

GIUSEPPE BARBALINARDO

Nanotheory Research Group - Department of Chemistry - University of California, Davis

Education

Ph.D. Candidate in Chemical Physics - Sept '16 - Current - University of California, Davis

- NSF Molecular Sciences Software Institute, Investment Software Fellowship for the development of an open-source computational framework to perform accurate large-scale simulations for heat transport at the nanoscale.
- Coursework GPA: 4.0

M.Sc. - Apr '12 - Dec '13 - University of California, San Diego - Physics: Condensed Matter Theory

M.Sc. - Dec '08 - Jul '11 - University of Milan, Bicocca (Italy) and Uppsala University (Sweden) - Physics: Theoretical Physics

- Graduated with academic honor, *magna cum laude*

Work experience

Teaching Assistant - Sept '16 - Jun '19 - University of California, Davis

- Teaching Assistant for the graduate classes of Quantum Mechanics (1 & 2) in the Chemistry Department. Collaborated with Dr. McCurdy to implement a code for students to find solutions to the Schrodinger equation using Discrete Variable Representation.
- Teaching Assistant for the graduate class of Mathematical Methods for Chemists. Helped students in implementing numerical algorithms using Python.
- Teaching assistant for the chemistry 2 series. Teaching general chemistry lab and weekly discussions.

iOS Engineering Manager - Jan '16 - Aug '16 - Bitalign Inc. dba Grio, San Francisco. More details here [\[3\]](#) and [\[4\]](#).

- Managed the iOS team which included 6-8 software developers
- Developed and delivered high-quality software
- Responsible for client communication
- Oversaw hiring for the iOS team
- Mentor for the apprentice program

Software Engineer - May '14 - Dec '15 - Bitalign Inc. dba Grio, San Francisco

- Developed software using Swift, Objective C, Java and Ruby in an Agile methodology-driven environment
- Collaborated with small and large clients in the Bay Area
- Designed high-level software architecture for new projects
- Examples of projects: Target iPad app, Twitter Cards campaign, Texture/NextIssue app rebranding

Research

Ph.D. Thesis at the University of California Davis

While the understanding of heat is an essential problem on its own, the description of thermal control and management at the nanoscale has fundamental technological applications. These include energy storage, thermo-electronics, thermal circuits and emerging material design techniques. My research work consists of both theory and software development to simulate heat transport at the nanoscale.

- Development of an open-source computational framework to perform accurate large-scale simulations for heat transport at the nanoscale: Ballistico. Its engine is written in Python and Tensorflow. This project has been awarded the MolSSI Software Investment fellowship, a National Science Foundation initiative and has recently been presented at the Material Research Society conference in Phoenix. Release scheduled for mid-2020. More details here [\[1\]](#).
- Amorphous and crystals: Development of a unified theoretical framework for amorphous and crystal structures, which bridges the gap between Anharmonic Lattice Dynamics and Molecular Dynamics. Theory and Simulations. In collaboration with Dr. Baroni's group at SISSA University (Trieste). A summary of this work has been published on Nature Communications. More details here [\[2\]](#).
- Materials design: Application of Machine Learning techniques to fine-tune the thermal conductivity of Silicon-Germanium superlattices.
- Principal Investigator: Dr. Davide Donadio.

Master Thesis at the University of California, San Diego

- Quantum Information: Theoretical study and development. Application of control theory feedbacks mechanisms to increase the coherence time in quantum dot qubits.
- Principal Investigator:: Dr. Lu Sham.

Master Thesis at the University of Milan (Bicocca) and Uppsala University

- Developed a mathematical model and a numerical implementation using Mathematica to study magneto-optics effects .
- Distinguished thesis award fellowship for the dissertation: "Quantum Theory of the Inverse Faraday Effect", issued by the: Lerici Foundation in Stockholm.
- Thesis Advisors: Dr. Peter Oppeneer, Dr. Giorgio Benedek and Dr. Gian Paolo Brivio.

Skills

Technologies	Mathematical Methods	Scientific Packages
Python Objective C JAVA Tensorflow C++ / C Fortran Swift AngularJS PostgreSQL MongoDB Parallel computing: MPI & CUDA	Statistics Probability Theory Linear Algebra Information Theory Stochastic Methods Markov Chain Monte Carlo Numerical Methods Algorithms	LAMMPS Quantum Espresso Psi4 Atomic Simulation Environment

