Nathan A. Miller

EXPERIENCE

Principal Research Associate August 2023 - present
Center for National Security Initiatives
The University of Colorado Boulder, Boulder, CO

Research and Development Engineer September 2010 - August 2023
W-13: Advanced Engineering Analysis, Los Alamos National Laboratory
Los Alamos, NM

- Lead Engineering Verification and Validation Engineer
  - 1000k / FY program under Advanced Simulation and Computing (ASC)
  - Provide technical leadership, strategic planning, and mentoring for the development and application of tools supporting Verification, Validation, and Uncertainty Quantification
  - Lead team which developed the W-13 material modelling framework for new material models within a GitLab CI/CD framework (a W-13 first)
  - Developed and deployed an automatically updating subroutine library CaMML within the CI/CD framework
  - Lead developer of the Approximate Bayesian Computation code Prophet
  - Provide briefings to LANL and DC-based Department of Energy (DOE) leadership as well as other technical staff across the DOE
- Lead high explosive modeller and subject matter expert for W-13
  - Lead developer of the finite deformation VIPor constitutive model
  - Advise on strategic financial allocations for experimental and theoretical work to support calibration and model validation activities
  - Work with experimentalists across LANL advocating for test data and new capabilities that support model development
  - Provide briefings to upper level LANL management as well as DOE technical staff on modelling status
- Workpackage manager of the WTD Material Characterization effort
  - 800 - 1100k / FY analysis and experimental program
  - Lead collaborations between LANL divisions and internationally with AWE
- Recognized as an expert in computational mechanics and multi-scale methods
  - Lead developer of the micromorphic continuum code Tardigrade which is the foundational code for the CU Boulder ASC PSAAP III center, "Center for Micromorphic Multiphysics Porous and Particulate Materials Simulations with Exascale Computing Workflows"
  - PI on the inter-division LDRD ER:
    "Biologically Inspired Coatings for Advanced Plastic Bonded Explosive Formulations" (2021-2023)
  - PI on the inter-division LDRD ER:
    "Efficient Probabilistically Informed Simulation of Metals" (2022-2023)
  - Co-Mentor of LANL Agnew Fellowship Post-doc
  - Mentor and Co-Mentor of numerous undergraduate and graduate students

EDUCATION

Doctor of Philosophy, Civil Engineering: The University of Colorado Boulder, Boulder, CO, December 2021
Dissertation Title: A Micromorphic Length-Scale Coupling Framework for the Determination of Higher-Order Constitutive Models and Multi-Scale Simulation of Heterogeneous Materials

Master of Science, Mechanical Engineering: Colorado State University, Fort Collins, CO, May 2010

Bachelor of Science, Mechanical Engineering: Colorado State University, Fort Collins, CO, May 2009

PUBLICATIONS

Miller, N. A., Regueiro, R. A., Shahabi, F., Bishop, J. E., "A micromorphic filter for determining stress and deformation measures from direct numeric simulations of lower length scale behavior," International Journal of Solids and Structures, 2022

Miller, N. A., "A micromorphic length-scale coupling framework for the determination of higher-order constitutive models and the multi-scale simulation of heterogeneous materials,", PhD Dissertation, University of Colorado Boulder, 2021

Bryant, E. C., Bennett, K. C., Miller, N. A., Misra, A., "Multiscale plasticity of geomaterials predicted via constrained optimization-based granular micromechanics," International Journal of Numerical and Analytical Methods in Geomechanics, 2022; 1-40

Buechler, M. A., Luscher, D. J., Miller, N. A., "A viscoelastic viscoplastic damage model (VPVD)," LANL Internal Report, LA-UR-21-21045, 2021

Buechler, M. A., Miller, N. A., Lusher, D. J., "(U) Preliminary validation of a TATB texture evolution model based on Lujan Center measurements," LANL Internal Report, LA-CP-16-00911, 2016

Luscher, D., Buechler, M., Miller, N. 2014, "Self-consistent modeling of the influence of texture on thermal expansion in polycrystalline TATB," Modelling Simul. Mater. Sci. Eng., 22 075008

PRESENTER

Miller, N. A., "Calibration of Micromorphic Constitutive Models from Variationally Filtered Direct Numeric Simulations," Boase Seminar Series, Boulder CO, LA-UR-22-21027, 2022

Miller, N. A., Brindley, K. A., "Uncertainty quantification for a thermo-mechanical model of PBX 9502," HOCWOG 31 Presentation, LA-CP-21-20449, 2021

Miller, N. A., Stone, T. B., "(U) A phenomenological constitutive model for ratchet growth, its calibration, and application," HOCWOG 31 Presentation, LA-CP-19-00418, 2019

Miller, N., A., Regueiro, R., A., Shahabi, F., Bishop J. E., "A micromorphic filter for determining macro-scale stresses from poly-crystalline elasto-plastic DNS," Engineering Mechanics Institute Conference Presentation, 2019, LA-UR-19-20481, 2019

Miller, N., A., "Stress and Deformation Measure Extraction from a DNS using Generalized Continuum Theory," Sandia Seminar, LA-UR-19-23465, 2019