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Interacting particle systems (IPSs) serve as a fine-grained spatial stochastic model for different population processes. These systems provide greater spatial detail than more common reaction-diffusion approaches, particularly through volume-exclusion effects. Examples include Ising/spin systems, the contact process, and the voter process. These models are typically analytically intractable, and simulation is slow and computationally expensive. We present efficient versions of the stochastic simulation algorithm (SSA) and tau-leaping algorithm specific to IPSs. We will talk briefly about applications to cancer, particularly with regards to genetic heterogeneity and interactions with the immune system.