Doctoral School of Information and Biomedical Technologies Polish Academy of Sciences

Subject
Convex optimization in image and signal processing

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Project Description

Problems related to image processing and image classification rely on recovery of an unknown vector x (signal or image) from noisy or incomplete data y. This problem is modeled by minimization problems of regularized cost/energy functions. Typically, a cost/energy function is the sum of a number of functions such as data-fidelity term, regularized term and other terms specific to particular other features of the problem considered, e.g. [3], [4].

Each term can be a smooth or a nondifferentiable function, some terms are usually convex, other are not. This leads to optimization problems with particular forms of the cost/energy functions. Such special structure of cost/energy functions allow to elaborate algorithms which exploit the structure in an efficient way and which allow to deal with big data problems, [1].

The aim of the project is to focus on convex optimization problems of minimizing the sum of functions which originate from particular problems of image processing (denoising, deblurring, reconstruction). These problems can be investigated from algorithmic point of view as well as from the point of view of applications coming from different domains, e.g. cultural heritage, geodesy, medicine and others. Prerequisite knowledge is elementary analysis and algebra, Matlab, programming languages Python or R.

Bibliography

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