Oliver Gorton

Ph.D. Candidate from San Diego State University and University of California, Irvine, currently at Lawrence Livermore National Laboratory

Github Profile
Google Scholar Profile
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Notes

Summary

My dissertation is on the integrated shell-model and Hauser-Feshbach description of beta-delayed neutron emission.

I use computational science to study nuclear structure and reactions. My work has touched on a number of topics in related fields such as the search for dark matter, nuclear data and evaluations, uncertainty quantification, and machine learning. All of my work involves scientific and high performance computing.

Code

Languages: Modern Fortran, Python, Bash Technologies: MPI, openMP

dmscatter [Code]
A fast Fortran code for WIMP-nucleus form factors and differential event rate spectra. Written in modern Fortran with an optional Python interface. Parallel execution with OpenMP.

PANASH [Not released]
Proton and neutron approximate shell model code. Not yet released.

COMMCAS [Not released]
Computational Model Monte Carlo Sampler. Not yet released.

Wigner [Code]
A library of functions for computation of Wigner 3-j, 6-j and 9-j symbols, written

in modern Fortran.

Education

PhD Computational Science
University of California, Irvine &
San Diego State University, expected 2023

MS Physics
San Diego State University, 2018

BA Physics
University of California, Berkeley, 2016

Research Positions

PhD Candidate and ACT-UP Scholar (2022 - present)
SDSU, UCI, LLNL

- New predictive capability for reaction and decay properties of fission fragments

Graduate Research Assistant (2019 - 2021)
SDSU Research Foundation with Calvin Johnson

- Developed software and theory to describe atomic nuclei using the nuclear shell model and computaional science

Glenn T. Seaborg Institute (GTSI) Summer Intern (Summer 2021)
Seaborg Institute, LLNL

- Investigated the validity of an approximation in indirect nuclear reaction measurements

High Energy Density Physics Intern (Summers 2018, 2019, 2020)
Lawrence Livermore National Laboratory

- Developed Python code for MCMC parameter estimation and applied to statistical nuclear reaction models in order to combine surrogate data and theory
- Modified and ran four Hauser-Feshbach model codes

Graduate Student Visitor (2019 - 2020)
UC Irvine, Department of Chemistry with Filipp Furche

- Collaborated to develop formalism for Nuclear-Electronic Orbital method using time-dependent density functional theory

Experience and Training

Professional

- Served as a referee for Physical Review C
- Experienced writing proposals for DOE, NNSA, and other funding sources

Training

- Attended "FRIB-TA Summer School: A practical walk through formal scattering theory", 2021
  - Course resources
  - Connecting bound states, resonances, and scattering states in exotic nuclei and beyond
- Attended "Agile Development Practices and Tools: A Guided Tour", 2020
  - Sustainable Horizons Institute introduction to agile software development
  - Collaborative source control using git, GitHub, and git workflows
- Attended "Technical Writing Workshop", 2019
  - LLNL PLS Directorate sponsored two-part writing class
  - Session 1: Structuring your research paper
  - Session 2: Clear, accurate, concise writing

Teaching

- Graduate Teaching Associate (2016 - 2020)
  San Diego State Univeristy, Department of Physics
  - Independently lead lectures and exams for introductory-level physics lab courses
  - Modernized the manual for Physics 182A/195L Laboratory for online deployment in Spring 2020

Awards

- LLNL WCI Academic Collaboration Team University Program (ACT-UP) Award
- Graduate S-STEM Scholarship, 2018-2020

Journal Papers

Proton-neutron entanglement in the nuclear shell model
C. W. Johnson and O. C. Gorton
arXiv:2210.14338

dmscatter: A Fast Program for WIMP-Nucleus Scattering
O. Gorton, C. Johnson, C. Jiao, J. Nikoleyczik
arXiv:2209.09187

Cross sections for neutron-induced reactions from surrogate data: Reexamining the Weisskopf-Ewing approximation for (n,n') and (n,2n) reactions
O. C. Gorton and J. E. Escher
arXiv:2102.03452

Measurements of proton capture in the A=100-110 mass region: Constraints of the 111In(gamma,p)/(gamma,n) branching point relevant to the gamma-process
O. Olivas-Gomez, A. Simon, O. Gorton, J. E. Escher et al.

