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Approximating Subdifferentials by Random Sampling of Gradients

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Abstract   Many interesting real functions on Euclidean space are differentiable almost everywhere. All Lipschitz functions have this property, but so, for example, does the spectral abscissa of a matrix (a non-Lipschitz function). In practice, the gradient is often easy to compute. We investigate to what extent we can approximate the Clarke subdifferential of such a function at some point by calculating the convex hull of some gradients sampled at random nearby points.