Learning Sparse Representations for Image and Signal Modeling

PhD Course, DEIB

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Assignments

Assignments on Dictionary Learning

The uploaded zip package contains a few snippets to fill in:

- Implement K-SVD Dictionary Learning

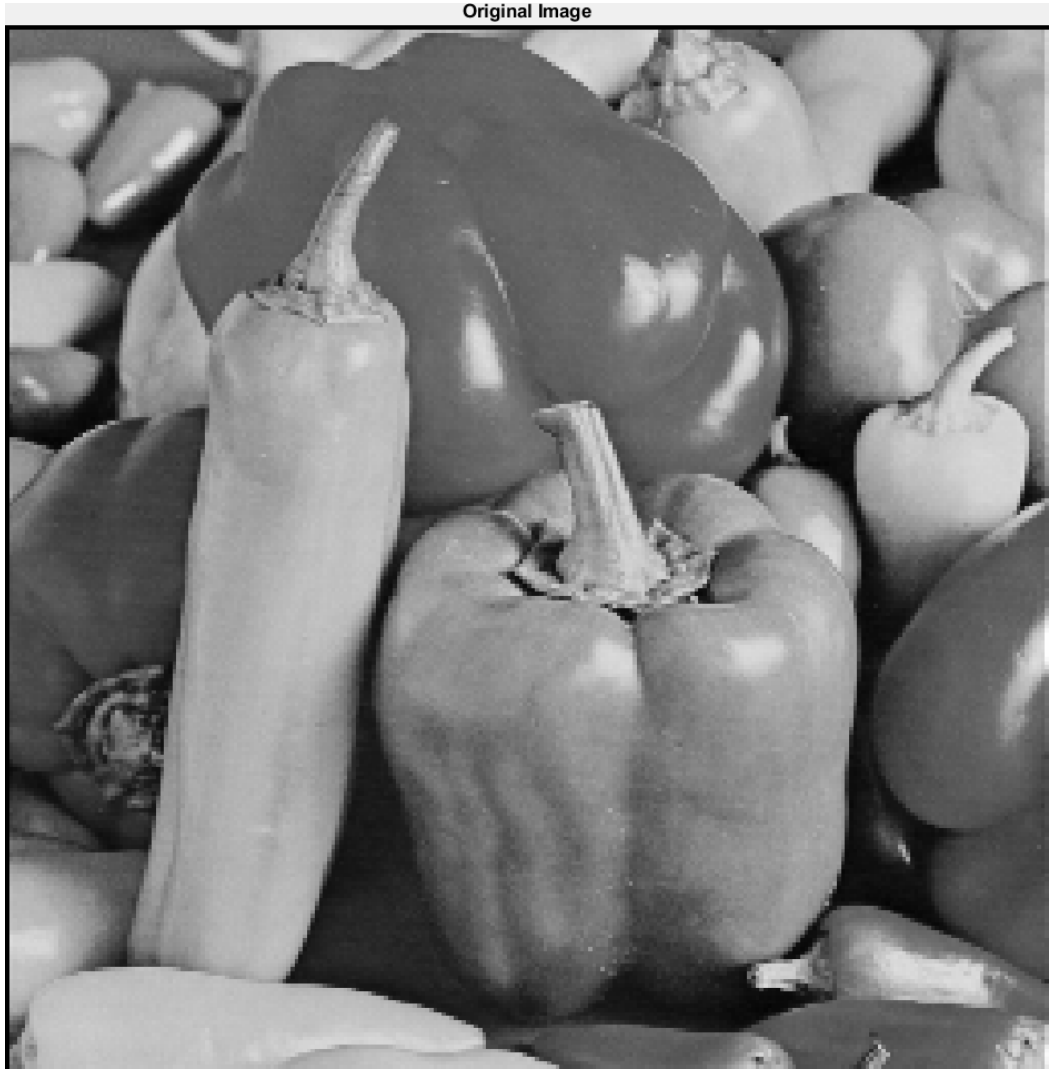
For the sparse coding stage involved you can use the OMP functions previously developed

