

Data-adaptive Filtering and the State of the Art in Image Processing

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Recent approaches to processing and restoration of images and video have brought together several powerful data-adaptive methods from different fields of work. Examples include Moving Least Square (from computer graphics), the Bilateral Filter and Anisotropic Diffusion (from computer vision), Boosting and Spectral Methods (from Machine Learning), Non-local Means (from Signal Processing), Bregman Iterations (from Applied Math), Functional Gradient Descent, Kernel Regression and Iterative Scaling (from Statistics). These approaches are deeply connected, and their use has led to the present state of the art in imaging applications. In this talk, I will present a practical and unified framework for understanding some common underpinnings of these methods. This leads to new insights and a broad understanding of how these diverse methods interrelate. I will also discuss the statistical performance of the resulting algorithms, illustrate connections between these techniques and empirical Bayes procedures.