Huan Q. Bui

8347 Mayflower Hill
Colby College
Waterville, Maine, USA 04901

Email: hqbui21@colby.edu
Websites: huanqbui.com | **in**
Phone: +1 (301)-704-6958

Education

B.A., Colby College ('21), Waterville, ME
Majors: Physics and Mathematics; Minor: Statistics
GPA: 4.18/4.30,   Class rank: 1/529

Relevant Coursework: (*) denotes "Independent Study"
• **Physics:** experimental atomic physics (thesis), quantum field theory*, quantum information, condensed matter physics*, massive gravity*, classical field theory*, quantum mechanics, general relativity, fluid dynamics, experimental soft matter physics, classical mechanics, E&M, thermo & statistical mechanics

• **Mathematics:** applied mathematics/analysis and ODE (thesis), combinatorics, functional analysis (with topology), real analysis, complex analysis, algebraic geometry, abstract algebra, matrix analysis, linear algebra, ordinary differential equations, partial differential equations, probability theory, vector calculus, honors calculus

• **Statistics:** mathematical statistics/statistical inference, statistical modeling, applied longitudinal data analysis

Summer school, Perimeter Institute for Theoretical Physics, *June 2020*
Topics in Theoretical Physics: Quantum Information & Thermodynamics, Numerical Methods & Condensed Matter Physics, Path Integrals, Symmetries

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
• Principal Investigator: Timothy Hsieh
• Quantum many-body physics on quantum hardware.

– Studied variational simulation of non-trivial quantum states (QAOA-based, $O(L)$ time)
– Studied 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

Research Assistant, Colby College Dept. of Mathematics & Statistics, *Oct 2019–Present*
• Area(s): Applied mathematics, Analysis, ODEs
• Principal Investigator: 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 surface-carried measures of level sets of polynomials associated with these attractors and studied the decay of their Fourier transforms
– Constructed a generalized polar-coordinate integration formula with applications to convolution powers and local (central) limit theorems.

Research Assistant, Joint Quantum Institute, College Park, *Summer 2019, Jan 2020*
- Area(s): Experimental atomic physics
- Principal investigator: Steven Rolston
- Studied infinite-range interactions among ultracold Rb atoms trapped around an optical nanofiber via measuring their collective decay.

Research Assistant, Colby College Dept. of Physics & Astronomy, *Nov 2017–Present*
- Area(s): Experimental atomic physics
- Principal Investigator: Charles Conover
- Precision measurements on ultracold ^{39}K in Rydberg states, *2017–2019*
  Lifetime measurement of $5p_{3/2}$ ^{39}K , *2019-*

Abstracts/ Conferences/ 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.

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.

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

**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),*

Teaching Assistantship

Teaching Assistant, Colby College Dept. of Physics & Astronomy, *Sep 2017–Present*
- Current courses: 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

Skills

Physics experience: numerical quantum simulation, optics, precision atomic spectroscopy, Ramsey interferometry, fabricating & polarization control of optical nanofibers, magneto-optical trapping, constructing external-cavity diode lasers & frequency-stabilizing electronics, programming waveform generators, data acquisition & analysis, massive gravity, general relativity, symbolic GR in Mathematica (`xACT`, `xPert`)

Mathematics experience: 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

Languages

English (fluent), Vietnamese (native)

Other Activities

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