Department of Applied and Computational Mathematics and Statistics Colloquium

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Agent-based models exhibiting spatial aggregation

We discuss several agent-based models which exhibit spatial aggregation. The first example is a simple stochastic model of bacterial aggregation which leads to a novel fourth-order nonlinear PDE in its continuum limit. This PDE admits soliton-type solutions corresponding to bacterial aggregation patterns, which we explicitly construct.

The second example models complex predator-swarm interactions. Here, each prey within a swarm is represented by a point particle, with near repulsion and far-field attraction, in addition to the repulsion from the predator. The resulting system of ODE's can be approximated by a nonlocal PDE whose analysis yields insight about whether swarming behaviour helpful in avoiding a predator.

In the last part we consider a variant of the Bouchaud-Mezard model for wealth distribution in a society which incorporates the interaction radius between the agents, to model the extent of globalization in a society. We show that this can lead to the emergence of hot-spots of wealth, which are persistent spatial concentrations of wealthy agents, separated by areas of "poor" agents.

Monday, October 2, 2017
4:15 PM – 5:15 PM
127 Hayes-Healy Center

Colloquium Tea 3:45 PM to 4:15 PM 154 Hurley Hall