Academic publications

- Leyla Isaeva, Giuseppe Barbalinardo, Davide Donadio & Stefano Baroni, "Modeling heat transport in crystals and glasses from a unified lattice-dynamical approach". Nature Communications volume 10, Article number: 3853 (2019)
- G. Barbalinardo, CA Sievers, S. Chen, D. Donadio, "Thermal transport in finite-size van der Waals materials: Modeling and Simulations". 2018 IEEE 18th International Conference on Nanotechnology (IEEE-NANO) 18414617
- G. Barbalinardo, C. Chen, N. Lundgreen and D. Donadio, "Unraveling A New Heat Transport Regime at The Nanoscale," In preparation.
- G. Barbalinardo, C. Chen, N. Lundgreen and D. Donadio, "Ballistico, A Large Scale Anharmonic Lattice Dynamics Simulator." In preparation
- M. Battiato, G. Barbalinardo, P. M. Oppeneer. Quantum theory of the inverse Faraday effect. Physical Review B 89 (1), 014413, - January 2014
- M. Battiato, G. Barbalinardo, K. Carva, P. M. Oppeneer. Beyond linear response theory for intensive light-matter interactions: Order formalism and ultrafast transient dynamics. Physical Review B 85 (4), 045117 - January 2012

Conferences, schools and workshops

Sept '19 – Berkeley, CA

AI for Science Town Hall at the Lawrence Berkeley National Lab. A meeting organized by the DOE.

Aug '19 - Blacksburg, VA

MolSSI Software Fellow Bootcamp on how to release an open-source scientific project at the Virginia Tech.

July '19 – Berkeley, CA

Deep Learning for Science School at the Lawrence Berkeley National Lab.

June '19 – Trieste, Italy

Conference on Nanophononics, Bridging Statistical Physics, Molecular Modeling, and Experiments and the International Centre for Theoretical Physics.

Poster presentation: Unravelling a New Heat Transport Regime at the Nanoscale

May '19 – Berkeley, CA

Northern California Theoretical Chemistry Meeting at UC Berkeley

May '19 – Davis, CA

Peter Hall Statistics and Machine Learning Conference at UC Davis

Apr '19 – Phoenix, AZ

Materials Research Science Conference.

Contributed talk: Unraveling A New Heat Transport Regime at The Nanoscale

Feb '19 – San Francisco, CA

Google AI Connect at San Francisco's Google Office

Oct '18 – Sunnyvale, CA

Design and Deployment of Deep Learning with Spark, Workshop by the Association for Computing Machinery.

Aug '18 – Davis, CA

30th annual Conference on Computational Physics (IUPAP), University of California Davis,

Poster Presentation: "Ballistico, An Anharmonic Lattice Dynamics Simulator"

Jul '17 – Chicago, IL

MICCoM Computational School - University of Chicago

Dec '16 – San Francisco, CA

Advanced Course on Deep Learning with Python, Keras and TensorFlow. DataWknds

Awards

Software Development Investment Fellowship from the Molecular Sciences Institute (funded by the NSF), for the project "Development of an open-source framework to model heat transport at the nanoscale." (2019 – Now)

Distinguished thesis award. Scholarship for dissertation: "Quantum Theory of the Inverse Faraday Effect". Issuer: Leric Foundation Stockholm. (2010 – 2011)

Other

Referee for Physical Review B, Physical Review E, Journal of Chemical Physics. (2018 – Now)

Links

[1] Ballistico, open-source project. Release in mid-2020. The repo is currently private, please contact me to obtain access credentials: <https://github.com/gbarbalinardo/ballistico>

[2] Link to the article [Nature Communications](#) and to the press coverage: [PhysicsWorld](#), [Ceramics](#), [SpaceDaily](#), [AskaNews](#) (italian), and [N+1](#) (russian)

[3] A few projects I participated as a software developer and engineering manager at [Grio, dba Bitalign](#), San Francisco.

- [Target iPad app](#). iOS Developer. Participated in a two scrum team sized project that developed the new iPad application for Target. Developed new features in the application like localization and store pickers and major components on the home screen. Dev team size ~ 15 people.
- [Texture](#) / [Next Issue Media](#). iOS Developer. Implemented a functional prototype to perform user-testing. Developed several features in the legacy app: Facebook integration, login workflow, free magazine, analytics, and rebranding. Dev team size ~ 12 people.
- [iPracticeBuilder](#). iOS Developer. Developed the iPhone version of the app. Multi-device synchronization with Core-Data and new UI/UX. Dev team size ~ 5 people
- [Twitter Cards](#): Built new cards using Twitter's native language. Designed the algorithm and produced several variants of it. Dev team size ~ 5 people

[4] A few tech talks I gave at Grio

- [Monte-Carlo](#) simulation of the NCAA March Madness using GPU and CUDA and NumbaPro as I discuss in [this blog post](#)
- [World Cup simulator](#), used to explain importance sampling algorithms to software developers as discussed in [this post](#).
- An introduction to probabilistic programming. Video [here](#).