Differentiable Lipschitz functions and subdifferentials.

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Abstract

We focus on the difference between differentiable versus strict differentiable locally Lipschitz functions from the view point of nonsmooth analysis: while in the latter class, all limiting Jacobians are singletons, we show that there exists a differentiable locally Lipschitz function for which the image of the limiting Jacobian map contains all nonempty compact connected subsets of matrices. In the particular case of real-valued functions, we obtain differentiable functions with surjective limiting and Clarke subdifferentias. In this case, our concrete example-scheme will also reveal that the class of such pathological locally Lipschitz differentiable functions is dense (for the topology of the uniform convergence) and spaceable (for the Lip-norm topology).

The talk is based on the works:

A. Daniilidis, R. Deville, S. Tapia-Garcia
All convex bodies are in the subdifferential of some everywhere differentiable locally Lipschitz function, *Proc. London Math. Society* (3) **129** (2024), no. 5, Paper No. e70007, 27 pp., DOI http://dx.doi.org/10.1112/plms.70007

A. Daniilidis, S. Tapia-Garcia
Differentiable functions with surjective Clarke Jacobians
hal-04952836 (Preprint 15p, 2025)