

# Dirac mass dynamics in a multidimensional nonlocal parabolic equation

Alexander Lorz, Sepideh Mirrahimi (LJLL), Benoit Perthame (LJLL, INRIA Rocquencourt)

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Nonlocal Lotka-Volterra models have the property that solutions concentrate as Dirac masses in the limit of small diffusion. Is it possible to describe the dynamics of the limiting concentration points and of the weights of the Dirac masses? What is the long time asymptotics of these Dirac masses? Can several Dirac masses co-exist? We will explain how these questions relate to the so-called "constrained Hamilton-Jacobi equation" and how a form of canonical equation can be established. This equation has been established assuming smoothness. Here we build a framework where smooth solutions exist and thus the full theory can be developed rigorously. We also show that our form of canonical equation comes with a structure of gradient flow. Numerical simulations show that the trajectories can exhibit unexpected dynamics well explained by this equation. Our motivation comes from population adaptive evolution a branch of mathematical ecology which models darwinian evolution.

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