# XIANG ZHANG

Postdoctoral Research Associate Department of Aerospace Engineering University of Illinois at Urbana-Champaign (UIUC), Urbana IL 61801 (615) 779-9609 zhangx22@illinois.edu

### EDUCATION

Ph.D., Civil Engineering	2017
Vanderbilt University, Nashville, TN	
Advisor: Prof. Caglar Oskay	
Research topic: Reduced-order modeling and multiscale investigations of high-performance allo	$_{\rm ys}$
M.S., Civil Engineering	2015
Vanderbilt University, Nashville, TN	
Advisor: Prof. Caglar Oskay	
Research topic: Eigensrain-based reduced-order homogenization for polycrystal plasticity	
M.E., Solid Mechanics	2012
Beihang University, China	
Advisor: Prof. Jialing Yang	
Research topic: Numerical and experimental study of bird-strike on aerostructures	
B.E., Engineering Mechanics	2009
Northeastern University, China	

## RESEARCH AREAS AND EXPERTISE

- Multiscale modeling of deformation and damage in heterogeneous materials
  - Crystal plasticity finite element modeling
  - Cohesive zone model based intergranular damage modeling
  - Reduced-order multiscale homogenization of polycrystal plasticity
  - Interface-enriched Generalized Finite Element Method (IGFEM) for transverse failure modeling in fiber-reinforced composites
- Gradient-based optimization of fiber-reinforced composite microstructure
  - IGFEM-based sensitivity analysis of the transverse failure response of fiber-reinforced composites with respect to the material and geometrical parameters characterizing the microstructure
  - Reduced-order multiscale sensitivity analysis for microstructure material and shape optimization
- Multiphysics modeling and design of composite manufacturing based on frontal polymerization (FP)
  - Coupled thermo-chemo-mechanical simulation of FP-based process
  - Design of FP-based manufacturing processes: 3D printing, morphogenic manufacturing
- Crashworthiness analysis of aerostructures by finite element modeling and experimental testing

#### EMPLOYMENT

- 08/2019 Pressent
- 01/2018 08/2019
- 09/2017 01/2018
- 06/2013 08/2017
- 08/2012 05/2013

Assistant Professor, Mechnical Engineering, University of Wyoming Postdoctoral Fellow with Prof. Philippe H. Geubelle, UIUC

Postdoctoral Fellow with Prof. Caglar Oskay, Vanderbilt University

- Graduate Research Assistant, Vanderbilt University
  - Graduate Teaching Assistant, Vanderbilt University

## AWARDS AND HONORS

- Finalist, 28th Robert J. Melosh Medal Competition for the Best Student Paper on Finite Element Analysis. Duke University, Durham, NC, 2017.
- Best Paper, Modeling Inelasticity & Multiscale Behavior (MIMB) Committee Student Competition, EMI Conference, Nashville, TN, 2016.
- Best Student Poster, Materials Science and Technology category, ANS Winter Meeting and Nuclear Technology Expo, Las Vegas, NV, 2016.
- Best Paper, Peter G. Hoadley Best Student Paper Competition, Department of Civil and Environment Engineering, Vanderbilt University, Nashville, TN, 2016.
- Travel Award, 15th U.S. National Congress on Computational Mechanics. Austin, TX, 2019.
- Travel Grant, 16th Pan-American Congress of Applied Mechanics. Ann Arbor, MI, 2019.
- Travel Award, 14th U.S. National Congress on Computational Mechanics. Montreal, Canada, 2017.

## JOURNAL PUBLICATIONS AND SUBMITTED MANUSCRIPTS

- S. Vyas, E. Goli, X. Zhang, P. Geubelle. Unidirectional glass-fiber reinforced composites via frontal polymerization: A numerical study. *Compos. Sci. Technol.*, 184:0266-0538, 2019.
- 2. X. Zhang, D. Brandyberry, P. Geubelle. IGFEM-based shape sensitivity analysis of the transverse failure of a composite laminate. *Comput. Mech.*, https://doi.org/10.1007/s00466-019-01726-y, 2019.
- J.T. Benzing, Y. Liu, X. Zhang, W.E. Luecke, D. Ponge, A. Dutta, C. Oskay, D. Raabe, J.E. Wittig. Experimental and numerical study of multi-phase medium-Mn TWIP-TRIP steel: influences of strain rate and phase constituents. *Acta Mater.*, 177:250-262, 2019.
- 4. X. Zhang, C. Oskay. Sparse and scalable eigenstrain-based reduced order homogenization models for polycrystal plasticity. *Comput. Methods Appl. Mech. Engg.*, 326:241-269, 2017.
- V. T. Phan, X. Zhang, Y. Li, C. Oskay. Microscale modeling of creep deformation and rupture in Alloy 617. Mech. Mater., 114:215-227, 2017.
- 6. X. Zhang, C. Oskay. Polycrystal plasticity modeling of Nickel-based superalloy IN 617 subjected to cyclic loading at high temperature. *Modelling Simul. Mater. Sci. Eng.*, 24:055009, 2016.
- X. Zhang, C. Oskay. Eigenstrain-based reduced order homogenization for polycrystalline materials. Comput. Methods Appl. Mech. Engg., 297:408-436, 2015.
- D.Y. Hu, X. Zhang. Full-scale crash test and FEM simulation of a crashworthy helicopter seat. J. Aero. Power, 27:395-400, 2012.

