

Fortino Garcia

Curriculum Vitae

Courant Institute of Mathematical Sciences
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📄 [fortinog.github.io/](https://github.com/fortinog)

Education

- 2016–2021 **Ph.D. Applied Mathematics**, *The University of Colorado Boulder*, Boulder, CO.
Advisor: Daniel Appelö (MSU)
- 2016–2018 **M.Sc. Applied Mathematics**, *The University of Colorado Boulder*, Boulder, CO.
Advisor: Daniel Appelö
- 2011–2015 **Bachelor of Arts, Computational and Applied Mathematics**, *Rice University*, Houston, TX.

Professional Experience

- 2021–Present **NSF Postdoctoral Fellow**, COURANT INSTITUTE OF MATHEMATICAL SCIENCES, New York, New York.
- 2016–2021 **Graduate Student/Research Assistant**, UNIVERSITY OF COLORADO BOULDER DEPARTMENT OF APPLIED MATHEMATICS, Boulder, CO.
 - Worked on an iterative wave equation based approach to solving Helmholtz problems, particularly for problems of high frequency.
- Summer 2019–2021 **Intern/Collaborator**, LAWRENCE LIVERMORE NATIONAL LABORATORY, Livermore, CA.
 - Worked with Dr. Anders Petersson on a quantum optimal control problem to recover control signals that generated logical gates on a quantum computing platform.
 - Developed a discrete adjoint scheme for a symplectic partitioned Runge-Kutta scheme to calculate exact gradients for gradient-based optimization of non-autonomous Hamiltonian systems.
 - Developed a Julia codebase (JuQBox) and actively maintain and/or update implementations of numerical methods within the package. Worked on optimizing performance and memory usage to improve the efficiency of JuQBox.
- Summer 2018 **Intern**, TOTAL E&P USA, Houston, TX.
 - Worked toward coupling spectral element and discontinuous Galerkin methods for PDE solvers. Updated in-house FORTRAN libraries to accommodate these hybrid meshes on various supercomputers.
- 2015–2016 **Consultant**, SLALOM CONSULTING, Houston, TX.
 - Developed Salesforce solutions for clients in the E-Commerce and medical device industry.
 - Implemented custom code for nightly integrations with SAP, user friendly event check-in pages, daily bulk database manipulations, and customization for desktop and mobile devices.

2014-2015 **Developer**, CAAM SENIOR DESIGN, Houston, TX.

- Designed a mobile/tablet application written in C for numerically modeling the Wi-Fi signal distribution in a home or apartment.
- Instructions to download an Android mobile app may be found here: <http://www.caam.rice.edu/~gillmana/Wi-Fly.html>

Summer 2014 **Undergraduate Research Assistant**, LOUISIANA STATE UNIVERSITY, Baton Rouge, LA.

- Worked on benchmarking performance of porous media flow problems through the multi-physics package OpenFOAM.
- Ran simulations on LSU's SuperMike-II supercomputing cluster and utilized the MPI profiler IPM to identify bottlenecks in the solver code.

Publications

Published

1. Daniel Appelö, Fortino Garcia, Allen Alvarez Loya, Olof Runborg. El-WaveHoltz: A Time-Domain Iterative Solver for Time-Harmonic Elastic Waves. *Computer Methods in Applied Mechanics and Engineering*. 2022.
2. N. Anders Petersson, Fortino M. Garcia. Optimal Control of Closed Quantum Systems via B-Splines with Carrier Waves. *SIAM Journal of Scientific Computing*. 2022.
3. Daniel Appelö, Fortino Garcia, Olof Runborg. WaveHoltz: Iterative Solution of the Helmholtz Equation via the Wave Equation. *SIAM Journal of Scientific Computing*. 2020.

In Review

1. Fortino Garcia, Daniel Appelö, Olof Runborg. Extensions and Analysis of an Iterative Solution of the Helmholtz Equation via the Wave Equation.

Presentations

- 2021 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. Numerical Analysis and Scientific Computing Seminar, Courant Institute of Mathematical Sciences, New York, NY, October 2021.
- 2021 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. SIAM CSE, Fort Worth, TX, March 2021.
- 2020 JuQBox: A Quantum Optimal Control Toolbox In Julia. SC20, Atlanta, GA, November 2020.
- 2020 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. CAIMS/SIAM Annual Meeting, Toronto, Ontario, Canada, July 2020.
- 2019 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. Seminar in Scientific Computing, Uppsala University, Uppsala, Sweden, December 2019.
- 2019 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. Numerical Analysis Seminar, KTH, Stockholm, Sweden, November 2019.

