

From TV-L1 Model to Convex & Fast Optimization Models for Image & Geometry Processing

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A “classical” model for image denoising is the TV-L2 model, in which regularity is controlled by total variation and data fidelity is measured by the L2 norm. Recently, it has been recognized that a corresponding TV-L1 model has particularly attractive features and thus have received much study. The TV-L1 model not only possesses robust contrast-invariant properties, but it also leads to the convexification of several non-convex image processing models, making them less sensitive to initial guesses and faster to minimize. In this talk, we will review some of the recent developments in this area. We show how to convexify non-convex optimization problems including shape regularization, image segmentation, classification defined on an arbitrary graph, and the level set method in the context of free boundary problems. Another important advantage of using convex optimization models is to provide fast algorithms. We introduce continuous optimization algorithms based on operator splitting, which reveal to be faster than graph-cut combinatorial optimization techniques.

This is a joint work with Xavier Bresson, UCLA.