Carter K. Cocke

391 S Holliston Ave, MC 104-44, Pasadena, CA 91125

Education

California Institute of Technology — Expected 2027
Ph.D. in Mechanical Engineering — Pasadena, CA
- Advisor: Prof. Kaushik Bhattacharya

University of Utah — 2022
M.S. in Mechanical Engineering — Salt Lake City, UT
- Advisor: Prof. Ashley Spear

University of Utah — 2022
Honors B.S. in Mechanical Engineering, magna cum laude — Salt Lake City, UT
- Solid Mechanics Emphasis, Honors Ecology and Legacy Minor

Research Experience

University of Utah — Aug. 2019 – Aug. 2022
Graduate Research Assistant — Salt Lake City, UT
Funded by: Department of Energy (DOE) Nuclear Energy University Program (NEUP)
Thesis title: Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials

- Implemented and validated a novel ductile fracture-extended finite-strain FFT-based crystal plasticity formulation and published the work to the *International Journal of Plasticity*
- Led and organized team efforts in a winning blind submission of simulation predictions to the NIST AM-Bench Challenge using the aforementioned fracture-extended FFT-based formulation
- Collaborated with three leading mechanics and materials science researchers to win the 2022 AFRL Challenge #4 and published a manuscript to *Integrating Materials Manufacturing and Innovation*, detailing our modeling approach and in-depth post-challenge investigation
- Developed serial and parallelized Python, Fortran, and C++ code for computational solid mechanics and materials science research applications
- Leveraged high-performance computing (HPC) for running OpenMP and MPI parallelized codes on a Linux cluster environment using the Slurm workload manager

Los Alamos National Laboratory — May 2021 – Aug. 2021
Graduate Research Assistant — Remote
- Developed a method to model mechanical indentation using a finite-strain FFT-based model through formulation modifications and novel algorithmic implementations
- Reduced simulation execution time of a Fortran-based crystal plasticity code via serial code optimizations, OpenMP parallelization, and external library implementations

Publications

2. **C. K. Cocke**, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *International Journal of Plasticity*, vol. 162, p. 103508, 2023. https://doi.org/10.1016/j.ijplas.2022.103508
1. **C. K. Cocke**, A. Rollett, R. Lebensohn, A. Spear, "The AFRL Additive Manufacturing Modeling Challenge: Predicting micromechanical fields in AM IN625 using an FFT-based method with direct input from a 3D microstructural image," *Integrating Materials Manufacturing and Innovation*, vol. 10, no. 2, pp. 157–176, 2021. https://doi.org/10.1007/s40192-021-00211-w

Conference Presentations

* Indicates presenter

5. **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *WCCM 15*, Virtual, August 2022
4. **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *ESMC 11*, Galway, Ireland, July 2022
3. **C. K. Cocke***, H. Mirmohammad, M. Zecevic, B. Phung, R. Lebensohn, O. Kingstedt, A. Spear, "Implementation and experimental validation of nonlocal damage in a large-strain elasto-viscoplastic FFT-based framework for predicting ductile fracture in 3D polycrystalline materials," *3DMS 6*, Washington, D.C., June 2022
2. **C. K. Cocke***, A. Rollett, R. Lebensohn, A. Spear, "The AFRL AM Modeling Challenge: Predicting Micromechanical Fields in AM IN625 Using an FFT-Based Method with Direct Input from a 3D Microstructural Image," *USNCCM 16*, Virtual, July 2021
1. **C. K. Cocke***, A. Rollett, R. Lebensohn, A. Spear, "The AFRL AM Modeling Challenge: Predicting Micromechanical Fields in AM IN625 Using an FFT-based Method with Direct Input from a 3D Microstructural Image," *3DMS 5*, Virtual, June 2021

Teaching Experience

- Teaching Assistant: Continuum Mechanics (ME EN 5530/6530) Fall 2021

Professional Experience

Corning June 2018 – June 2019

Engineering Intern Salt Lake City, UT

- Reduced automation downtime and improved operator safety of several systems through custom designed (SolidWorks) and machined metal and plastic parts (manual/CNC milling)
- Improved cycle time and enhanced user safety of a testing fixture by redesigning system electronics and reworking PLC ladder logic

Honors & Awards

2023: National Science Foundation Graduate Research Fellowship (NSF GRFP)
2022: 1st Place: NIST AM-Bench 2022: Subcontinuum Mesoscale Tensile Test
2022: Travel Award: 15th World Congress on Computational Mechanics (WCCM 15)
2022: Session Chair: 11th European Solid Mechanics Conference (ESMC 11)
2021: 1st Place: ASME/IEEE Heat Sink Design Competition 2021
2020: 1st Place: AFRL AM Modeling Challenge Series 2020: Microscale Structure-to-Properties Predictions
2019: Larry DeVries Scholarship: awarded to outstanding mechanical engineering students
2019: Mechanical Engineering Tuition Waiver
2017 – 2021: Utah Flagship Scholarship

Skills

Programming: Python, C++, Fortran, MATLAB, C
Tools: Git, Linux, Slurm, OpenMP, CUDA, MPI, LaTeX
Software: DREAM.3D, ParaView, deal.II, ABAQUS, FRANC3D, COMSOL, SolidWorks