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Nonlocal of Sobolev spaces and application to nonlinear Integro-Differential Equations

We study nonlocal Sobolev-like spaces generated by symmetric p -Lévy integrable kernels. These spaces generalize classical Sobolev spaces of fractional order and are tailored for the study of a large class of nonlinear integro-differential equations (IDEs) associated with p -Lévy operators. Specifically, we will examine the well-posedness of IDEs with Dirichlet, Neumann, and Robin conditions. Additionally, to establish a nonlocal-to-local transition, we introduce a class of concentrated p -Lévy integrable functions approximating unity, which serves as the core tool to provide a nonlocal characterization of classical Sobolev spaces of the first order. This characterization plays a decisive role in establishing the transition from the nonlocal setting to the local one e.g., the convergence of solutions of IDEs to solutions of the corresponding nonlinear PDEs. This presentation is combination of recent joint works with Moritz Kassmann [1-4].

References.

- [1] Guy Foghem and Moritz Kassmann. A General Framework For Nonlocal Neumann Problems. *Commun. Math. Sci.* (22), 1, 2024.
- [2] Guy Foghem. Stability of complement value problems for p -Lévy operators. *Preprint: Arxiv: 2303.03776*, 2023.
- [3] Guy Foghem. A remake on Brezis-Bourgain-Mironescu characterization of Sobolev spaces. *Partial Differential Equations and Applications* 4 (2), 16, 2023.
- [4] Guy Foghem. L^2 -Theory for nonlocal operators on domains *PhD Thesis, Bielefeld Universität*, 2020.