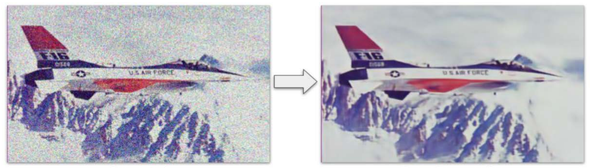
Image inpainting via supervised-Variational Autoencoders

Federico Maggiore [1], Sanhanat Deesamutara [2]
[1] Faculty of Economics, [2] Faculty of Mathematics and Computer Science

Basic Ideas



denoising with autoencoders

Question : Can we use same idea to restore damaged photos ?

Dataset

Heterogeneous
Animals Data

Training Set	25,000
Test Set	2,000

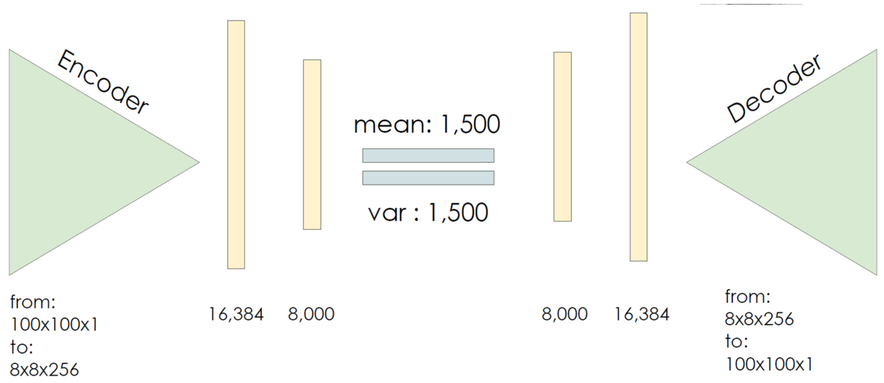
Homogeneous
Faces Data

Training Set	39,000
Test Set	2,000

Input Data

Model, Implementation & Results

Variational Autoencoders

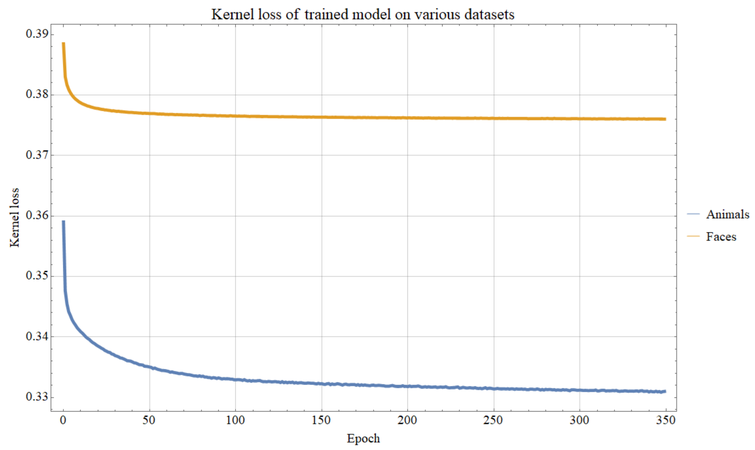


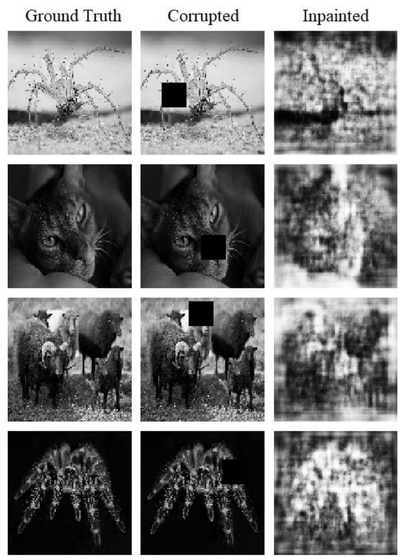
Encoder
- 7 Convolutional Layers
- 3 Pool Layers
- 3 BatchNorm Layers
- VGG16 architecture

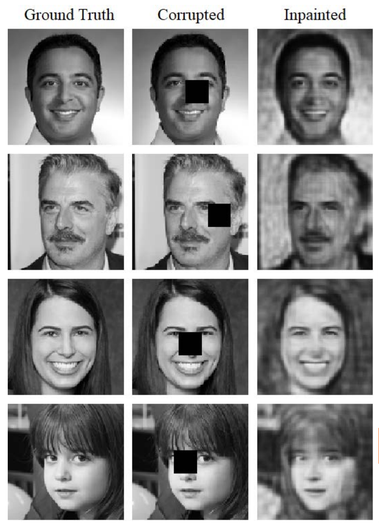
Decoder
- 6 Deconvolutional Layers
- 5 BatchNorm Layers
- DC-GAN architecture

Structural Similarity investigation

$$SSIM(x,y) = \frac{(2\mu_x\mu_y + c_1)(2\sigma_{xy} + c_2)}{(\mu_x^2 + \mu_y^2 + c_1)(\sigma_x^2 + \sigma_y^2 + c_2)}$$







Performances

Experiment 1: Heterogeneity vs Homogeneity

SSIM	Train Set	Test Set
Animals	0.8874 ± 0.0493	0.6869 ± 0.1606
Faces	0.9168 ± 0.0524	0.9012 ± 0.0537

Experiment 2 : Various interested cases

Dataset	SSIM (Test Set)
40% occultation	0.8692 ± 0.0590
2x20% boxes	0.8553 ± 0.0617

Outlook

- Variation of SSIM subjects to occultation ratio.
- SSIM is arbitrary occultation shapes.

References

- Fawzi et.al. Image Inpainting through Neural Networks hallucinations. 2016
- Burlin et.al. Deep Image Inpainting. 2017
- Ham et.al. Variational Image Inpainting. 2018
- Pinho et.al.Unsupervised Learning for Concept Detection in Medical Images: A Comparative Analysis. doi : 10.3390/app8081213 . 2018
- Yu et.al. Generative Image Inpainting with Contextual Attention. 2018
- Nazeri et.al. EdgeConnect: Generative Image Inpainting with Adversarial Edge Learning. 2019
- Erofeev in Towards Data Science Image Inpainting: Humans vs. AI. 2018
- Takahashi et.al. Adaptive Image Inpainting Algorithm based on generalized Principal Component Analysis. 2016