Self-Similarity Prior

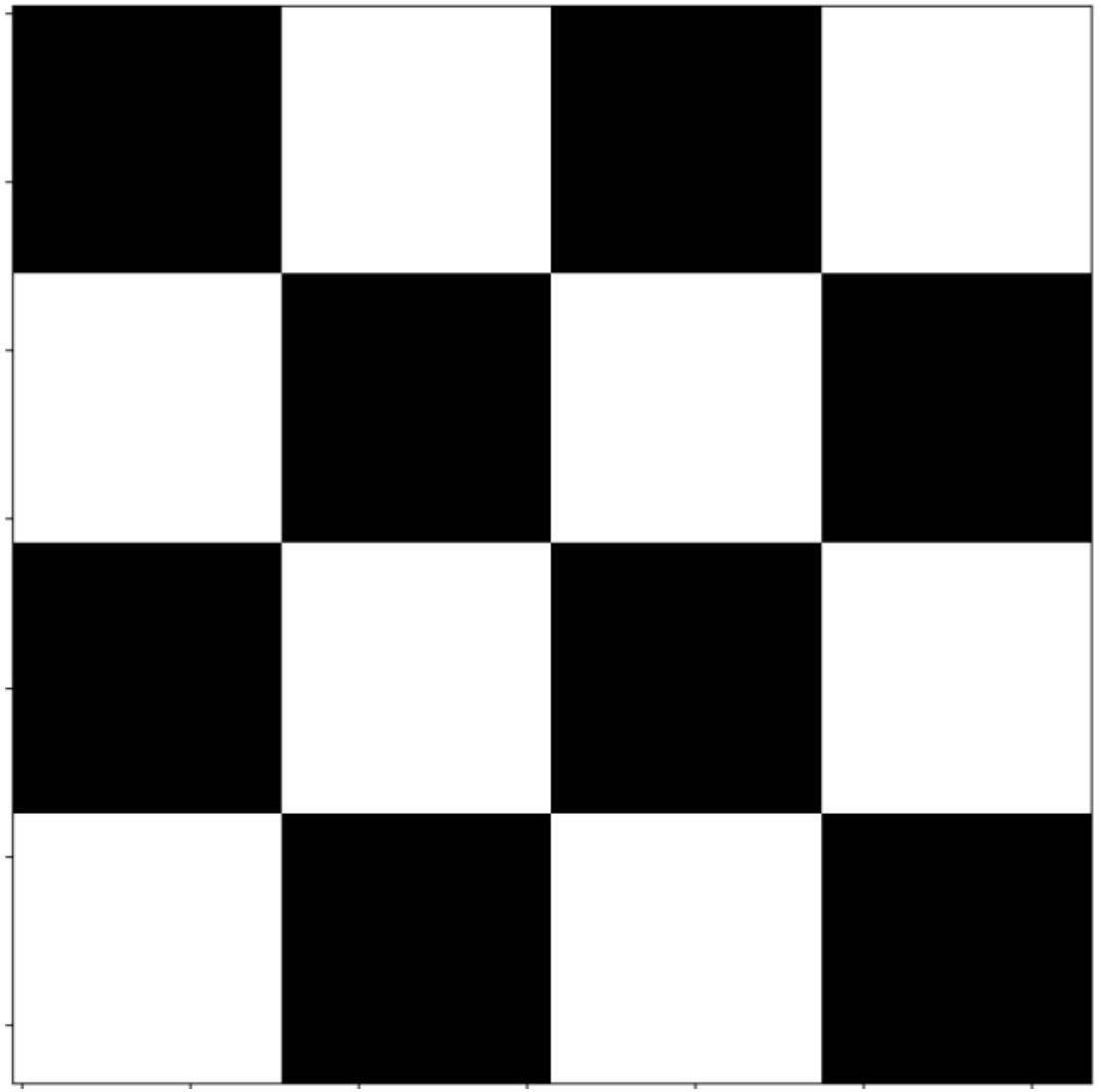
Mathematical Models and Methods for Image Processing

