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Title: On Newton–Sobolev spaces

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Newton–Sobolev spaces, as presented by N. Shanmugalingam, describe a way to extend Sobolev spaces to the metric setting via upper gradients, for metric spaces with ‘sufficient’ paths of finite length. Sometimes, as is the case of parabolic metrics, most curves are non-rectifiable. We generalize some of these results to spaces where paths are not necessarily measured by arc length. Under the assumption of a Poincaré-type inequality and an arc-chord property here defined, we obtain the density of some Lipschitz classes, relate Newton–Sobolev spaces to those defined by Hajłasz, and we also get some Sobolev embedding theorems. Finally, we illustrate some non-standard settings where these conditions hold, specifically by adding a weight to arc-length.

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