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Applications of Computational Convex Analysis

Computational Convex Analysis algorithms have been rediscovered several times in the past by researchers from different fields. To further communications between practitioners, we review the field of Computational Convex Analysis, which focuses on the numerical computation of fundamental transforms arising from convex analysis. Current models use symbolic, numeric, and hybrid symbolic-numeric algorithms. Our objective is to disseminate widely the most efficient numerical algorithms useful for applications in image processing (computing the distance transform, the generalized distance transform, and mathematical morphology operators), partial differential equations (solving Hamilton–Jacobi equations, and using differential equations numerical schemes to compute the convex envelope), max-plus algebra (computing the equivalent of the Fast Fourier Transform), multi-fractal analysis, etc. The fields of applications include, among others, computer vision, robot navigation, thermodynamics, electrical networks, medical imaging, and network communication.