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Extreme non-differentiability of typical Lipschitz mappings

Contrary to the intuition and the well-known measure-theoretic statement of the Rademacher theorem that a Lipschitz mapping between finite-dimensional spaces is differentiable almost everywhere, we show that in both finite- and infinite-dimensional settings, a typical 1-Lipschitz mapping is extremely non-differentiable at a typical point of any set S it is defined on: its derivative ratios approach every operator with norm at most 1.

Moreover, when the domain is finite-dimensional and S can be covered by countably many closed, purely unrectifiable sets, this extreme non-differentiability of a typical Lipschitz mapping holds simultaneously at every point of S , for any choice of co-domain.

In this lecture, I will discuss what it means for a property to be "typical" and introduce techniques we use in the proof. This is a joint work with Michael Dymond.