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



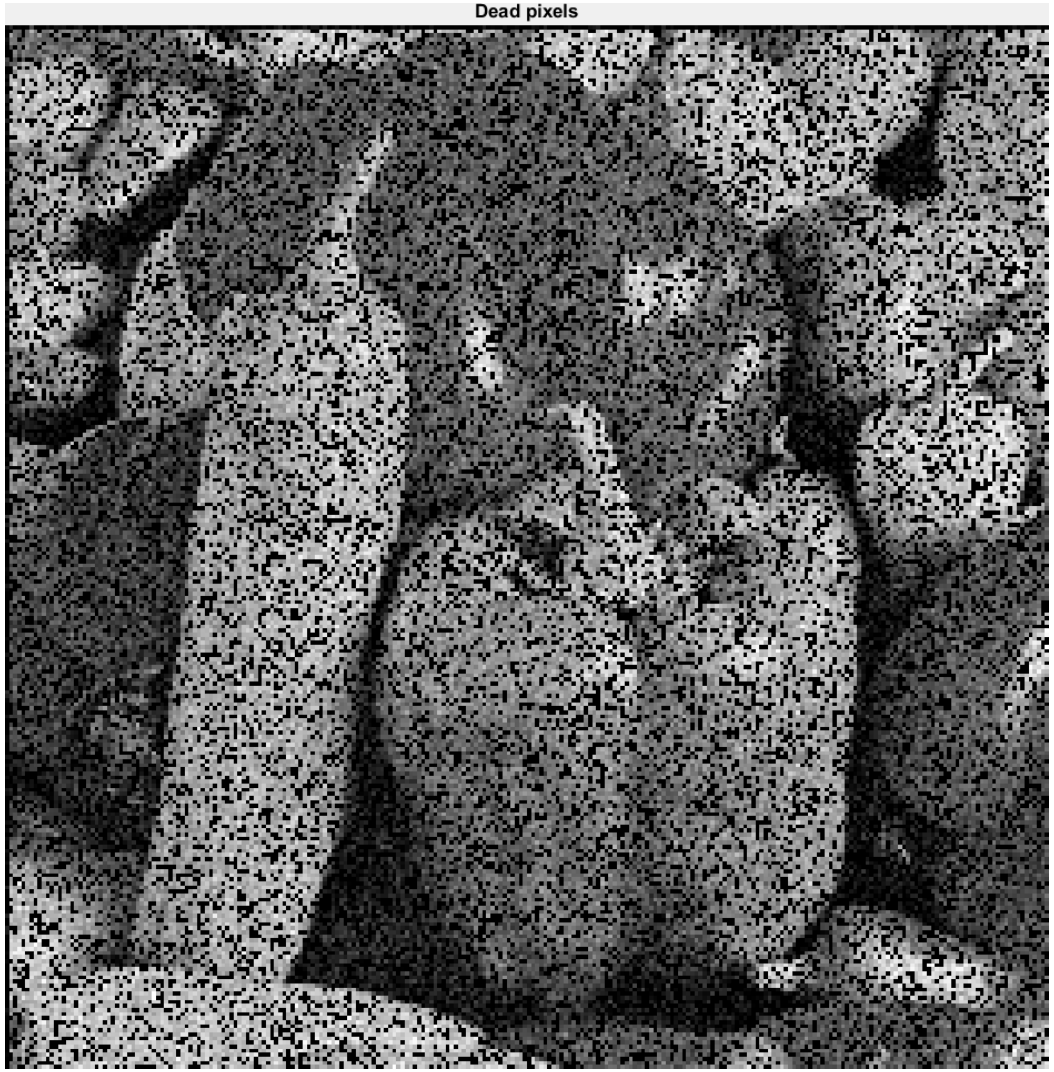


Image Inpainting

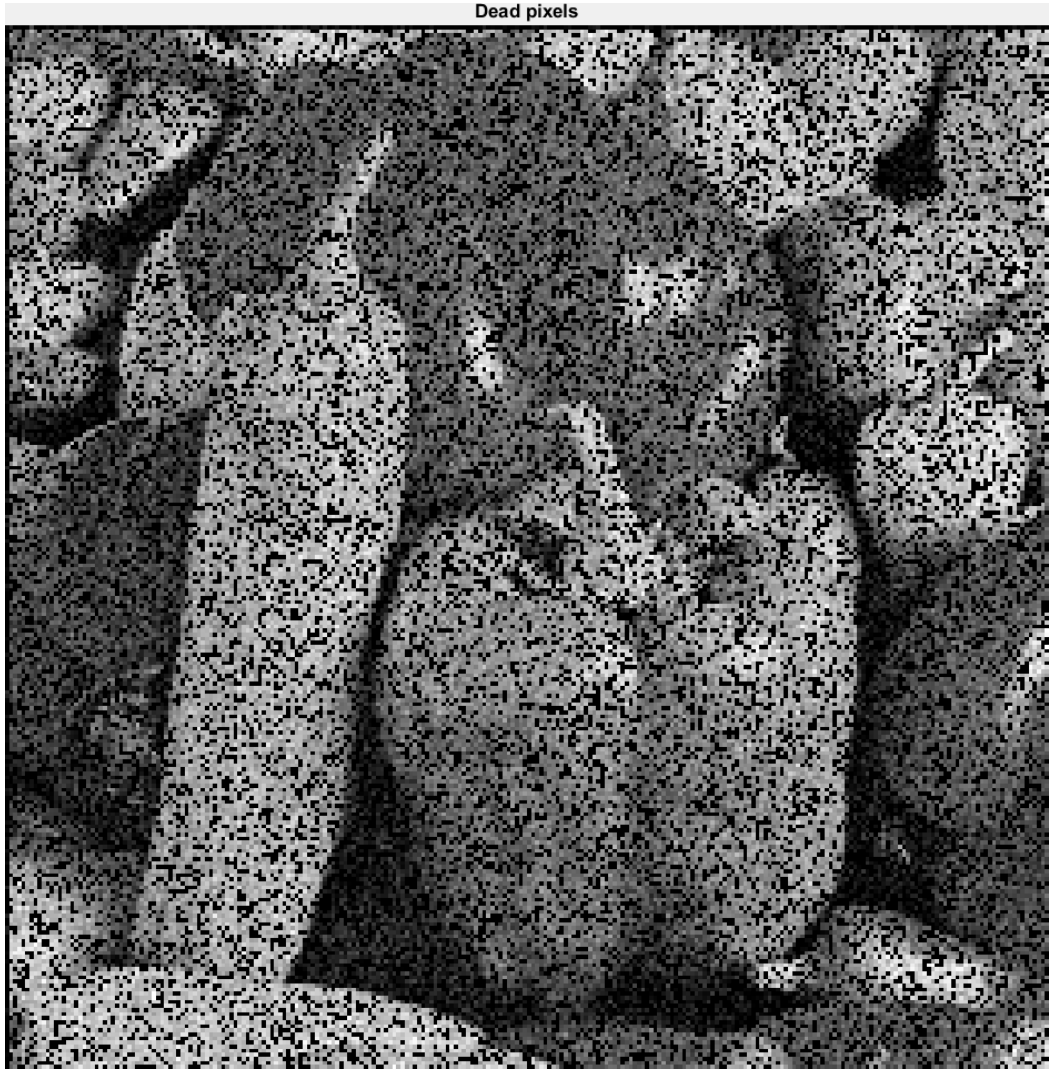


Image Inpainting via Sparse Coding

Implement image inpainting by sparse coding

- 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!