

$S_t \circ c(h)(a_s)_{ti} c(s) + \mathfrak{S}_e m^i n(a_r)$

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Heat kernel estimates and Harnack inequalities for some Dirichlet forms with non-local parts

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We consider the Dirichlet form given by

$$\begin{aligned} \mathcal{E}(f, f) &= \frac{1}{2} \int_{\mathbb{R}^d} \sum_{i,j=1}^d a_{ij}(x) \frac{\partial f(x)}{\partial x_i} \frac{\partial f(x)}{\partial x_j} dx \\ &+ \int_{\mathbb{R}^d \times \mathbb{R}^d} (f(y) - f(x))^2 J(x, y) dx dy. \end{aligned}$$

Under the assumption that the $\{a_{ij}\}$ are symmetric and uniformly elliptic and with suitable conditions on the nonlocal part, we obtain upper and lower bounds on the heat kernel of the Dirichlet form. We also prove a Harnack inequality and a regularity theorem for functions that are harmonic with respect to \mathcal{E} .