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Localization in the1-Dimensional Fermi-Hubbard Model[1] SOBHAN SAYADPOUR, ETTORE VITALI, California State University, Fresno — The ability to study quantum systems and to predict their behaviors starting from the fundamental equations of quantum mechanics is a significant challenge with extensive applications, including but not limited to condensed matter physics, atomic physics, and even quantum information. In this context, computer simulations provide valuable insight into investigating the behavior of complex systems. The objective of our computational experiment is to design and perform a Monte Carlo simulation of a collection of fermions moving in a lattice, modeling the behavior of electrons in a crystalline solid. Furthermore, we would like to study and assess a computational probe that can distinguish between a conductor and an insulator, just relying on the ground state physics. This study is particularly relevant in a strongly correlated system as most current approaches rely on response functions. These functions involve the entire manifold of the excited states of the system, thus making the theoretical and computational approach a formidable task. The computational ground state probes that we are studying measure how the fermions scatter relative to each other. The anticipated results will show how reliable and sensitive those probes are.

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