Benjamin Cohen-Stead

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Personal Website
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Education

University of California, Davis — Davis, Ca
Ph.D. in Physics, Advisor: Professor Richard Scalettar — 2016–2022

Whitman College — Walla Walla, Wa
B.A. in Physics — 2010–2014

Professional Experience

University of Tennessee Knoxville — Knoxville, Tn
Postdoctoral Research Associate — 2022–current
Principal Investigator: Professor Steven Johnston

Los Alamos National Laboratory — Los Alamos, NM
Graduate Student Researcher — 2020–2022
Mentor: Dr. Kipton Barros

- Project: Langevin Methods for Quantum Electron-Phonon Simulations

Picarro, Inc. — Santa Clara, Ca
Associate Data Scientist — 2014–2016

- Responsibilities: software development, algorithm design, data analysis

Picarro, Inc. — Santa Clara, Ca
Data Science Intern — Summer 2014

University of Rochester, Department of Physics — Rochester, NY
Physics REU Student, Mentor: Professor Stephen Teitel — Summer 2013

- Research: numerical investigation of two-dimensional granular systems

Awards

UC-National Lab In-Residence Graduate Fellowship — 2020–2022
National Lab: Los Alamos National Laboratory — Mentor: Dr. Kipton Barros

- Project: Langevin Methods for Quantum Electron-Phonon Simulations

Open Source Codes

SmoQyDQMC.jl: https://github.com/SmoQySuite/SmoQyDQMC.jl.git
Flexible implementation of the determinant quantum Monte Carlo algorithm for simulating Hubbard and electron-phonon interactions.

JDQMCFramework.jl: https://github.com/SmoQySuite/JDQMCFramework.jl.git
Julia package exporting a suite of types and routines useful for writing a determinant quantum Monte Carlo code.

JDQMCMeasurements.jl: https://github.com/SmoQySuite/JDQMCMeasurements.jl.git
Julia package implementing various correlation measurements that are frequently made in determinant quantum Monte Carlo simulations.

StableLinearAlgebra.jl: https://github.com/cohensbw/StableLinearAlgebra.jl.git
Exports numerically stable linear algebra routines used in determinant quantum Monte Carlo codes.

Checkerboard.jl: https://github.com/cohensbw/Checkerboard.jl.git
Implements the checkerboard approximation for representing exponentiated kinetic for tight-binding models.

MuTuner.jl: https://github.com/cohensbw/MuTuner.jl.git
Implements a method for tuning the chemical potential in grand canonical Monte Carlo simulations to achieve a target particle density.

LatticeUtilities.jl: https://github.com/cohensbw/LatticeUtilities.jl.git
Julia package for representing arbitrary periodic lattice geometries.

Patents

Aggregate leak indicator display systems and methods US Patent Number: 10962437
Assignee: Picarro, Inc. Date of Patent: March 30, 2021
Inventors: A. Nottrott, S. MacMullin, S.M. Tan, B. Cohen-Stead, C. Rella

Publications

[1] B. Cohen-Stead, K. Barros, R. Scalettar, and S. Johnston, "A hybrid Monte Carlo study of bond-stretching electron–phonon interactions and charge order in $BaBiO_3$", *npj Computational Materials*, vol. 9, no. 1, p. 40, 2023. DOI: 10.1038/s41524-023-00998-6.

[2] B. Cohen-Stead, O. Bradley, C. Miles, G. Batrouni, R. Scalettar, and K. Barros, "Fast and scalable quantum Monte Carlo simulations of electron-phonon models", *Phys. Rev. E*, vol. 105, p. 065 302, 6 Jun. 2022. DOI: 10.1103/PhysRevE.105.065302.

[3] B. Cohen-Stead, K. Barros, Z. Meng, C. Chen, R. T. Scalettar, and G. G. Batrouni, "Langevin simulations of the half-filled cubic holstein model", *Phys. Rev. B*, vol. 102, p. 161 108, 16 Oct. 2020. DOI: 10.1103/PhysRevB.102.161108.

[4] B. Cohen-Stead, N. C. Costa, E. Khatami, and R. T. Scalettar, "Effect of strain on charge density wave order in the holstein model", *Phys. Rev. B*, vol. 100, p. 045 125, 4 Jul. 2019. DOI: 10.1103/PhysRevB.100.045125.

[5] A. Tanjaroon Ly, B. Cohen-Stead, S. Malkaruge Costa, and S. Johnston, "Comparative study of the superconductivity in the holstein and optical su-schrieffer-heeger models", *Phys. Rev. B*, vol. 108, p. 184 501, 18 Nov. 2023. DOI: 10.1103/PhysRevB.108.184501.

[6] S. Malkaruge Costa, B. Cohen-Stead, A. T. Ly, J. Neuhaus, and S. Johnston, "Comparative determinant quantum monte carlo study of the acoustic and optical variants of the su-schrieffer-heeger model", *Phys. Rev. B*, vol. 108, p. 165 138, 16 Oct. 2023. DOI: 10.1103/PhysRevB.108.165138.

[7] S. Karakuzu, B. Cohen-Stead, C. D. Batista, S. Johnston, and K. Barros, "Flexible class of exact hubbard-stratonovich transformations", *Phys. Rev. E*, vol. 107, p. 055 301, 5 May 2023. DOI: 10.1103/PhysRevE.107.055301.

[8] O. Bradley, B. Cohen-Stead, S. Johnston, K. Barros, and R. T. Scalettar, "Charge order in the kagome lattice Holstein model: A hybrid Monte Carlo study", *npj Quantum Materials*, vol. 8, no. 1, p. 21, 2023. DOI: 10.1038/s41535-023-00553-y.

[9] P. M. Dee, B. Cohen-Stead, S. Johnston, and P. J. Hirschfeld, "Charge correlations suppress unconventional pairing in the holstein model", *Phys. Rev. B*, vol. 107, p. 104 503, 10 Mar. 2023. DOI: 10.1103/PhysRevB.107.104503.

[10] C. Miles, B. Cohen-Stead, O. Bradley, S. Johnston, R. Scalettar, and K. Barros, "Dynamical tuning of the chemical potential to achieve a target particle number in grand canonical Monte Carlo simulations", *Phys. Rev. E*, vol. 105, p. 045 311, 4 Apr. 2022. DOI: 10.1103/PhysRevE.105.045311.

[11] G. Paleari, F. Hébert, B. Cohen-Stead, K. Barros, R. Scalettar, and G. G. Batrouni, "Quantum monte carlo study of an anharmonic holstein model", *Phys. Rev. B*, vol. 103, p. 195 117, 19 May 2021. DOI: 10.1103/PhysRevB.103.195117.