## CONFERENCE PUBLICATIONS

- X. Zhang, Y. Liu, C. Oskay. Coupling crystal plasticity with structural mechanics for prediction of thermo-mechanical response in large scale structures. 6th European Conference on Computational Mechanic., Glasgow, UK, June 11-15, 2018.
- 2. X. Zhang, C. Oskay. Eigenstrain-based reduced order homogenization models for polycrystal plasticity: addressing scalability. XIV International Conference of Computational Plasticity. Fundamentals and Applications., Barcelona, Spain, September 5-7, 2017.
- X. Zhang, V. T. Phan, C. Oskay. Microstructural creep, fatigue and creep-fatigue modeling of Nickel-based superalloy Inconel 617 at high temperature. *Proceedings of the High Temperature Reactor Technology (HTR) Meeting 2016*, Las Vegas, NV, November 7-10, 2016.

#### SELECTED CONFERENCE PRESENTATIONS

- X. Zhang, J. Aw, L. Dean, N. Sottos, J. Moore and P. Geubelle. Numerical modeling and design for a 3D printing process based on frontal polymerization. 15th U.S. National Congress on Computational Mechanics, Austin, Tx, July 2019.
- 2. X. Zhang, C. Oskay. Sparse and scalable eigenstrain-based reduced order models for polycrystal plasticity. U.S. National Congress on Computational Mechanics, Montreal, Canada, July 2017.

- 3. X. Zhang, C. Oskay. Microscale modeling of creep and rupture of IN 617 using cohesive zone-CPFE analysis. Engineering Mechanics Institute Conference, San Diego, CA, June 2017.
- 4. X. Zhang, C. Oskay. Sparse and scalable digenstrain-based reduced order models for polycrystal plasticity. Engineering Mechanics Institute Conference, San Diego, CA, June 2017.
- 5. X. Zhang, V. T. Phan, C. Oskay. Microstructural creep, fatigue and creep-fatigue modeling of nickel-based superalloy IN 617 at high temperature. ANS 8th International Topical Meeting on High Temperature Reactor Technology, Las Vegas, NV, November 2016.
- 6. X. Zhang, C. Oskay. Eigenstrain based reduced order homogenization for polycrystalline materials. Engineering Mechanics Institute Conference, Nashville, TN, May 2016.
- 7. X. Zhang, C. Oskay. Fatigue and creep-fatigue modeling of Alloy 617 at high temperature. ASME International Mechanical Engineering Congress & Exposition, Houston, TX, November 2015.
- 8. X. Zhang, C. Li, J.L. Yang. Bird-strike simulation of a helicopter front fuselage based on SPH method. Chinese Conference of Theoretical and Applied Mechanics, Harbin, China, August 2011.

## PROFESSIONAL EXPERIENCE

• Peer-reviewer for technical journals: Computer Methods in Applied Mechanics and Engineering, Computational Mechanics, Acta Mechanica, Modelling and Simulation in Materials Science and Engineering, International Journal for Multiscale Computational Engineering, Mathematics and Mechanics of Solids, Materialia

## TEACHING AND STUDENT MENTORING EXPERIENCE

• ME4050/5040 Introduction to Finite Element Analysis, Fall 2019

# CAE/CAD PACKAGE

- Abaqus, subroutines (UMAT, UEL, etc.) development and python scripting
- MOOSE, development in tensor mechanics, heat conduction modules and experience with multiapp simulation and postprocessing
- HyperMesh, experience with mesh generation of various aero-structures and electronics
- LS-DYNA, experience with bird impact analysis and drop analysis of electronic device
- CATIA, experience with sketch, part generation and assembly

## PROGRAMMING EXPERTISE

• Fortran, Matlab, Python, C++, Linux bash,  ${\rm L\!AT}_{\rm E\!X}.$