Discrete collisionless kinetics: how far we've come and where we're going

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Abstract:

Collisionless kinetic models typically possess Hamiltonian structure that is inherited from an underlying many-body problem. This Hamiltonian structure is responsible for many of the ``conservative'' properties that these models enjoy. Recently, a number of researchers have uncovered continuous-time particle-in-cell discretizations of collisionless kinetic models that retain the Hamiltonian structure of their parent continuum model. I will discuss this work using a tutorial-style approach. Then I will introduce and speculate about two important open problems in the area of structure-preserving discretization of kinetic models.