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A measure characterization of the Sobolev embedding theorem and Lebesgue's differentiation theorem.

Historically, the Sobolev embedding theorem and Lebesgue's differentiation theorem have had a ubiquitous influence, playing a key role in establishing many basic results in the area of analysis. Typically, sufficient conditions on the underlying measure have been imposed in order to guarantee the availability of the aforementioned theorems.

In this talk, we will revisit these classical theorems and discuss some recent results which identify a set of conditions on the measure that are both necessary and sufficient to ensure their veracity. This is joint work with Przemyslaw Gorka (Warsaw University of Technology), Piotr Hajlasz (University of Pittsburgh), and Marius Mitrea (University of Missouri, Columbia).