Localized patterns in non-local aggregation equations

David Uminsky

Abstract:
We present an overview of recent results on localized pattern formation in non-local PDEs that arise in swarming and self-assembly models. Much work has been done in one dimension but two dimensions and higher has been more challenging. We present in this tutorial a mathematical framework which predicts the rich array of localized patterns which have been observed in two and three dimensions. In particular we will show how to compute the non-local, linear stability analysis for particles which bifurcate away from radially symmetric states such as rings and spheres. The linear theory accurately characterizes patterns in the ground states of the fully nonlinear problem. This aspect of the theory allows us to solve the inverse problem of designing specified potentials which assemble into targeted patterns. Time permitting we will talk about the physics of isotropic assembly and comment on how to extend this work to the anisotropic setting.