Edoardo Peretti

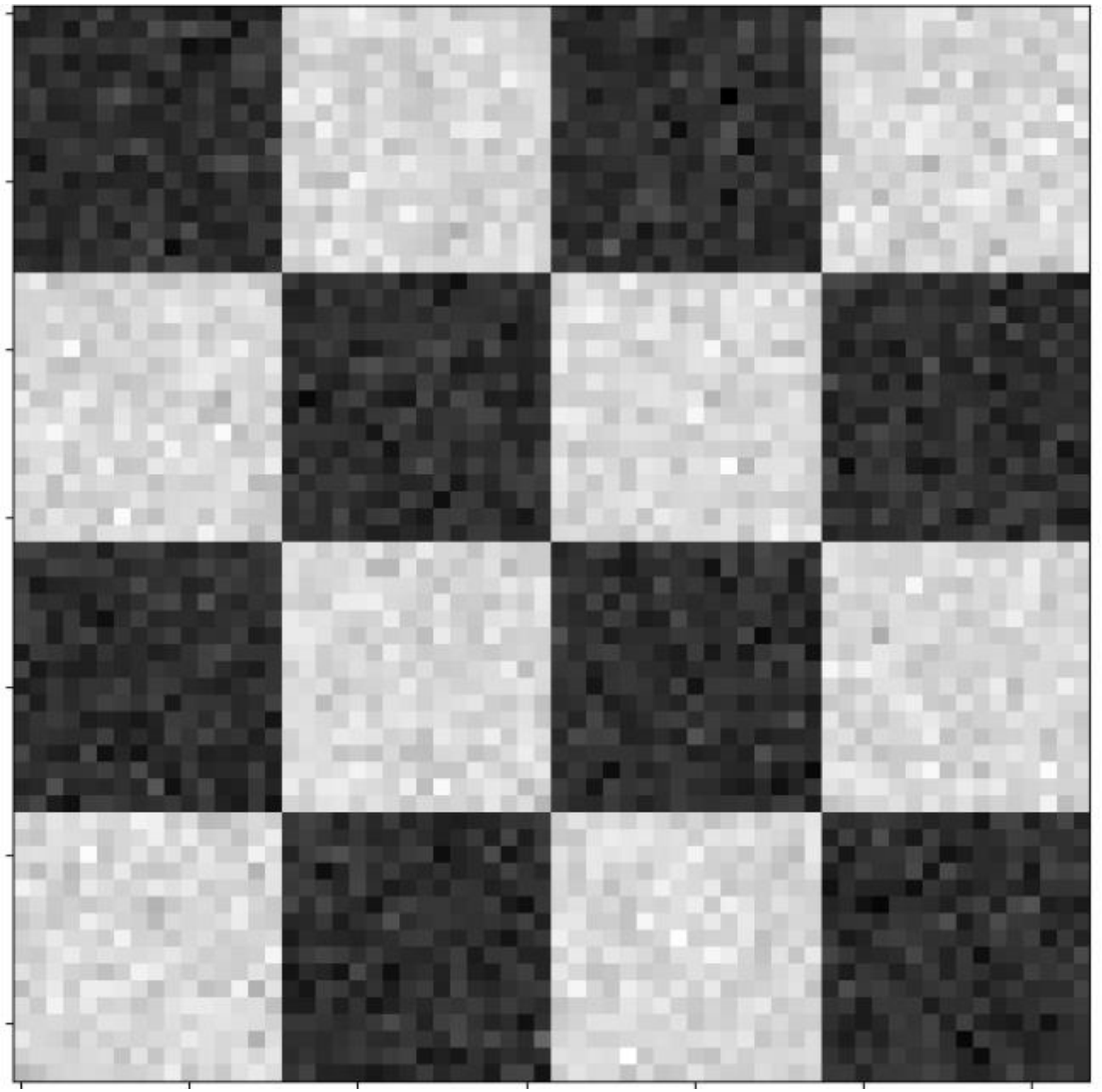
April 8th 2025

Denoising by convolution

