CURRICULUM VITAE | JAN N. FUHG

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Upson Hall, Room 414, Ithaca, New York 14850

RESEARCH INTERESTS

- Multiscale and Multiphysics Modeling
- Uncertainty Quantification
- Reliability Analysis
- Optimization Under Constraint

SCIENTIFIC TOOLS

- Nonlinear FEM/ FVM/ Particle Methods
- Physics-informed Machine Learning
- Bayesian inference/ optimization
- Adaptive Design of Experiments

EDUCATION

Ph.D. in Mechanical Engineering, Cornell University 2020 - 2023
Thesis: Data-driven constitutive laws towards modular elastoplasticity.
Dissertation committee: N. Bouklas (advisor), M. P. Miller (Cornell University),
C. J. Earls (Cornell University)

M.Sc. in Computational Methods in Engineering, University of Hannover, Germany 2016 - 2019
With honors. Thesis: Adaptive surrogate models for parametric studies.

B.Sc. in Computational Engineering, University of Hannover, Germany 2012 - 2016
Thesis: Computation of melt pool geometry for selective laser melting with FEM.

EMPLOYMENT HISTORY

The University of Texas at Austin, USA 01/2023 - present
Assistant Professor, Dept. of Aerospace Engineering & Engineering Mechanics

University of Hannover, Germany 05/2019 - 07/2020
Scientific coworker at the institute of continuum mechanics and
for the German Cluster of Excellence PhoenixD.

Volkswagen AG, Wolfsburg, Germany 05/2018 - 10/2018
Research and development intern

Mahle GmbH, Stuttgart, Germany 10/2017 - 04/2018
Software engineering intern

University of Hannover, Germany 11/2016 - 04/2019
Research assistant at the institute of continuum mechanics

ZF Friedrichshafen AG, Friedrichshafen, Germany 04/2016 - 08/2016
Research and development intern

SELECTED PUBLICATIONS

- **Fuhg, J. N.**, Karmarkar, A., Kadeethum, T., Yoon, H., & Bouklas, N. (2023). Deep Convolutional Ritz Method: Parametric PDE surrogates without labeled data. Applied Mathematics and Mechanics *In press*. arXiv preprint arXiv:2206.04675.
- **Fuhg, J. N.**, Hamel, C. M., Johnson, K., Jones, R., & Bouklas, N. (2023). Modular machine learning-based elastoplasticity: generalization in the context of limited data. Computer Methods in Applied Mechanics and Engineering, 407, 115930.
- **Fuhg, J. N.**, A., Bouklas, N., & Marino, M. (2023). Enhancing phenomenological yield functions with data: Challenges and opportunities. European Journal of Mechanics-A/Solids, 104925.
- **Fuhg, J. N.**, Bouklas, N., & Jones, R. E. (2022). "Learning hyperelastic anisotropy from data via a tensor basis neural network." Computer Methods in Applied Mechanics and Engineering
- **Fuhg, J. N.**, van Wees, L., Obstalecki, M., Shade, P., Bouklas, N., & Kasemer, M. (2022). "Machine-learning convex and texture-dependent macroscopic yield from crystal plasticity simulations." Materialia, 101446.

