Sparse Coding Minimizing ℓ_0: Image Inpainting

Mathematical Models and Methods for Image Processing

Giacomo Boracchi

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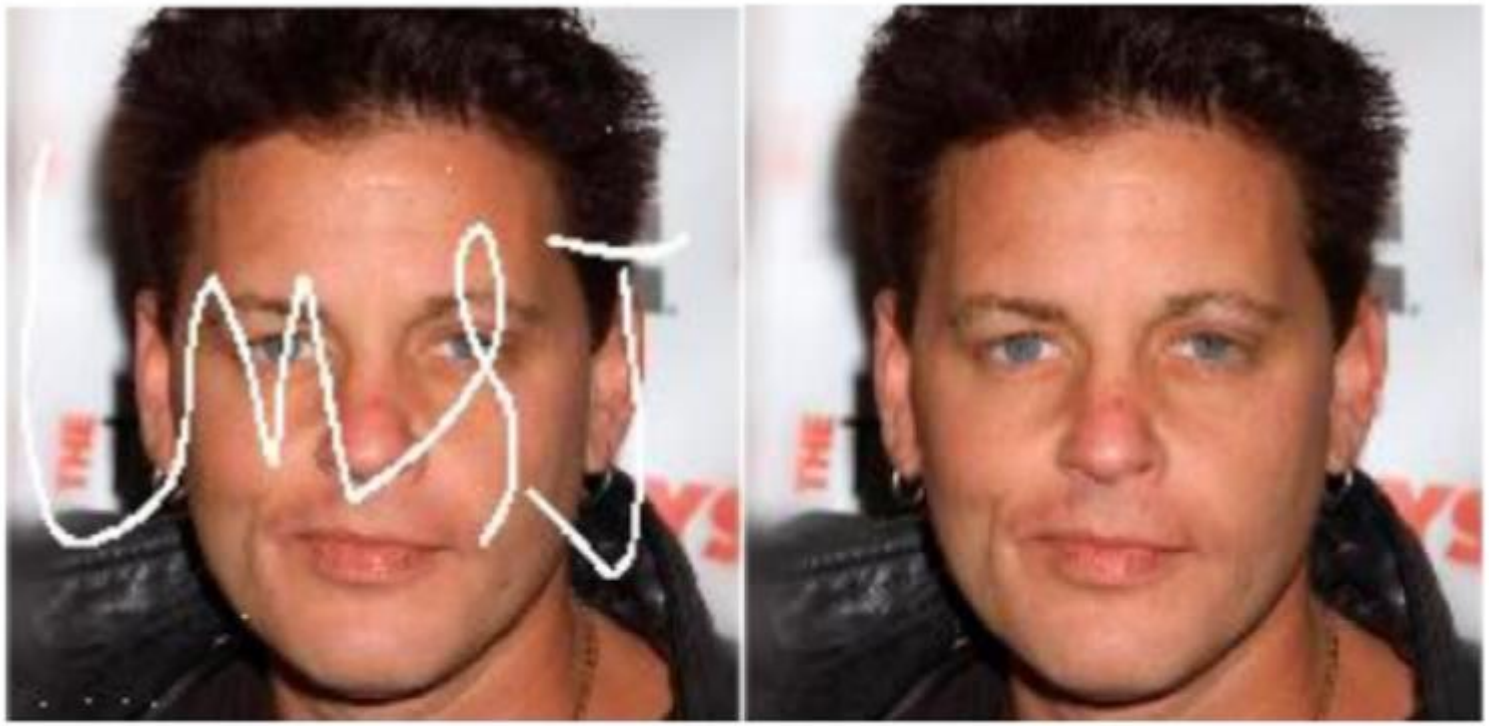
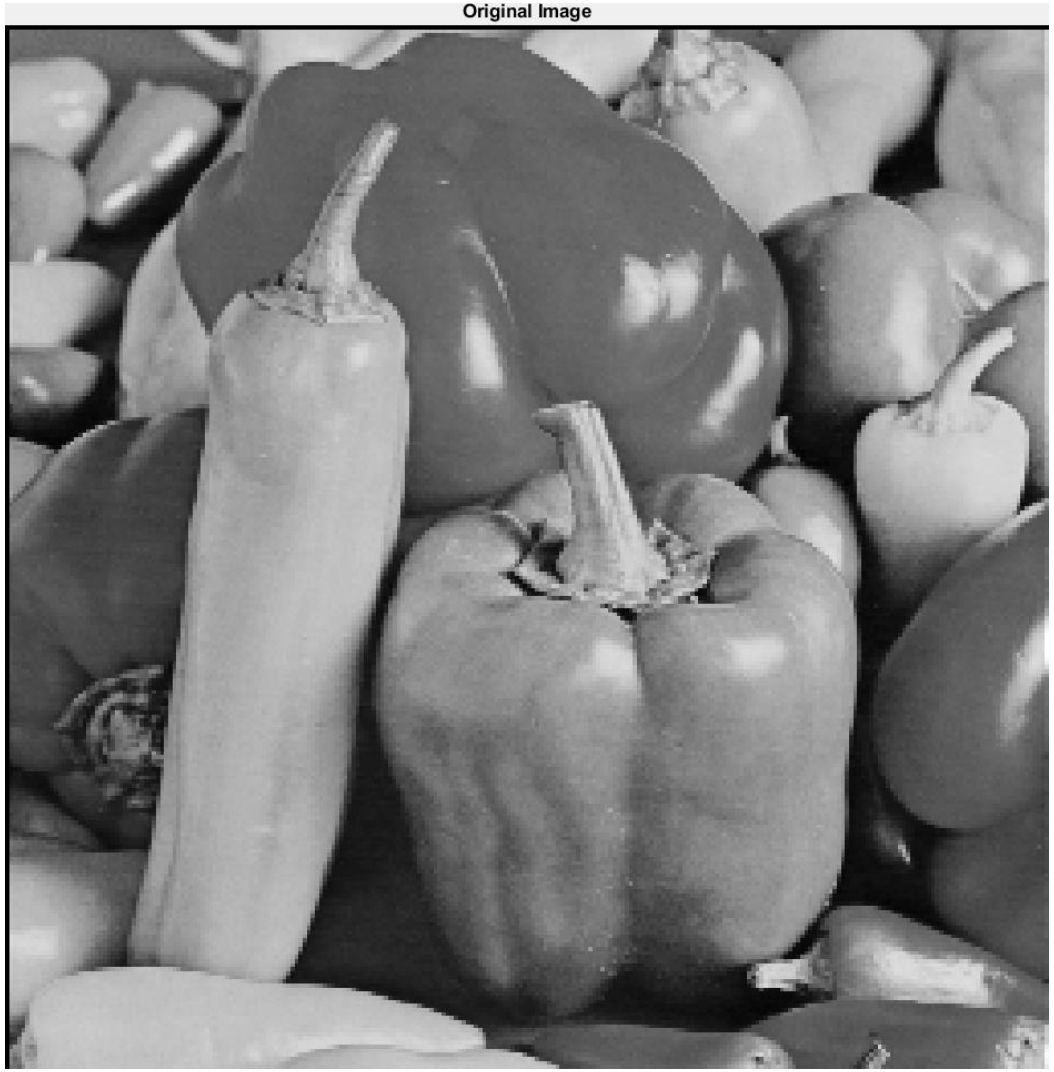
Image Inpainting



