Huan Q. Bui

8347 Mayflower Hill
Colby College
Waterville, Maine, USA 04901

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

Education

B.A., Colby College ('21), Waterville, ME
Majors: Physics and Mathematics
Minor: Statistics
GPA: 4.17/4.30, Class rank: 1/560

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

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

• **Mathematics:** applied mathematics/analysis and ODE (thesis), functional analysis, 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

Theses

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

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

Research

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, $O(N)$ time)
  – Studied measurement-assisted algorithms as a candidate for sublinear depth simulation
  – Found numerically that ground states of the disordered 1D quantum Ising model can be represented exactly by a depth $O(L)$ nonuniform-coupling 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
  – Constructing surface-carried measures of level sets of polynomials associated with these attractors and studying the decay of their Fourier transform

Research Assistant, Joint Quantum Institute, College Park, *Summer 2019, Jan 2020*
- Area(s): Experimental atomic physics
- Principal investigator: Steven Rolston
- Studying infinite-range interactions and finding evidence of superradiance and super-superradiance between two Rb ensembles 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 measurements of ultracold $4p$ ^{39}K , *2019-*

Abstracts/ Conferences/ Presentations

Perimeter Institute Undergrad Intern Symposium, *July 2020*
Measurement-assisted variational simulation of non-trivial quantum states (pdf)

DAMOP 20, *May 2020*
Measurements of f-, g-, and h-state quantum defects in Rydberg states of potassium

DAMOP 19, *May 2019*
Millimeter-wave precision spectroscopy of d-d transitions in ^{39}K Rydberg states (pdf)

CLAS 2019, *May 2019*
Matrices in Quantum Computing: A 2-qubit entanglement circuit (pdf)

CUSRR 2018, *Jul 2018*
Precision measurement of potassium energy levels at highly excited states (pdf)

Projects

Personal Website/Archive, `GitHub`, `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*

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),*

Teaching Assistantship

Teaching Assistant, Colby College Dept. of Physics & Astronomy
• Current courses: Quantum Mechanics; Electricity and Magnetism
• Instructor: Kelly Patton, Dale Kocevski (resp.)
• Grade weekly problem sets
• Past courses: 2×Modern Physics II (quantum; instructor: Robert Bluhm), 2×Modern Physics I (relativity & early quantum; instructor: Duncan Tate), Introduction to Electricity-Magnetism & Optics (instructor: Charles Conover), Introduction to Mechanics (instructor: Jonathan McCoy)

Teaching Assistant, Colby College Dept. of Mathematics & Statistics
• Current course: Linear Algebra
• Instructor: Leo Livshits
• Grade problem sets & hold weekly TA sessions
• Past courses: Linear Algebra (instructor: Otto Bretscher), Ordinary Differential Equations (instructor: Evan Randles)

Mathematics & Physics Tutor, Colby College Deans of Studies
• Provide academic assistance through reviewing course material and solving problems

Skills

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

Mathematics experience: harmonic analysis (elementary), measure theory (elementary), real analysis, estimating highly oscillatory integrals, computing convolution powers of complex-valued functions on $\mathbb{Z}^d$ in Python and MATLAB.

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 & primary), Vietnamese (native),

Other Activities

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

References

`Professor Robert Bluhm`
Colby College, Department of Physics & Astronomy
`rtbluhm@colby.edu`

`Professor Charles Conover`
Colby College, Department of Physics & Astronomy
`cconover@colby.edu`

`Professor Evan Randles`
Colby College, Department of Mathematics & Statistics
`erandles@colby.edu`