

Huan Q. Bui

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Education

Ph.D. in Physics,
coming soon

B.A., Colby College, Waterville, ME, 2017–2021
Majors: Physics and Mathematics; Minor: Statistics
GPA: 4.18/4.30, Class rank: 1/529

Summer school, Perimeter Institute for Theoretical Physics, June 2020

Theses

Honors in Physics, Colby College (*in preparation*)
Advisor: Charles Conover

Honors in Mathematics, Colby College (*in preparation*)
Advisor: Evan Randles

Research Experience

Undergraduate Researcher, Perimeter Institute for Theoretical Physics, May 2020–Present

- Area(s): Quantum information, Condensed matter physics
- PI: Timothy Hsieh
- Quantum many-body physics on quantum hardware.
 - Variational simulation of non-trivial quantum states (QAOA-based, $O(L)$ time)
 - Measurement-assisted algorithms as a candidate for sublinear depth simulation
 - Found numerically that ground states of the quantum Ising model with nonuniform field and couplings can be simulated exactly by a depth $O(L)$ QAOA ansatz

RA, Colby College Dept. of Mathematics & Statistics, Oct 2019–Present

- Area(s): Applied mathematics, Analysis, ODEs
- PI: Evan Randles
- Convolution powers of complex functions on \mathbb{Z}^d whose attractors involve oscillatory integrals.
 - Computed convolution powers & associated attractors that are highly oscillatory integrals and generated examples indicative of a new local limit theorem
 - Constructed a generalized polar-coordinate integration formula with applications to sup-norm-type estimates of convolution powers of complex functions on \mathbb{Z}^d

RA, Joint Quantum Institute, College Park, Summer 2019, Jan 2020

- Area(s): Experimental atomic physics
- PI: Steven Rolston
- Studied infinite-range interactions among ultracold Rb atoms trapped around an optical nanofiber via measuring their collective decay.

RA, Colby College Dept. of Physics & Astronomy, Nov 2017–Present

- Area(s): Experimental atomic physics
- PI: Charles Conover
- Precision measurements on ultracold ^{39}K in Rydberg states, 2017–2019
Lifetime measurement of $5p_{1/2}$ and $5p_{3/2}$ in ^{39}K , 2019–

Teaching Experience

Teaching Assistant, Colby College Dept. of Physics & Astronomy, Sep 2017–Present

- Current course: Thermodynamics and Statistical Mechanics
- Grade weekly problem sets
- Past courses: Quantum Mechanics; Electricity and Magnetism, 2×Modern Physics II, 2×Modern Physics I (relativity & early quantum physics), Introduction to Electricity-Magnetism & Optics, Introduction to Mechanics

Teaching Assistant, Colby College Dept. of Mathematics & Statistics, Sep 2018–Present

- Current course: Partial Differential Equations
- Grade problem sets & hold weekly TA sessions
- Past courses: 2×Linear Algebra, Ordinary Differential Equations

Mathematics & Physics Tutor, Colby College Deans of Studies, Sep 2018–May 2020

- Provide academic assistance through reviewing course material and solving problems

Publications/Preprints

Huan Q. Bui, Evan Randles (2021). *A generalized polar-coordinate integration formula with applications to the study of convolution powers of complex-valued functions on \mathbb{Z}^d* . [arXiv:2103.04161](#) (submitted to The Journal of Fourier Analysis and Applications)

Presentations

Joint Mathematics Meeting (virtual), Jan 2021

A generalized polar-coordinate integration formula with applications to convolution powers and local (central) limit theorems ([pdf](#)).

Supervisor: Prof. Evan Randles, Colby College.

Perimeter Institute Undergrad Intern Symposium (virtual), July 2020

Measurement-assisted variational simulation of non-trivial quantum states ([pdf](#))

Supervisor: Dr. Timothy Hsieh, Perimeter Institute.

DAMOP 20, May 2020

Measurements of f -, g -, and h -state quantum defects in Rydberg states of potassium ([abstract](#)).

Supervisor: Prof. Charles Conover, Colby College.

DAMOP 19, May 2019

Millimeter-wave precision spectroscopy of d - d transitions in ^{39}K Rydberg states ([pdf](#)).

Supervisor: Prof. Charles Conover, Colby College.

CLAS 2019, May 2019

Matrices in Quantum Computing: A 2-qubit entanglement circuit ([pdf](#))

Instructor: Prof. Leo Livshits, Colby College.

CUSRR 2018, Jul 2018

Precision measurement of potassium energy levels at highly excited states ([pdf](#))

Supervisor: Prof. Charles Conover, Colby College.

Skills

Physics: numerical quantum simulation, precision atomic spectroscopy, Ramsey interferometry, fabricating & polarization control of optical nanofibers, magneto-optical trapping, constructing ECDLs, massive gravity, symbolic general relativity in Mathematica ([xACT](#), [xPert](#))

Mathematics: harmonic analysis (elementary), measure theory (elementary), real analysis, estimating highly oscillatory integrals

Programming/Scripting Languages: R, Python, MATLAB, Mathematica, HTML & CSS, \LaTeX

Softwares: IGOR Pro, MATLAB, NI-MAX, PicoHarp & TimeHarp (photon-counting modules), MS Office, Adobe Illustrator, Adobe Lightroom

*Awards/
Honors/
Fundings*

Williams A. Rogers Prize in Physics and Astronomy, Colby College, *May 2020*
Phi Beta Kappa, *April 2020*
Mu Sigma Rho, *April 2020*
Honorable Mention, COMAP Mathematical Contest in Modeling, *S'20*
Linda K. Cotter Internship Fund, *Jan 2020*
for Jan 2020 internship at the Joint Quantum Institute (JQI), College Park, MD
Phi Beta Kappa Scholastic Achievement Award, *Sep 2019*
Julius Seelye Bixler Scholar, *Sep 2018, Sep 2019, Sep 2020*
Meritorious Winner, COMAP Mathematical Contest in Modeling, *S'19*
Top 8% out of more than 10,000 teams
Dean's List, *F'17, S'18, F'18, S'19, F'19, (S'20 – canceled due to COVID-19),*

Languages

English (fluent), Vietnamese (native)

Projects

Personal Website/Archive, huanqbui.com, *Oct 2019–Present*
Notes from class, independent readings, and research projects.

Classical Field Theory, Advisor: Robert Bluhm, *Feb 2019–May 2020*
Theoretical aspects of Massive Gravity

*Other
Activities*

Math Mentor, Colby Dept. of Mathematics & Statistics
Colby Society of Physics Students, Photography, Ultimate Frisbee, Classical guitar