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Phase Space Approach to Dynamics of Interacting Fermions SHAINEN DAVIDSON, DRIES SELS, Boston University, VALENTIN KASPER, Universita t Heidelberg, ANATOLI POLKOVNIKOV, Boston University — Understanding the behavior of interacting fermions is of fundamental interest in many fields ranging from condensed matter to high energy physics. Developing numerically efficient and accurate simulation methods is an indispensable part of this. Already in equilibrium, fermions are notoriously hard to handle due to the sign problem. Out of equilibrium, an important outstanding problem is the efficient numerical simulation of the dynamics of these systems. In this work we develop a new semiclassical phase-space approach (a.k.a. the truncated Wigner approximation) for simulating the dynamics of interacting lattice fermions in arbitrary dimensions. We demonstrate the strength of the method by comparing the results to exact diagonalization (ED) on small 1D and 2D systems. We furthermore present results on Many-Body Localized (MBL) systems in 1D and 2D, and demonstrate how the method can be used to determine the MBL transition.

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