

Shivesh Pathak

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EDUCATION

University of Illinois at Urbana-Champaign

PhD in Physics

Expected graduation: May 2021

- Preliminary examination completed Fall 2019
- Relevant coursework: Statistical Learning (STATS 547), Natural Language Processing (CS 447)

Bachelor of Science in Physics, Minor in Mathematics

Aug 2013 – May 2016

- Summa Cum Laude, Highest Distinction in Curriculum: Physics
- Relevant coursework: Tensor and vector calculus (MATH 481), Linear algebra (MATH 415)

GPA: 3.95/4.00

RESEARCH AND WORK EXPERIENCE

Graduate Researcher in Lucas Wagner Group — Champaign, IL

Fall 2016 – Present

- Use of the supervised machine learning framework Density Matrix Downfolding and *ab initio* quantum mechanics simulations in model Hamiltonian development for quantum systems on high dimensional Hilbert spaces
 - Models built: non-interacting models for single/bilayer graphene with lattice effects, excited states of benzene
 - Models to be built: model with long-range interactions for single layer graphene
- Implementation, optimization and testing of compact quantum wave functions in high dimensional Hilbert spaces
- Development of highly parallel real space *ab initio* quantum Monte Carlo codes: QWalk in C++, PyQMC in Python (<https://github.com/QWalk>, <https://github.com/WagnerGroup/pyqmc>)

Graduate Teaching Assistant — Champaign, IL

Fall 2016, Fall 2017, Spring 2018, Fall 2018, Spring 2019

- Taught PHYS 212, PHYS 213/214 and PHYS 436
- "Teacher Ranked as Excellent" all five semesters, evaluated by Illinois Center for Innovation in Teaching & Learning

Graduate Intern at Lawrence Livermore National Lab — Livermore, CA

Summer 2017

- Development of distributed sparse matrix operations on massively parallel quantum simulation code using C++
- Correspondence with experts at LLNL: Daniel Osei-Kuffuor, Jean-Luc Fattebert

Graduate Intern at Lawrence Livermore National Lab — Livermore, CA

Summer 2016

- Development and testing for a massively parallel code hydrodynamics code Miranda using FORTRAN 2003 with C/C++ interoperability and Lua interfacing
- Correspondence with experts at LLNL: Samuel Schofield, Bryan Johnson, Andy Cook

Undergraduate Researcher in Karin Dahmen Group — Champaign, IL

2013 – 2016

- Data analysis and function fitting for experimental slip avalanche data from nanopillars to earthquakes

PUBLICATIONS AND AWARDS

S. Pathak et al. "Excited states in variational Monte Carlo using a penalty method", *J. Chem. Phys.* **154** (2021). (<https://doi.org/10.1063/5.0030949>)

S. Pathak, L.K. Wagner, "A light weight regularization for wave function parameter gradients in quantum Monte Carlo", *AIP Advances* **10** (2020). (<https://doi.org/10.1063/5.0004008>)

S. Pathak, L.K. Wagner, "Non-orthogonal determinants in multi-Slater-Jastrow trial wave functions for fixed-node diffusion Monte Carlo", *J. Chem. Phys.* **149** (2018). (<https://doi.org/10.1063/1.5052906>)

J.T. Uhl, **S. Pathak et al.** "Universal Quake Statistics: From Compressed Nanocrystals to Earthquakes," *Scientific Reports* **5**, 16493 (2015). doi:10.1038/srep16493. (<http://www.nature.com/articles/srep16493>)

University of Illinois at Urbana-Champaign University Fellowship

Fall 2019

Phi Beta Kappa Honor Society

December 2016

Golden Key International Honor Society

December 2016

Lorella M. Jones Summer Research Award

Summer 2014

University Achievement Scholarship

Fall 2013 – Spring 2016

SKILLS

Python, C/C++, Git, MATLAB, OriginPro, Linux OS (3+ yrs.); MPI, FORTRAN, Javascript (1 yr.); HTML, Java, Lua (6 mo.)
ML libraries and visualization software: scikit-learn, Pandas, seaborn, Vega (3+ yrs.); PyTorch, Tensorflow (1 yr.)

LEADERSHIP AND ACTIVITIES

Wesley Food Pantry Board Member and Volunteer — Champaign, IL

2017 – Present