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Lipschitz Regularity of Solutions for Mixed Integro-Differential Equations

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We establish new Hoelder and Lipschitz estimates for viscosity solutions of a large class of elliptic and parabolic nonlinear integro-differential equations, by the classical Ishii-Lions's method. We thus extend the Hoelder regularity results recently obtained by Barles, Chasseigne and Imbert (2011). In addition, we deal with a new class of nonlocal equations that we term mixed integro-differential equations. These equations are particularly interesting, as they are degenerate both in the local and nonlocal term, but their overall behavior is driven by the local-nonlocal interaction, e.g. the fractional diffusion may give the ellipticity in one direction and the classical diffusion in the complementary one.

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