Current and Pending Support

Morten Hjorth-Jensen

Current

Sponsor: National Science Foundation
Award Number: PHY-1713901
Project/Proposal Title: Ab-Initio Nuclear Theory: From Nuclei to Neutron Stars
Total Award Amount: $600,000
Person-Months: 0.12 summer
Total Award Period Covered: 8/1/17 – 7/31/20
Location of Project: Michigan State University

Brief Description of Project: This project aims at developing and applying complementary many-body methods to a wide variety of nuclear systems, ranging from stable closed-shell nuclei and homogenous dense nuclear matter to exotic loosely-bound neutron and proton rich nuclei far from shell closures. The proposed research will be built around thoroughly modern ab initio many-body methods such as coupled cluster theory and the in-medium similarity renormalization group. Overlap with Proposed Research: The new proposal attempts at uniting theoretical nuclear many-body problems that span from Lattice quantum Chromodynamics to standard many-body methods with recent and novel approaches in quantum computing and quantum information theory. These novel approaches will be applied to theoretical studies of nuclear physics systems. The groups involved and their expertise go well beyond what is outlined in PHY-1713901. Except for the expertise of Bogner and Hjorth-Jensen that will be used in the new proposal to link with new methods from quantum computing and quantum information theory, there is no overlap.

Pending

Sponsor: Department of Energy
Project/Proposal Title: From Quarks to Stars; A Quantum Computing Approach to the Nuclear Many-Body Problem
Total Award Amount: $1,000,000
Person-Months: 0.12 summer
Total Award Period Covered: 10/1/19 – 9/30/22
Location of Project: Michigan State University
Brief Description of Project: This proposal aims at studying and applying recent developments of algorithms and methods from quantum computing and quantum information theory to studies of complex and strongly interacting nuclear many-particle systems. The proposal aims at developing new methods for studying systems that span from strong force simulations of quarks and gluons to many-body methods applied to the equation of state of dense matter. The proposal aims at developing interdisciplinary research projects that unites researchers in quantum computing and quantum information theory with theorists working on interacting many-particle methods applied to nuclear physics.
Overlap with Proposed Research: this is the proposed project