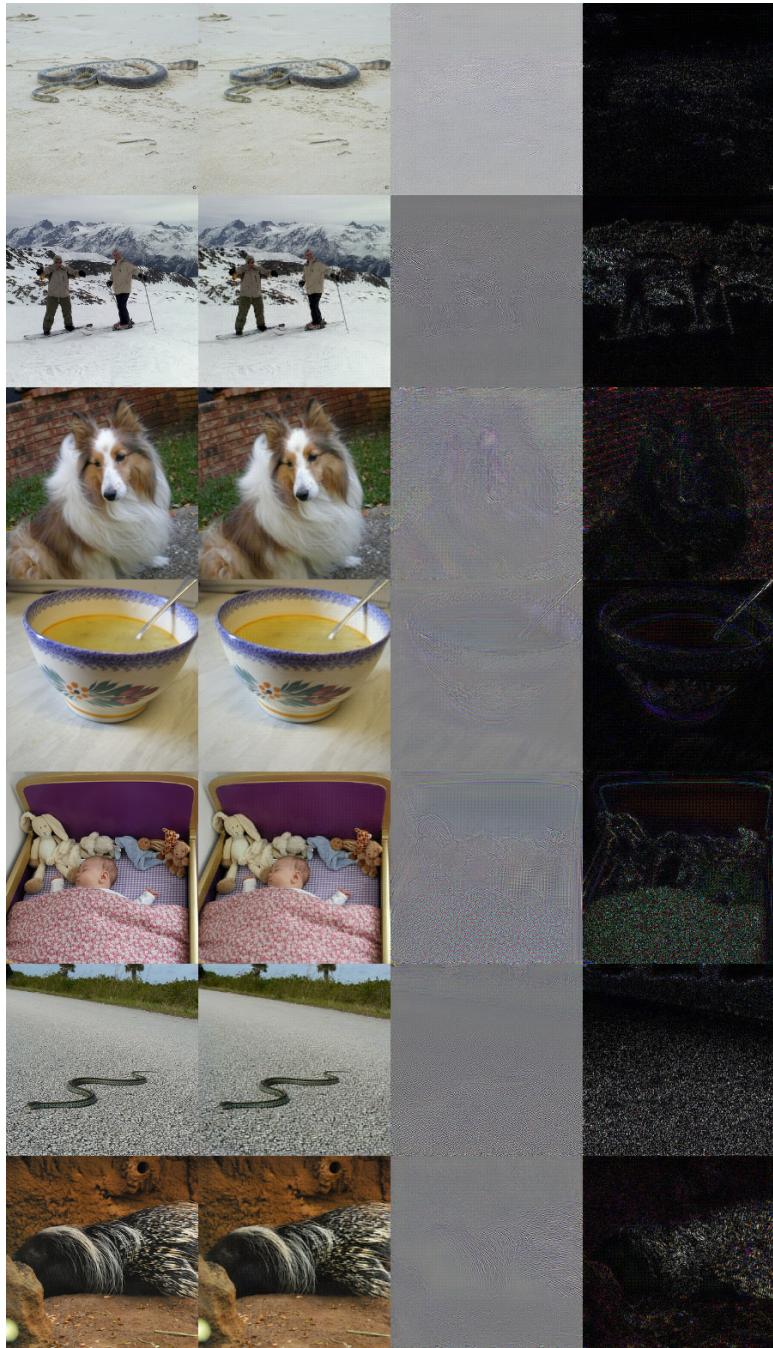


Figure 3: reconstructions of the first alexnet layer using Conv-Deconv model

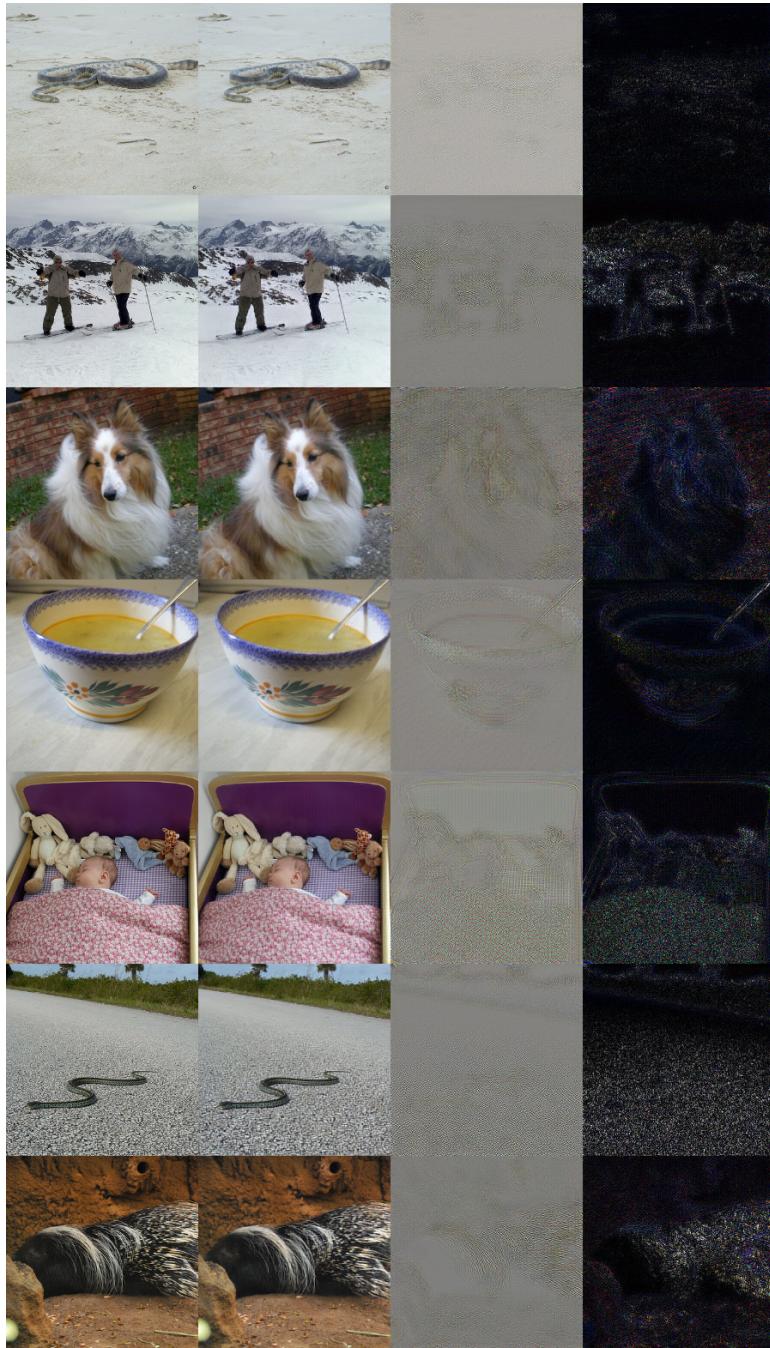


Figure 4: reconstructions of the first alexnet layer using Deconv-Conv model

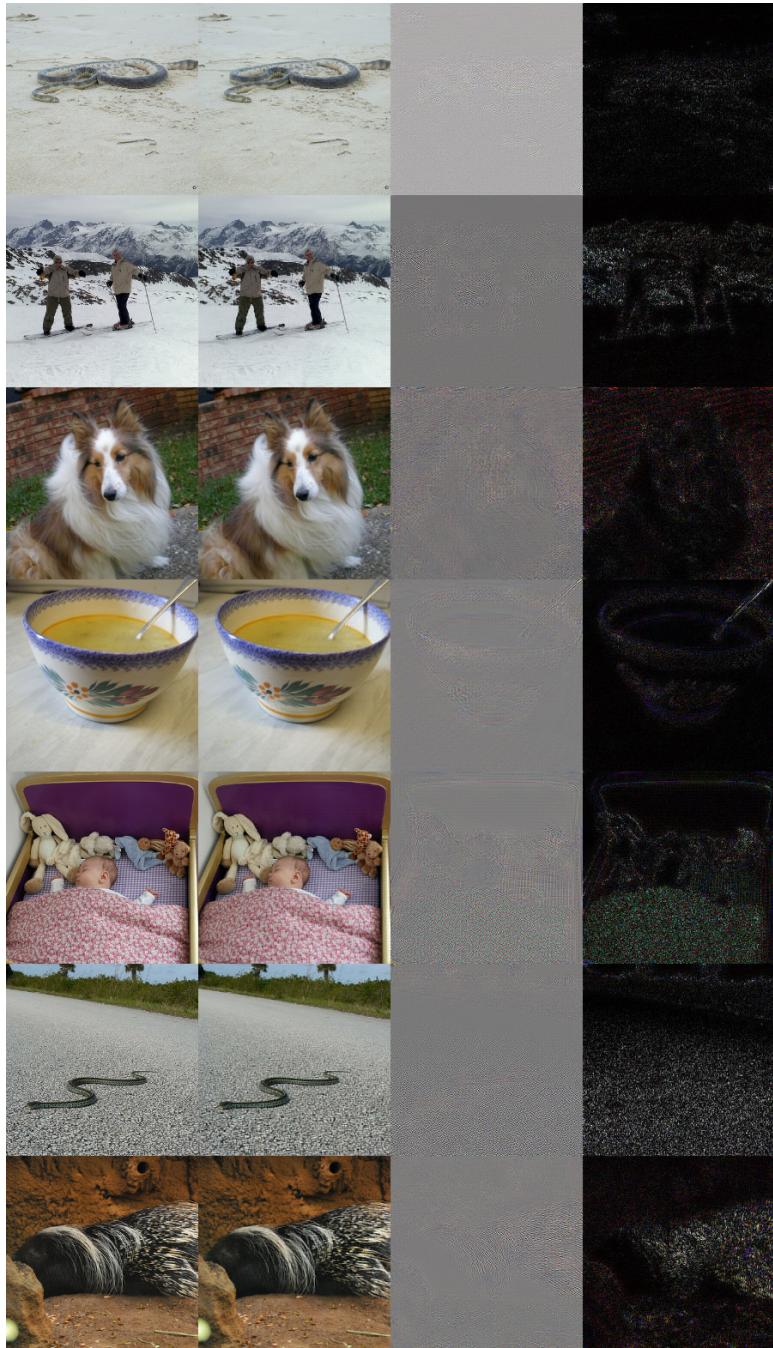


Figure 5: reconstructions of the first alexnet layer using Deconv-Deconv model

### 1.3 Next Steps

- invert pool1 with a deconv conv model, which deals better with strides
- train and stack 3 layer inversions, compare to same model trained in one go.
- find second source on image net means
- increase number of stacked layers and extend results to alexnet
- work out details of ICA based model
- specify roadmap for remaining thesis and officially register the project