Exam instructions for the course “Smooth and non-smooth optimisation for imaging”

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Option I: ℓ_0 algorithms

- Using the notebook seen in the lab sessions, implement the iterative hard thresholding (IHT) algorithm to solve the ℓ_2-ℓ_0 image deconvolution problem. Compare the solution with the one obtained by ISTA/FISTA for the ℓ_2-ℓ_1 problem.
- Using the explicit expression of the proximal operator of CEL0 seen in class and available, e.g., here (`http://proximity-operator.net/nonconvexfunctions.html`) implement the forward-backward splitting algorithm solving the ℓ_2-CEL0 deconvolution problem. Compare with the solutions obtained by the previous methods (starting from the same initial value). What do you observe?
- * (optional) For ℓ_2-CEL0 compare the solution obtained by FB splitting and the iterative-reweighted ℓ_1 algorithm (using the explicit expression of the ℓ_1 weights seen in class) from the same initial point and regularisation parameter. What do you observe?
- Plot the decay of the cost functional in all cases above starting from the same initial point and make some empirical consideration on the quality of the result obtained and the speed of convergence of the algorithms.

Option II: your problem solved by the algorithms seen in class

- Contact me at calatroni@i3s.unice.fr for discussing which optimisation problems you need to solve in your research activity.
- We will discuss together which algorithms among the ones seen in class could be used in your case (smooth/nonsmooth, convex/nonconvex, with/without inertia. . .)

Questions?

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