Convex Optimization for Computer Vision
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Exercises: E. Laude
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Weekly Exercises 10

Room 01.09.014
Friday, 8.7.2016, 09:00-11:00
Submission deadline: Wednesday, 6.7.2016, 14:15, Room: 02.09.023

Theory (4 Points)

Exercise 1 (4 points)**.** The Huber penalty $h_\varepsilon : \mathbb{R} \to \mathbb{R}$ is given as

$$h_\varepsilon(x) = \begin{cases} \frac{x^2}{2\varepsilon} & \text{if } |x| \leq \varepsilon, \\ |x| - \frac{\varepsilon}{2} & \text{otherwise.} \end{cases}$$

1. Show that the huber penalty can be expressed as the infimal convolution of the functions $f : \mathbb{R} \to \mathbb{R}$ with $f(x) := \frac{x^2}{2\varepsilon}$ and $g : \mathbb{R} \to \mathbb{R}$ with $g(x) := |x|$:

$$h_\varepsilon(x) = (f \,\square\, g)(x).$$

2. Compute the convex conjugate of the function $t : \mathbb{R}^{2N} \to \mathbb{R}$ defined as

$$t(x) := \sum_{i=1}^{2N} h_\varepsilon(x_i).$$

Optimization Challange (12 Points)

Exercise 2 (12 Points)**.** Complete the optimization challange. Only reasonable attempts will be counted.