- **Fuhg, J. N.**, & Bouklas, N. (2021). "On physics-informed data-driven isotropic and anisotropic constitutive models through probabilistic machine learning and space-filling sampling" Computer Methods in Applied Mechanics and Engineering 394: 114915.
- Kadeethum, T., O'malley, D., Ballarin, F., Ang, I., **Fuhg, J. N.**, Bouklas, N., ... & Yoon, H. (2022). Enhancing high-fidelity nonlinear solver with reduced order model. Scientific Reports, 12(1), 1-15.
- **Fuhg, J. N.**, Kalogeris, I., Fau, A., & Bouklas, N. (2022). "Interval and fuzzy physics-informed neural networks for uncertain fields." Probabilistic Engineering Mechanics: 103240.
- **Fuhg, J. N.**, & Bouklas, N. (2021). "The mixed deep energy method for resolving concentration features in finite strain hyperelasticity." Journal of Computational Physics: 110839.
- Kadeethum, T., O'Malley, D., **Fuhg, J. N.**, Choi, Y., Lee, J., Viswanathan, H. S., & Bouklas, N. (2021). "A framework for data-driven solution and parameter estimation of PDEs using conditional generative adversarial networks." Nature Computational Science.
- **Fuhg, J. N**, Marino, M, & Bouklas, N. (2021). "Local approximate Gaussian process regression for data-driven constitutive laws: Development and comparison with neural networks." Computer Methods in Applied Mechanics and Engineering 388: 114217.
- **Fuhg, J. N.**, Böhm, C., Bouklas, N., Fau, A. , Wriggers, P. , & Marino, M. (2021). "Model-data-driven Constitutive Responses: Application to a Multiscale Computational Framework." Journal of Engineering Science 167: 103522.
- **Fuhg, J. N.**, & A. Fau. (2021). "A classification-pursuing adaptive approach for Gaussian process regression on unlabeled data." Mechanical Systems and Signal Processing 162: 107976.
- Urrea-Quintero, J. H., **Fuhg, J. N.**, Marino, M., & Fau, A. (2021). "PI/PID controller stabilizing sets of uncertain nonlinear systems: an efficient surrogate model-based approach." Nonlinear Dynamics, 1-23.
- **Fuhg, J. N.**, Fau, A., & Nackenhorst, U. (2020). "State-of-the-Art and Comparative Review of Adaptive Sampling Methods for Kriging." Archives of Computational Methods in Engineering, 1-59.
- Huang, D., **Fuhg, J. N**., Weißenfels, C., & Wriggers, P. (2020). "A machine learning based plasticity model using proper orthogonal decomposition." Computer Methods in Applied Mechanics and Engineering, 365, 113008.
- **Fuhg, J. N.**, & Fau, A. (2019). "Surrogate model approach for investigating the stability of a friction-induced oscillator of Duffing's type." Nonlinear Dynamics, 1-21.

Preprints (papers under review):

- Upadhyay, K., **Fuhg, J. N.**, Bouklas, N., & Ramesh, K. T. (2023). Physics-informed Data-driven Discovery of Constitutive Models with Application to Strain-Rate-sensitive Soft Materials. arXiv preprint arXiv:2304.13897.

GRANTS, AWARDS AND FELLOWSHIPS

- MMLDT-CSET Conference NSF fellowship (2021)
- USNCCM16 Conference Award (2021)
- Lower Saxony Scholarship, Covering tuition for the whole year of 2013
- Lower Saxony Scholarship, Covering tuition for the whole year of 2012

MASTER STUDENT SUPERVISION

- **Wenhan Zhou**, Master thesis: "Neural Ordinary Differential Equations in Computational Mechanics" (2020). Institute of continuum mechanics, Leibniz University Hannover, Germany.
- **Arnav Karmarkar**, Master project: "Physics-informed convolutional neural networks" (2022). Cornell University

JOURNAL REFEREE

Computer Methods in Applied Mechanics and Engineering, Engineering with Computers, Engineering Computations, Journal of Composites Part B, International Journal of Computational Methods, Mechanical Systems and Signal Processing, International Journal of Heat and Mass Transfer, Fuzzy Information and Engineering

CONFERENCE PRESENTATIONS

- "Modular machine learning-based elastoplasticity: generalization in the context of limited data." SES 22 (2022).
- "Deep Convolutional Ritz Method: Parametric PDE surrogates without labeled data." SES 22 (2022).
- "Data-Driven Material Modeling Employing the Theory of Representations." USNC-TAM 22 (2022).
- "Hybrid Elastoplasticity with Data-Driven Yielding and Model-Based Hardening." USNC-TAM 22 (2022).
- "Interval and Fuzzy Physics-Informed Neural Networks for Uncertain Fields". SIAM UQ 22 (2022).
- "Exploring the Building Blocks of Adaptive Sampling Methods for Kriging". SIAM UQ 22 (2022).
- "Physics-Informed Data-Driven Material Models with Gaussian Process Regression." MMLDT-CSET (2021).
- "Data-Driven Constitutive Laws: Homogenization for Finite-Strain Hyperelasticity." USNCCM16 (2021).
- "Adaptive Multi-Fidelity Metamodeling for Computational Contact Problems." ICCCM VI. (2019).