

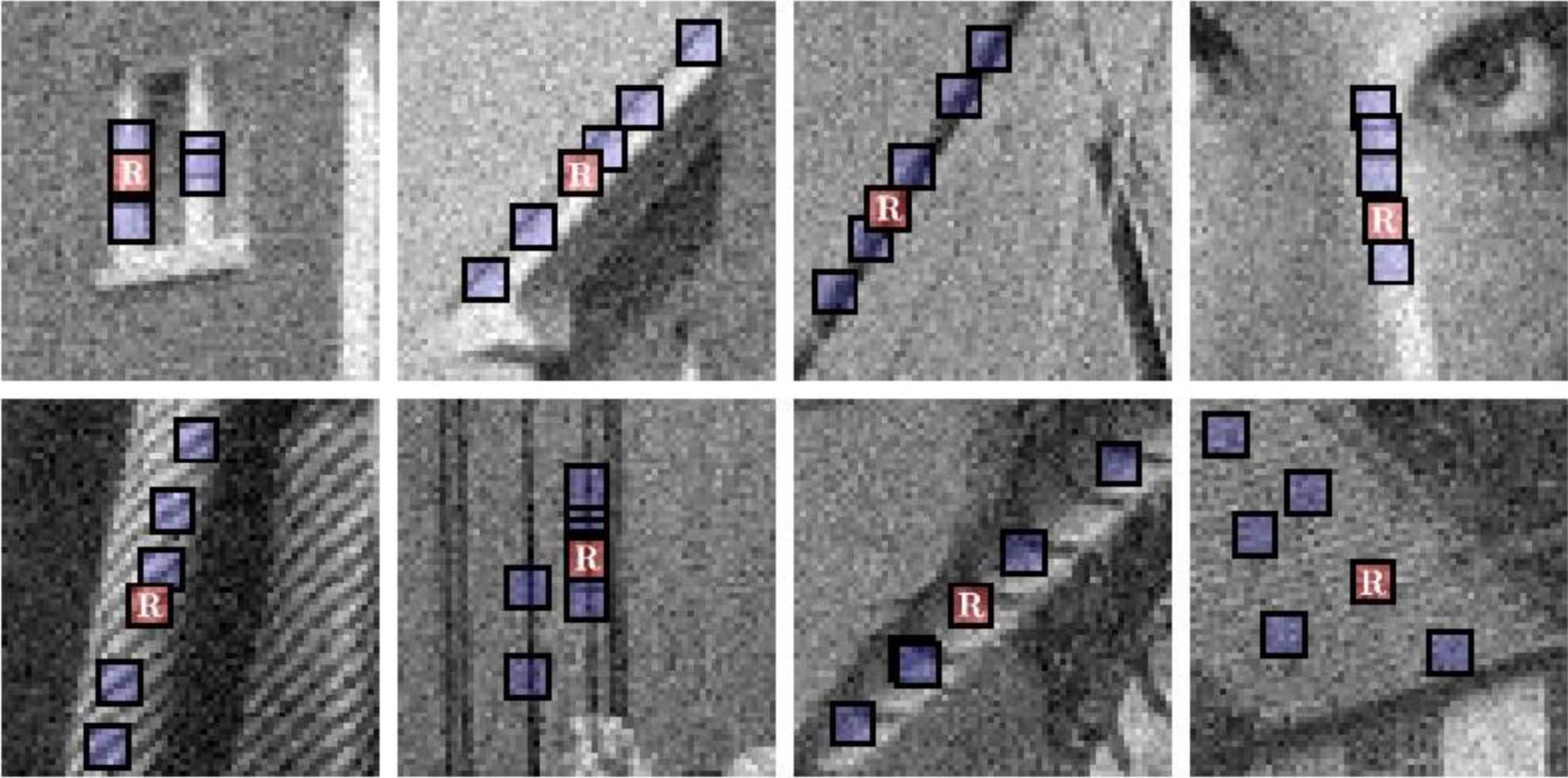
BM3D

Mathematical Models and Methods for Image Processing

Edoardo Peretti

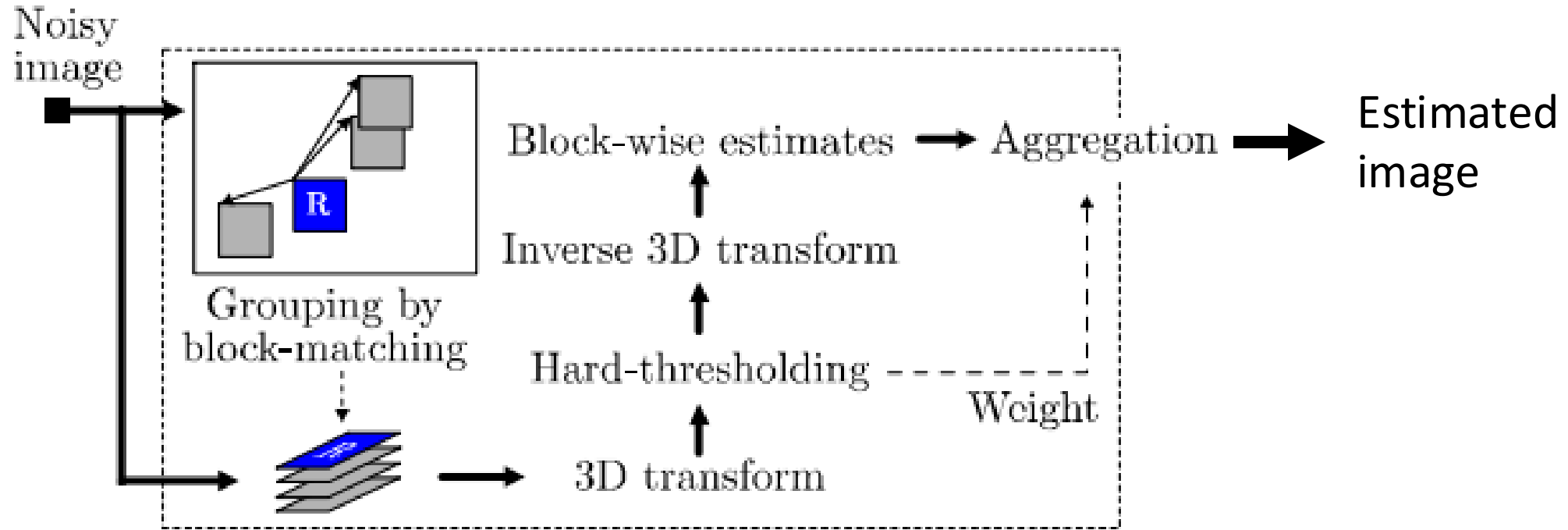
April 8th 2025

Grouping in BM3D



Dabov, Kostadin, et al. "Image denoising by sparse 3-D transform-domain collaborative filtering." *IEEE Transactions on image processing* 16.8 (2007): 2080-2095.

The (partial) BM3D pipeline



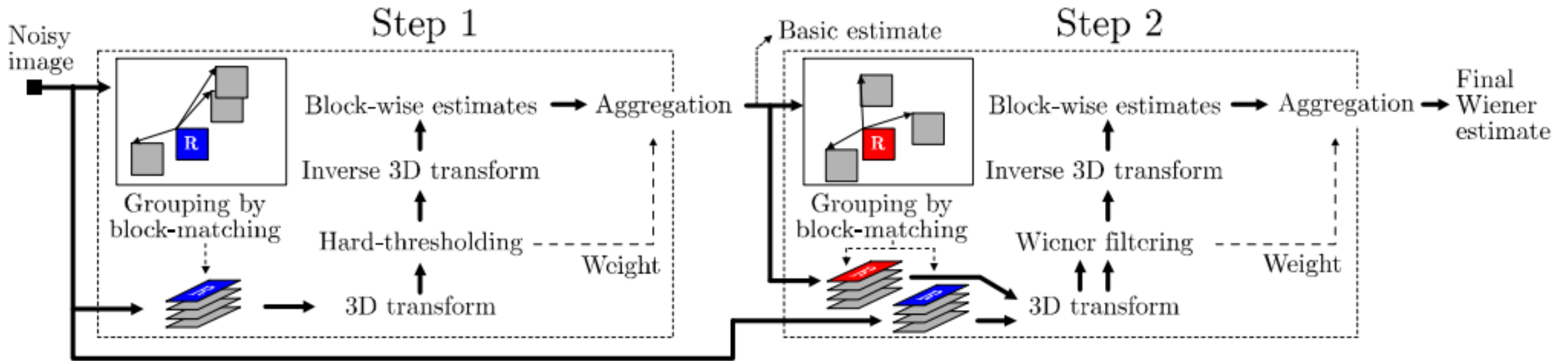
Dabov, Kostadin, et al. "Image denoising by sparse 3-D transform-domain collaborative filtering." *IEEE Transactions on image processing* 16.8 (2007): 2080-2095.

Optional Assignment 1

Implement both steps of the BM3D algorithm

- $M=64$ (8x8 patches)
- $K=16$ maximum number of patches in the group
- $R=25$ size of the squared search neighborhood
- $\epsilon = 0.05, \frac{\left\|s_{r,c} - s_{r',c'}\right\|_2^2}{M} < \epsilon$
- $\tau = 2.7\sigma$
- step=6

The BM3D pipeline



Dabov, Kostadin, et al. "Image denoising by sparse 3-D transform-domain collaborative filtering." *IEEE Transactions on image processing* 16.8 (2007): 2080-2095.

Optional Assignment 2

Implement both steps of the BM3D algorithm

- $M=64$ (8x8 patches)
- $K=16$ maximum number of patches in the group
- $R=25$ size of the squared search neighborhood

- $\epsilon = 0.006, \frac{\left\| \hat{\mathbf{y}}_{r,c} - \hat{\mathbf{y}}_{r',c'} \right\|_2^2}{M} < \epsilon$

- $\tau = 2.7\sigma$

- $\text{step}=6$