Conference Proceedings

A Problem in the Statistical Description of Beta-Delayed Neutron Emission
O. Gorton, C. Johnson, and J. Escher
arXiv:2210.05904

Improving nuclear data evaluations with predictive reaction theory and indirect measurements
J. Escher, K. Bergstrom, E. Chimanski, O. Gorton, E. J. In, M. Kruse, S. Peru, C. Pruitt, R. Rahman, E. Shinkle, A. Thapa, W. Younes
arXiv:2304:10034

Neutron capture cross sections from surrogate reaction data and theory: connecting the pieces with a Markov-Chain Monte Carlo approach
O. Gorton and J. E. Escher
arXiv:1905:03055

Thesis

Efficient Modeling of Nuclei Through Coupling of Proton and Neutron Wavefunctions (Masters)
O. Gorton, Advisor: C. Johnson

Presentations

Gamma-ray strength functions using approximate shell model calculations
O. Gorton, C. Johnson, J. Escher
Talk at T3 "Taking the Temperature" Workshop on Statistical Nuclear Physics for Astrophysics and Applications (Ohio University, August 2023)
PDF

Nuclear Shell Model to the Rescue: Efforts to Resolve a Mystery in Beta Delayed Neutron Emission
O. Gorton, C. Johnson, J. Escher
Talk at APS Division of Nuclear Physics Fall 2022 Meeting (New Orleans, October 2022)
PDF

Crisis in Beta-Delayed Neutron Emission: Shell Model to the Rescue
O. Gorton, C. Johnson, J. Escher
Talk at Nuclear Data Conference (July 2022).
PDF

Proton and Neutron Approximate Shell Model: Factorization-based Importance Truncation
O. Gorton, C. Johnson, J. Escher
Poster at Nuclear Structure Conference (June 2022)
PDF

DMFortFactor: A Fast and Accessible for Computing WIMP-Nucleus-Scattering Event-Rates
O. Gorton, C. Johnson, C. Jiao
Talk at DNP21 APS Conference (October 2021)
PDF

Better MCMC for Nuclear Data using emcee and B-DJINN
O. C. Gorton, J. E. Escher, K. O. Bergstrom, M. K. Kruse
Talk given at LLNL Summer Slam 2021
PDF

Nuclear Physics for WIMPs
O. Gorton and C. W. Johnson
Talk at SDSU SIAM Student Chapter Summer Colloquium Series, Friday July 2, 2021
PDF

Cross subsections for neutron reactions from surrogate measurements: Revisiting the Weisskopf-Ewing approximation
O. Gorton and J. E. Escher
Talk at DNP20 APS Conference (October 2020)
PDF

Can we get rid of the theorists?
O. Gorton and J. E. Escher
Talk at LLNL Summer Slam (August 2020)
PDF

Big Picture and Background for Nuclear-Electronic Orbital (NEO) Approach: Calculating Mixed Nucleon-Electron Wave Functions
O. Gorton
Seminar for the Furche Group, Chemistry Department, UC Irvine (March 2020)
PDF

Indirect measurements of nuclear cross subsections: tempering experimental results with theory
O. Gorton and J. E. Escher
Seminar for HEDP Exit Talk (September 2019)
PDF

Sensitivity Study of the Surrogate Method
O. Gorton and J. E. Escher
Poster at LLNL Student Poster Symposium (August 2019)
PDF

Temperature and Entropy in the Nuclear Shell Model
O. Gorton and C. W. Johnson
Poster at SDSU ACCESS event (April 2019)
PDF

Proton Neutron Interacting Shell Model: Order of Magnitude Reduction for Medium Mass Nuclei
O. Gorton and C. Johnson
Poster at SDSU annual research symposium (March 2019)
PDF

Neutron capture cross subsections from surrogate reaction data and theory: connecting the pieces with a Markov-Chain Monte Carlo approach
O. Gorton and J. E. Escher
Poster at Compound Nuclear Reactions conference CNR18, September 2018
PDF

A Markov Chain Monte Carlo Tool for Hauser-Feshbach Codes
O. Gorton and J.E. Escher
Seminar for HEDP Exit Talk (August 2018)
PDF

Climbing

In my free time I enjoy rock climbing.

Page last updated May 2023