(a) **Masked-Image** (b) **Inpainted-Image**

Jam, Jireh, et al. "A comprehensive review of past and present image inpainting methods." *Computer vision and image understanding* 203 (2021): 103147.

Image Formation Model



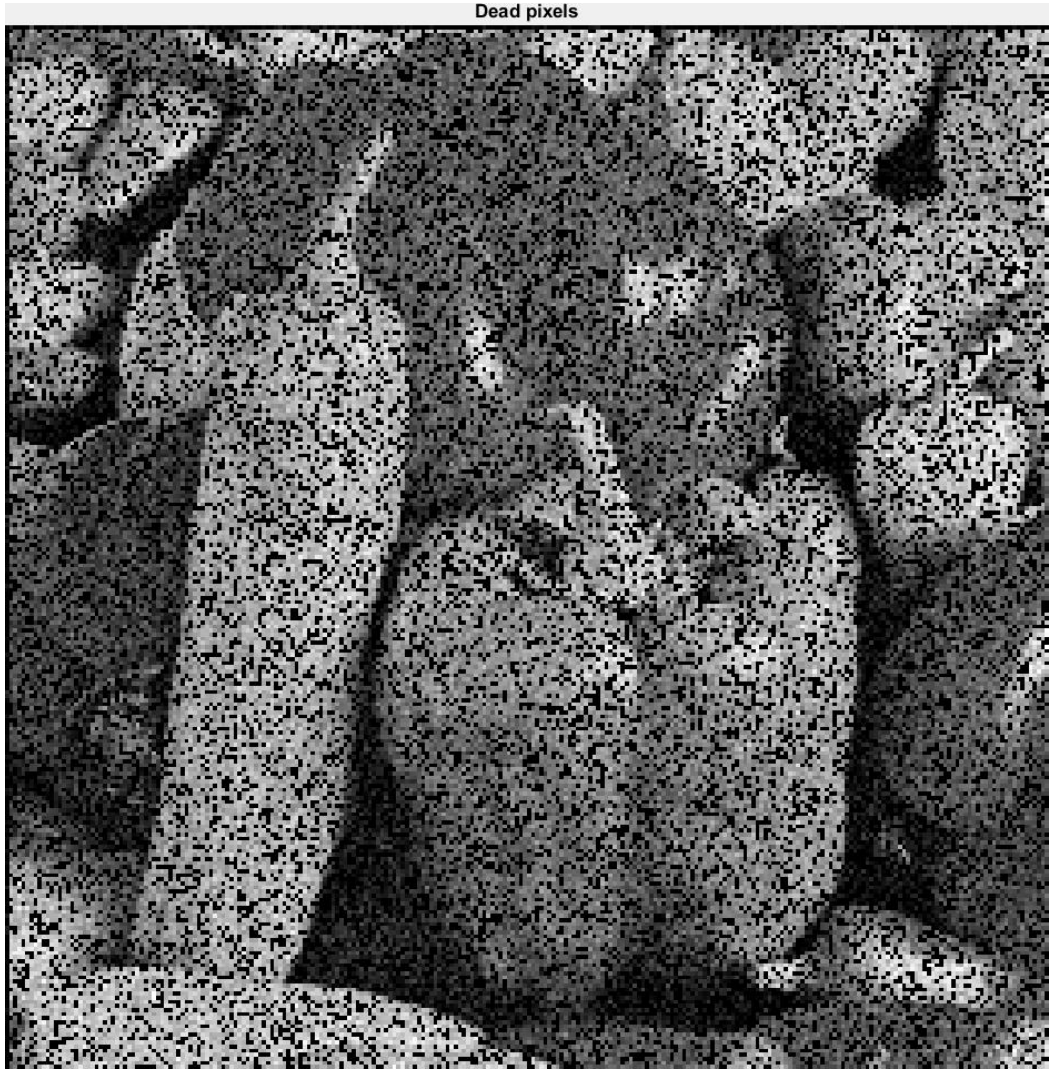


Image Inpainting

Assignment

Image Inpainting Enforcing Sparsity

G. Boracchi

Denoising via Sparse Coding

Take the setup of Assignment 3 (denoising via DCT)

- Load the dictionary provided (learned from natural images)
  - Add a constant atom and avoid average subtraction
- Replace the analisys and the thresholding of patch s_i with the sparse coding using the OMP with respect to the inpainted dictionary $P_i D$. Use as a threshold for residual

