

WEIGHTED ANALYTIC REGULARITY FOR THE INTEGRAL FRACTIONAL LAPLACIAN IN POLYGONS

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ABSTRACT

In this talk we consider PDEs involving fractional powers of the Laplacian $(-\Delta)^s$ for $s \in (0, 1)$, using the singular integral definition of such operators. Solutions to fractional PDEs are known to lose regularity near the boundary of the computational domain. Finite regularity results on Lipschitz domains in Sobolev spaces and Besov spaces have recently been shown, [2].

Here, we establish a precise description of the regularity of solutions for piecewise analytic data in suitably weighted Sobolev spaces reflecting both the analytic nature inside the domain and the anisotropic singular behaviour near the boundary. Unlike local elliptic operators in polygons, fractional operators in polygons require not only vertex-weighted but also additionally edge-weighted spaces.

Weighted analytic regularity results of our type can be used to design exponentially convergent hp -finite element approximations.

REFERENCES

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