Original



Noisy



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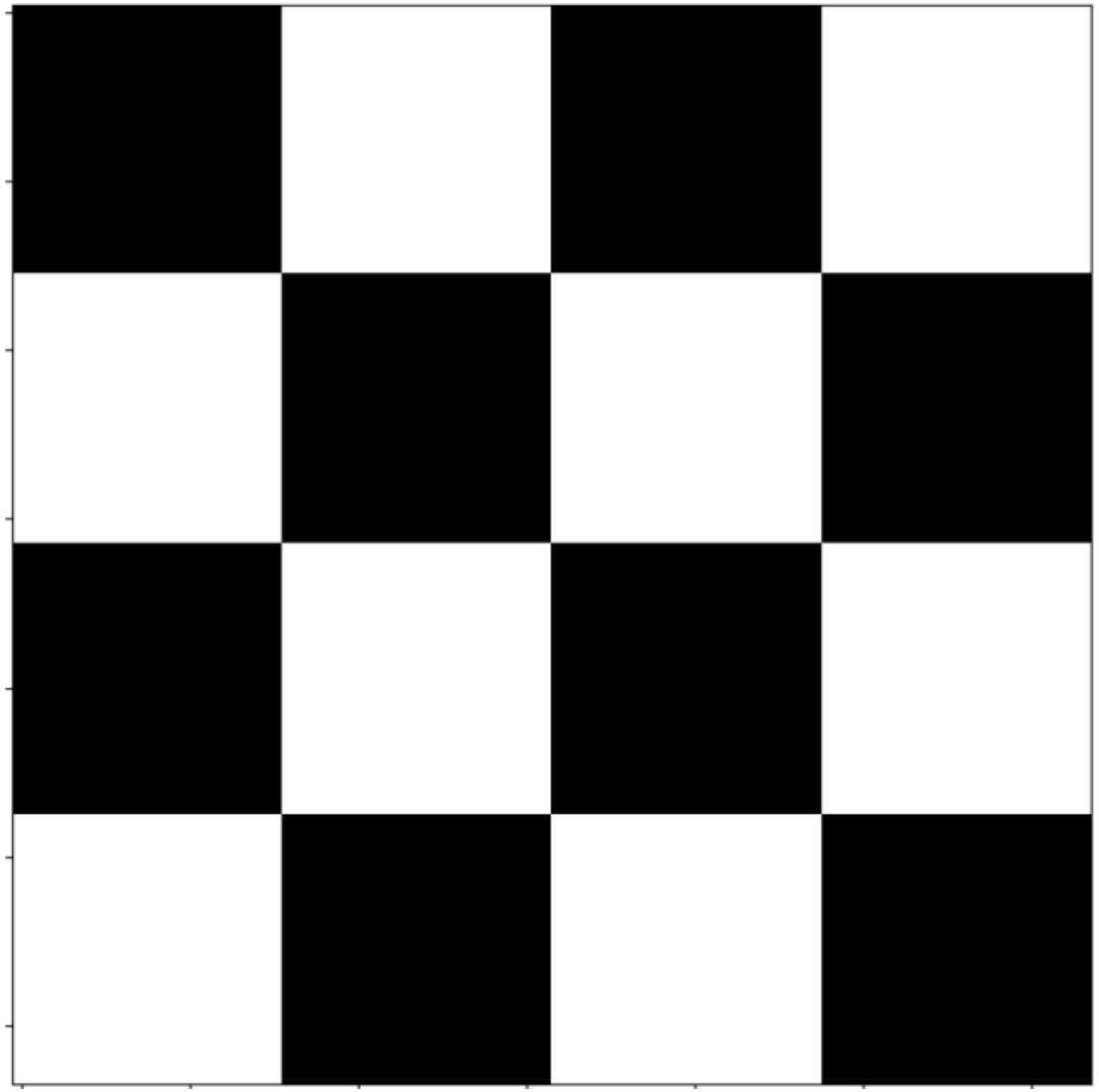
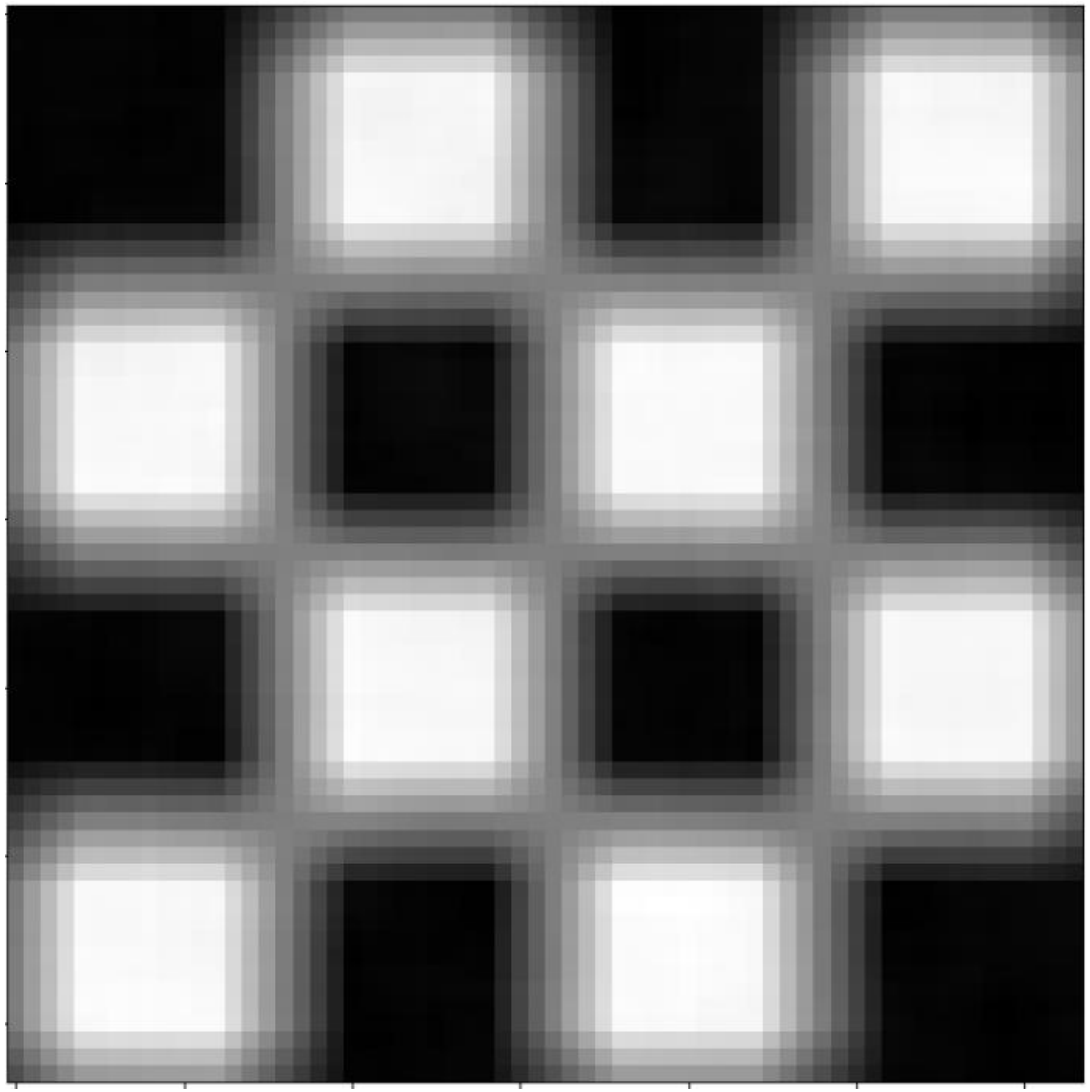
Denoising by convolution

