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Obstacle problems for integro-differential operators.

We study obstacle problems for integro-differential operators of order $2s$, with $s \in (0, 1)$.

Our main result establishes the regularity of the free boundary near regular points. Namely, we show that the set of regular free boundary points is open and that the free boundary is $C^{1,\alpha}$ near those points. Furthermore, we give a fine expansion for the solution at those points.

These results were only known for the fractional Laplacian and are completely new for more general integro-differential operators. The methods we develop are purely nonlocal, and do not rely on any monotonicity formula.

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