Justin Burzachiello

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Education

University of California, San Diego (UC San Diego) **01/2025–Present**
Ph.D. in Mechanical and Aerospace Engineering (3.66 GPA)

Stony Brook University (SBU) **08/2023–12/2024**
M.S. in Computational Applied Mathematics (3.63 GPA)

University of California, Riverside (UC Riverside) **09/2019–06/2023**
B.S. in Physics (3.80 GPA, Magna Cum Laude): Applied Physics concentrated into Computer Science

Coursework

Math : Numerical analysis, ODEs/PDEs (numerical, theoretical), Complex analysis, Measure theory, Discrete math, Mathematical physics

CS : Parallel computing, ML, RL, CV, DSA Software engineering

Engineering: Model reduction, Design optimization, Density functional theory, Robotics

Current : Computational fluid dynamics, Functional analysis

Skills

Programming: Python (PyTorch, skimage), C++, MATLAB, LabVIEW

Engineering : VGSTUDIO MAX, ImageJ, EGSnrc, SOLIDWORKS

Other : MPI, LaTeX, UNIX, Bash, Slurm, Git / Github

Publications

Structural and Dynamical Analyses of Apo and Cap-binding eIF4E: An in silico Study (BioArxiv, **2024**)

Impact of Rhizobium Tropici Produced EPS on Arabidopsis Thaliana Growth (ICBBG2025, **2025**)

Experience

UC San Diego: Kramer Research Group **01/2025–Present**
Graduate research assistant (advised by Dr. Boris Kramer) *La Jolla, CA*

- Implemented spectral submanifolds for nonlinear dimensionality reduction in Lagrangian structure–preserving Operator Inference–based model reduction.
- Used computational graph transformations to significantly reduce computational complexity of multidimensional numerical integration for polynomial chaos expansion uncertainty quantification.

VJ Technologies **05/2024–08/2024**
CT System Engineer Intern *Bohemia, NY*

- Modeled chemical filtration through FEM simulation of water flow through a CT scan of coffee.
- Quantified manufacturing defects in 3D prints with CT & VGSTUDIO MAX.
- Computed ionizing photonic & electronic radiation dose from particle accelerators with EGSnrc.
- Used ImageJ to compute root growth increase after adding EPM to *Arabidopsis thaliana*.

SBU: Deng Research Group **02/2024–Present**
Graduate research assistant (advised by Dr. Yuefan Deng) *Stony Brook, NY*

- Lead my team in processing CT scans of plant roots; segmented voxels-of-interest.
- Analyzed molecular dynamics distance matrix time series of eIF4E protein for AI drug discovery.
- TA for AMS 210–Applied Linear Algebra, AMS 361–Applied Calculus IV: Differential Equations.

UC Riverside: Coh Research Group **03/2022–12/2023**

Research Assistant I in Mech. Eng. (under Dr. Sinisa Coh) *Riverside, CA*

- Created Python library for WYSIWYG tensor arithmetic from strings for quantum physics.
- Created private Sphinx-based database website for hosting Wannier90/Wannier-Berri DFT data.
- Used supercomputer Quantum ESPRESSO DFT software to calculate properties of materials.

U.S. DOE, ORNL: Application Engineering Group **06/2022–08/2022**

Software engineer intern (under Drs. Greg Watson and Ben O'Neill) *Oak Ridge, TN*

- Documented source code of VnV verification and validation software.
- VS Code extension: https://marketplace.visualstudio.com/items?itemName=jburz2001.vnv-snippets
- Visualized data for finite element method mesh refinement studies.

UC San Diego: Kramer Research Group **06/2021–09/2021**

Undergraduate research assistant (under Dr. Boris Kramer) *Remote*

- Configured genetic programming AI for symbolic regression-based physics derivation (1 of 13 honorees, out of 400+, to present at UC San Diego 2021 Summer Research Conference).
- Documented 5 Lagrangian mechanical systems' equations, figures, and physics with LaTeX.
- Used MATLAB to program ODE simulations for a mass-spring-damper and discretized linear beam.

UC Riverside: Microwave Nano-Electronics Laboratory **02/2020–11/2021**

Undergraduate research assistant (under Dr. Yongtao Cui) *Riverside, CA*

- Created an FPGA-based PLL with a lock-in amplifier, PI controller, and I/O with LabVIEW (1 of 5 honorees, out of 20+; presented at UC LEADS 2021 Research Conference).
- Built custom atomic force microscope (AFM) components with SOLIDWORKS.
- Analyzed microscale topography with a Bruker AFM; post-processed the data with NanoScope.

Presentations

SBU Garcia Scholars **06/2024**

- Presented work on using micro-CT with image processing in order to quantify plant root growth.

Oak Ridge National Laboratory (ORNL) Summer Intern Symposium **08/2022**

- Presented VnV software-based web app for ASGarD software-based numerical fluid simulation

UC San Diego STARS Closing Ceremony **08/2021**

- Nominated to present physics-based artificial intelligence research at STARS closing ceremony 1 of 2 nominees out of 60+ students

UC San Diego 2021 Summer Research Conference **08/2021**

- Conveyed how to use artificial intelligence to derive physical laws from experimental data 1 of 13 "Student Spotlight" honorees out of 400+ students

MSRIP/UC LEADS/Cal Pre-Doc Symposium **08/2021**

- Conveyed how to use artificial intelligence to derive physical laws from experimental data

UC LEADS 2021 Koret Leadership and Research Symposium **03/2021**

- Presented FPGA-based quartz tuning fork sensor for atomic force microscopy 1 of 3 "Honorable Mentions" in engineering out of 20+ students

UC LEADS 2020 Summer Symposium **07/2020**

- Presented methodologies for developing an LIA and optimizing FPGA memory consumption

Geospatial data science: various venues **08/2017–08/2019**

- Advocated for combatting homelessness with a custom ArcGIS-based resource guide:
  - **Redlands City Hall**: conveyed the need for more haircut/shower resources for the homeless
  - **San Diego Convention Center**: demoed resource guide at 2018 ESRI User Conference
  - **University of Redlands**: answered questions from San Bernardino County foster youth
  - **Redlands Country Club**: demoed resource guide to the Women's Council of Realtors
  - **Redlands Mitten Building**: demoed resource guide to the YouthHope Foundation

Outreach & Service

UC Riverside Undergraduate Research Journal **09/2021–06/2023**
Editorial board member *UC Riverside*

- Reviewed 6 article submissions for 3 rounds of reviews

Mentor Collective **08/2021–06/2023**
Mentor *UC Riverside*

- Mentored 8 undergraduate freshmen in their first year of college

Honors

UC Riverside

Outstanding 1st-, 2nd-, and 4th-Year Undergraduate Student **06/2020, 2021, 2023**
Graduate Deans' Leadership Award **03/2022**
Schuler Endowed Scholarship for Guardian Scholars (i.e., for foster youth) **2022–2023 academic year**
UC Riverside Honors (offered) **2020**