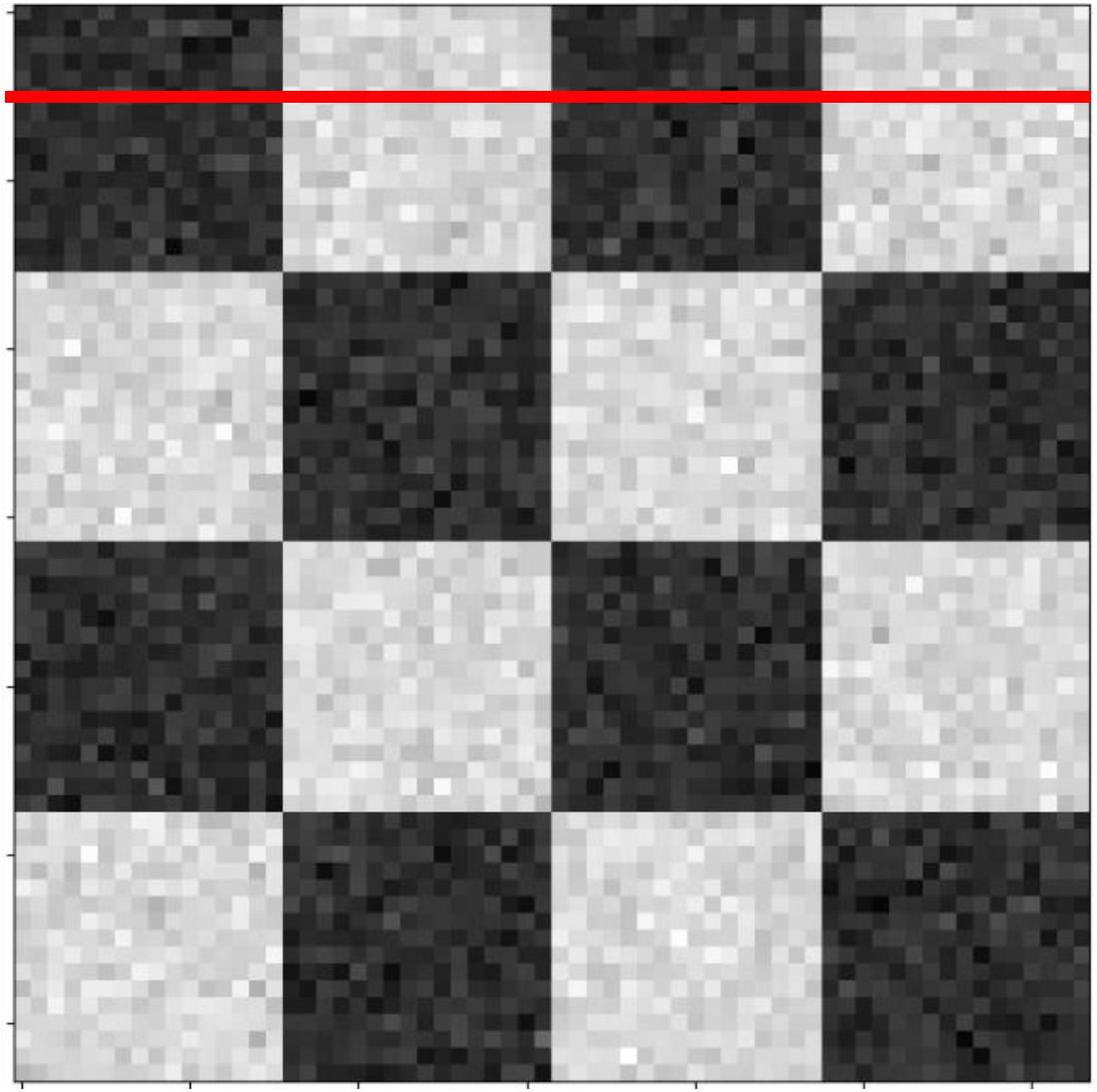
Original

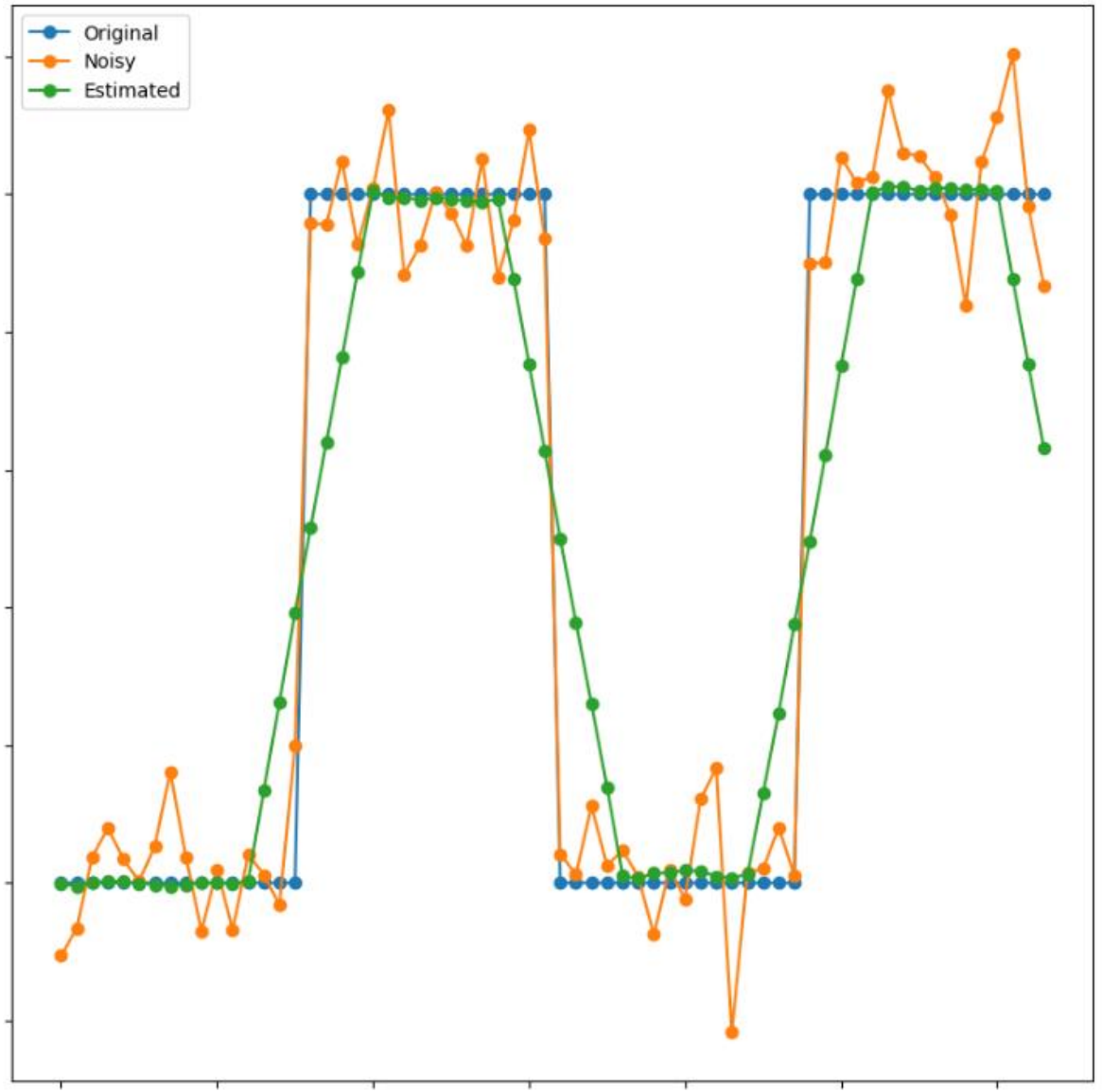


Estimated



Cross Section





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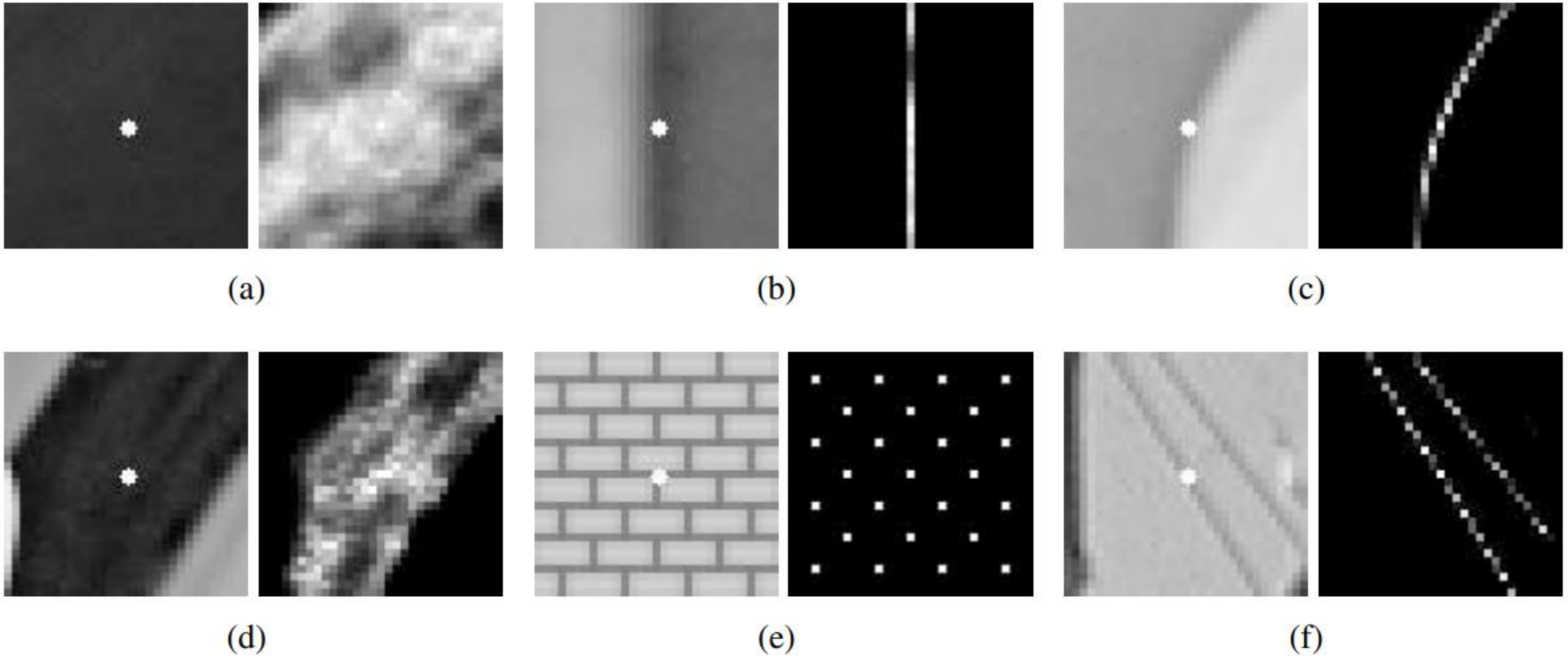
Weights in Nonlocal Means



Buades, Antoni, Bartomeu Coll, and J-M. Morel. "A non-local algorithm for image denoising." *2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05)*. Vol. 2. IEEE, 2005.

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Assignment: Implement the non-local means algorithm

- The estimate is point-wise: you cannot use the step to speed up computation
- Try using:
  - $\sigma = 20$
  - R = 25
  - M = 49 (7x7 patches)
- To develop and debug, start by cropping a portion of image

Antoni Buades, Bartomeu Coll, and Jean-Michel Morel, Non-Local Means Denoising, Image Processing On Line, 1 (2011), pp. 208–212. https://doi.org/10.5201/ipol.2011.bcm_nlm