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Porosity and Differentiability in Euclidean Spaces and Carnot Groups

Abstract: Rademacher's theorem states that Lipschitz functions between Euclidean spaces are differentiable almost everywhere. Investigating validity of a converse to Rademacher's theorem leads to the construction of small universal differentiability sets, which contain points of differentiability for all Lipschitz functions. Porous sets are sets with relatively large holes on arbitrarily small scales, and have applications to the study of differentiability. For instance, a universal differentiability set cannot be a countable union of porous sets. We discuss measure zero universal differentiability sets in the Heisenberg group and applications of porosity to differentiability in Carnot groups, which can be used to help prove Pansu's differentiability theorem for Lipschitz mappings.

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