

Nicholas C. Dorn

Computational Modeling, CFD & Medical Software Engineer

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Summary

Computational biomechanics PhD candidate applying physics-based cardiovascular simulation and reduced-order modeling to improve surgical planning and reduce clinical uncertainty. Experience delivering validated software used in multi-institution modeling studies and driving engineering adoption for translational research.

Technical Skills

Python, C++, Swift, Bash, Git; CFD and 0D/1D cardiovascular modeling; SimVascular, Linux/HPC (Slurm), profiling, **CI/CD** (GitHub Actions), unit testing; DICOM/VTK/ITK pipelines, **NumPy/Pandas, scikit-learn, Pytorch**, optimization methods; numerical V&V practices for medical software

Experience

PhD Candidate, Cardiovascular Biomechanics Computation Lab

Stanford University

Apr 2023 – Present

- Created the **first automated pipeline** for adaptive pulmonary CFD boundary condition tuning in SimVascular, improving agreement with clinical pressure/flow data.
- Built **svZeroDTrees**, enabling rapid microvascular BC and impedance computation for **2 labs** across **5+ studies**.
- Executed multi-patient HPC studies on Slurm with performance debugging to reduce runtime and improve stability.
- Communicated modeling outcomes with clinicians to support adoption for patient-specific treatment planning.

Key Open-Source Contributions

- **svZeroDTrees — Core Developer:** Automated BC generation; built an end-to-end pipeline from image segmentation to predicted post-surgical hemodynamics.
- **svZeroDSolver — Core Contributor:** Led **7+ merged issues/PRs** improving CI robustness; mentored an undergraduate who contributed major new features; collaborate with **14+ developers** across **3 institutions**.

Undergraduate Researcher, Nanoscale Materials and Cell Engineering Lab

UC San Diego

Sept 2019 – Jun 2022

- Led *in vivo* and *in vitro* studies of a novel nanoparticle platform for delivering short-chain fatty acids to treat arthritis.
- Published a **co-first author** paper (**30+ citations**); presented findings in **3 conference talks**.

Software Projects

PacerBrain — iOS Performance Strategy App

SwiftUI, CoreData

- Developed a pacing/fueling modeling app used for personal race planning and execution; demonstrated to 30+ peers with positive feedback.

Publications and Talks (select)

Menon, **Dorn** et al. *svZeroDSolver: A modular package for lumped-parameter cardiovascular simulations*, JOSS, 2025.
Dorn et al. *Modeling vascular adaptation for prediction of surgical outcomes in pulmonary stenosis repair*, in prep.
Dorn et al. *Comparative CFD analysis in a sheep model of Fontan circulation*, Talk, CMBBE 2025 Barcelona.
McBride*, **Dorn*** et al., *Advanced Science*, 2023; *Drug Deliv. Transl. Res.*, 2022 (*co-first)

Education

MS & PhD, Chemical Engineering (Cardiovascular Biomechanics) — Stanford University

MS Jun 2025; PhD exp. 2027

BS, Chemical Engineering (Minor: Mathematics) — UC San Diego

3.82 GPA; Jun 2022

Awards & Leadership

NSF Graduate Research Fellow (2022–2025)

Vice President, Project Bluewater Racing — nonprofit cleaning up San Diego waterways and providing tuition-free science and sailing education to 100 students. Improved website user data capturing + CRM integration. (2023–)

President, UCSD Sailing Team — led competition & operations for 40 athletes (2020–2022)