- 2019 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. WAVES, Vienna, Austria, August 2019.
- 2019 WaveHoltz: Wave Based Iterative Scheme for Helmholtz Problems. North American High Order Methods Conference, San Diego, CA, June 2019.
- 2019 Wave Equation Based Iterative Scheme for Helmholtz Problems. Front Range Applied Mathematics Student Conference, Denver, CO, February 2019.
- 2014 Profiling Porous Media Flow Problems. Mellon Mays Undergraduate Fellowship Southeast Regional Undergraduate Conference, Durham, NC, November 2014.

Posters

- 2019 Wave Equation Based Iterative Scheme for Helmholtz Problems (Garcia, F., Appelö, D., Runborg, O.). Poster, University of Colorado at Boulder Applied Mathematics Graduate Recruitment.
- 2015 A Faster and More Accurate App for Optimal Router Placement (Balkum, A., Chen, S., Garcia, F., Schwettman, S.). Poster, Rice University Engineering Design Showcase.
- 2014 Benchmarking Performance of Porous Media Flow Simulations (Garcia, F., Tyagi, M., Nandakumar, K.). Poster, Louisiana State University CCT REU Poster Session.

Teaching Experience

- Fall 2022 **Instructor**, *New York University*, Department of Mathematics, Math for Economics III (MATH-UA.0133).
- Fall 2018 **Teaching Assistant**, *University of Colorado Boulder*, Department of Applied Mathematics, Matrix Methods (APPM 3310).
- Spring 2018 **Teaching Assistant**, *University of Colorado Boulder*, Department of Applied Mathematics, Calculus III for Engineers (APPM 2360).
- Fall 2017 **Teaching Assistant**, *University of Colorado Boulder*, Department of Applied Mathematics, Differential Equations (APPM 2360).
- Spring 2017 **Teaching Assistant**, *University of Colorado Boulder*, Department of Applied Mathematics, Calculus II for Engineers (APPM 1360).
- Spring 2017 **Instructor of Note**, *University of Colorado Boulder*, Department of Applied Mathematics, Calculus II Workgroup (COEN 1360).
- Fall 2016 **Teaching Assistant**, *University of Colorado Boulder*, Department of Applied Mathematics, Calculus I for Engineers (APPM 1350).
- Spring 2015 **Instructor**, *Rice University*, Foundations for Self-Discovery & Lifelong Learning (UNIV 110).
- Spring 2014 **Rice Learning Assistant (RLA)**, *Rice University*, Department of Computational and Applied Mathematics, Introduction to Engineering Computation Lab (CAAM 211).

University activities, service, and outreach

- 2020-2021 SIAM grad student chapter treasurer

- 2020 Math Alliance Fall Graduate Fair Department Representative
- 2018-2019 Association for Women in Mathematics (AWM) Study Session Facilitator
- 2013 Rice Emerging Scholars Program Student Coach.
- 2012-2013 Young Owls Leadership Program Advisor.
- 2011-2013 Volunteer tutor with the Nehemiah Center (Houston, TX).

Mentorship

- Summer 2022 Applied Math Summer Undergraduate Research Experience (AM-SURE) Mentor.
Student: Qianyu Zhu
- Spring 2021 Discovering America Program Project Supervisor (MSU). Project title: "Quantum Control: Algorithms and Optimal Gate Design". Students: Charlie Hultquist, Madeline Mitchell, Luke Perelli, Shun Yao Wang

Awards and Honors

- 2021-2024 NSF Mathematical Sciences Postdoctoral Research Fellowship.
- 2015 **Rice University**: CAAM-Chevron Prize.
- 2014-2015 **Rice University**: Mellon Mays Undergraduate Fellow.
- Spring 2014 **Rice University**: President's Honor Roll.

Skills

Fortran, C/C++, OpenMP, MPI, Julia, MATLAB, Git, Perl, Python, UNIX/Linux Environments, Mathematica, \LaTeX , SQL, JavaScript, OpenFOAM, Java, HTML, CSS.