Nolan Black, Ph.D. | Simulation Engineer

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Areas of Interest

Computational Mechanics
- Multiscale solid mechanics
- Topology optimization

Machine Learning
- Physics-informed machine learning
- Multi-fidelity data analysis

Professional & Research Experience

Pasteur Labs | Scientific ML Startup — Denver, CO
Simulation R&D Engineer — *January 2025 – Present*
- Automated data generation workflows for CFD, computational mechanics, and multiphysics data generation that accelerated the training of ML surrogate models
- Designed a data generation API that connects existing CAE modeling frameworks, enabling surrogate modeling training on data from Ansys, Siemens, and open-source software
- Designed and programmed differentiable interfaces to perform structural optimization of pre-trained ML surrogates in aerospace applications (Python/PyTorch)

Drexel University | GAANN Fellowship — Philadelphia, PA
Graduate Research Assistant — *September 2020 – January 2025*
- Developed high-performance finite-element models for multiscale design optimization (C^{++}/PETSc)
- Investigated novel methods of Machine Learning (ML) for physics-informed simulation (C^{++}/Python/PyTorch)
- Integrated ML techniques to design nature-inspired metamaterials with tailorable physical properties

Lawrence-Livermore Nat. Lab. | Center for Design Optimization — Livermore, CA
NSF PhD INTERN — *January 2024 – May 2024*
- Implemented parallel solvers for mixed finite element methods in a high-performance computing environment (C^{++})
- Developed nonlinear finite element programs for hyperelastic, hierarchical materials for applications in structural optimization

Zimmer Biomet | Zimmer Knee Creations R&D — Exton, PA
Development Engineering Coop — *April 2019 – April 2020*
- Developed functional medical devices using rapid prototyping to perform orthopedic procedures on the hand and wrist
- Established design criteria to meet surgeon input and verified design features in cadaveric lab testing
- Adapted, tested, and re-validated existing products to meet new standards of quality based on risk management
- Prepared and executed test protocols to analyze new product aging, transit, and functional capabilities

NAVSEA | Department of the Navy — Philadelphia, PA
Entry-level Engineer — *April 2017 – September 2018*
- Drafted procedures and diagrams for US Navy shipboard engineering systems
- Coordinated small-team projects to overhaul procedures and diagrams, thereby increasing operating efficiency
- Communicated objectives with ship's force onboard Nimitz-class carriers, LCU, and Arleigh Burke destroyers

Skills & Interests

Computational
- C++ (MPI, PETSc)
- Python (PyTorch, JAX, SciPy, NumPy)
- MATLAB

CAE Tools
- Solid Mechanics: Ansys Mechanical
- CFD: Ansys Fluent, OpenFOAM
- CAD: Solidworks, Gmsh, CREO, Paraview

Education

Ph.D., Mechanical Engineering / Computer Science
Drexel University, Philadelphia, PA — *September 2020 – December 2024*
Thesis: Multiscale Structural Optimization through Second-order Homogenization and Machine Learning

B.S./M.S., Mechanical Engineering
Drexel University, Philadelphia, PA — *September 2016 – June 2020*