$$\delta_i = 1.15 \cdot p \cdot \sigma \cdot \sqrt{\frac{p^2 - m}{p^2}}$$

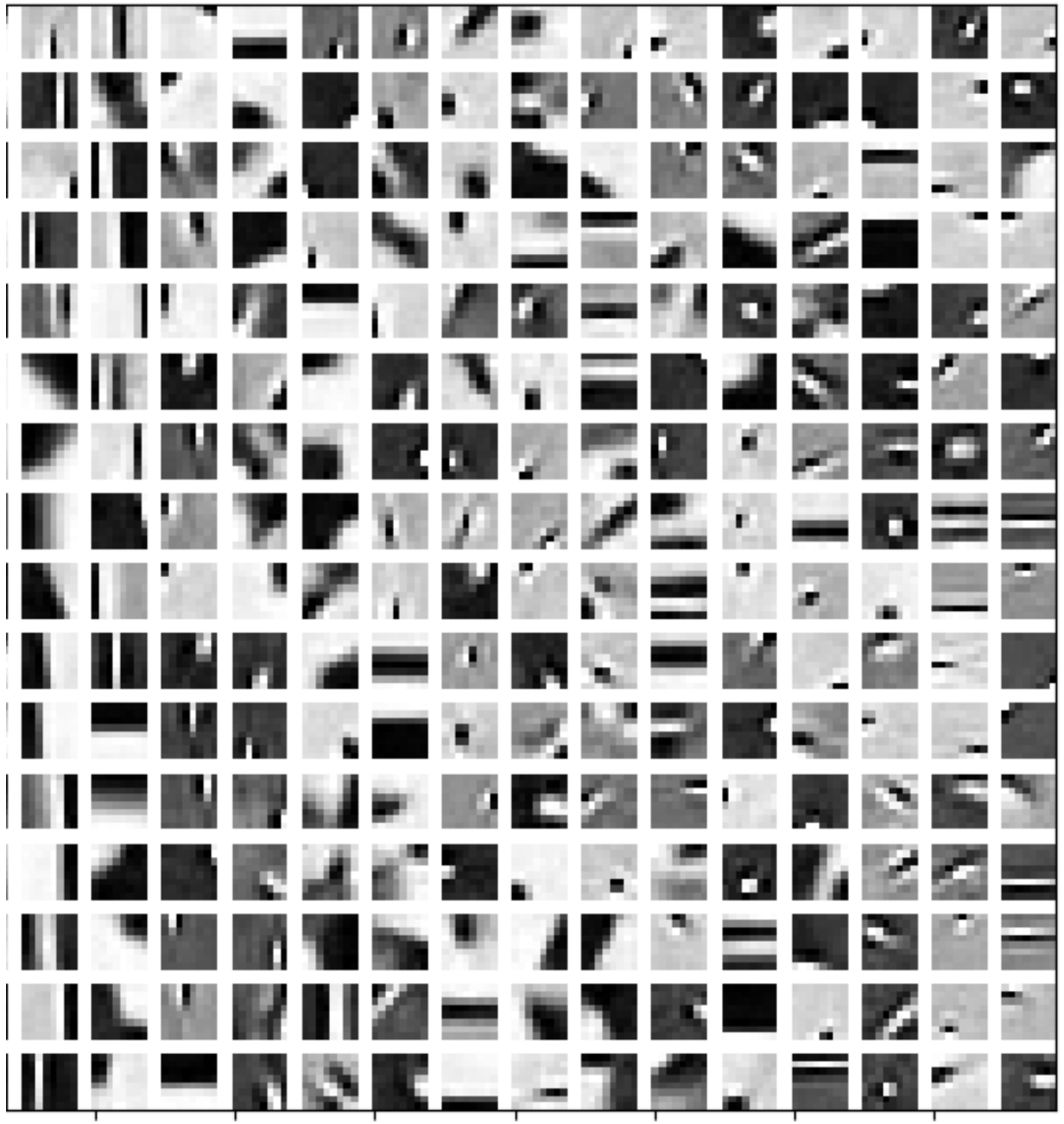
  being m the number of zero entries in s_i
- Perform the synthesys of each patch using the original dictionary D

The Dictionary from KSVD

+ remember to add a constant atom in your dictionary!

In denoising we have been reconstructing only zero-mean patches, as the mean removed before denoising and added back afterwards.

In inpainting the patch mean does not need to be preserved (as this is severly modified by inpainted pixels). We leave the reconstruction algorithm the freedom to set back the correct patch mean



G. Boracchi