

# Xingsheng Sun

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## RESEARCH INTEREST

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Long-Term Atomistic Modeling and Simulation, Uncertainty Quantification in Solid Mechanics, Materials/Structures by Design, Mechanics of Materials in Extreme Conditions

## ACADEMIC EXPERIENCE

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Assistant Professor, University of Kentucky, United States Department of Mechanical Engineering	Nov 2021 - Present
Postdoctoral Scholar, California Institute of Technology, United States Department of Aerospace (GALCIT)	Nov 2018 - Oct 2021
Graduate Research Assistant, Virginia Tech, United States Kevin T. Crofton Department of Aerospace and Ocean Engineering	Jan 2015 - Oct 2018
Graduate Research Assistant, Hunan University, China State Key Laboratory of Advanced Design and Manufacturing for Vehicle Body	Sep 2011 - Dec 2014
Undergraduate Research Assistant, Dalian University of Technology, China State Key Laboratory of Structural Analysis for Industrial Equipment	Sep 2009 - Jun 2011

## EDUCATION

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Ph.D. in Aerospace Engineering, Virginia Tech, United States	Jan 2015 - Oct 2018
M.S. in Mechanical Engineering, Hunan University, China	Sep 2011 - Jun 2014
B.S. in Mechanical Engineering, Dalian University of Technology, China	Sep 2007 - Jun 2011

## PUBLICATIONS

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### Google Scholar

<https://scholar.google.com/citations?user=f6wWVV8AAAAJ&hl=en>

### Journal Articles (\*Equal contribution)

1. B. Liu\*, X. Sun\*, K. Bhattacharya, M. Ortiz. Hierarchical multiscale quantification of material uncertainty. *Journal of the Mechanics and Physics of Solids*. 2021, 153: 104492. [\[Link\]](#)
2. X. Sun, T. Kirchdoerfer, M. Ortiz. Rigorous uncertainty quantification and design with uncertain material models. *International Journal of Impact Engineering*. 2020, 136: 103418. [\[Link\]](#)
3. X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Atomistic modeling and analysis of hydride phase transformation in palladium nanoparticles. *Journal of the Mechanics and Physics of Solids*. 2019, 125: 360-383. [\[Link\]](#)
4. X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Long-term atomistic simulation of hydrogen absorption in palladium nanocubes using a diffusive molecular dynamics method. *International Journal of Hydrogen Energy*. 2018, 43(11): 5657-5667. [\[Link\]](#)
5. X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Acceleration of diffusive molecular dynamics simulations through mean field approximation and subcycling time integration. *Journal of Computational Physics*. 2017, 350: 470-492. [\[Link\]](#)
6. J. Liu, X. Sun, X. Meng, K. Li, G. Zeng, X. Wang. A novel shape function approach of dynamic load identification for the structures with interval uncertainty. *International Journal of Mechanics and Materials in Design*. 2016, 12(3): 375-386. [\[Link\]](#)

7. J. Liu, X. Sun, X. Han, C. Jiang, D. Yu. Dynamic load identification for stochastic structures based on Gegenbauer polynomial approximation and regularization method. *Mechanical Systems and Signal Processing*. 2015, 56-57: 35-54. [\[Link\]](#)
8. J. Liu, X. Sun, K. Li, C. Jiang, X. Han. A probability density function discretization and approximation method for the dynamic load identification of stochastic structures. *Journal of Sound and Vibration*. 2015, 357: 74-94. [\[Link\]](#)
9. K. Li, J. Liu, X. Han, X. Sun. A novel approach for distributed dynamic load reconstruction by space-time domain decoupling. *Journal of Sound and Vibration*. 2015, 348: 137-148. [\[Link\]](#)
10. J. Liu, X. Sun, X. Han, C. Jiang, D. Yu. A novel computational inverse technique for load identification using the shape function method of moving least square fitting. *Computers & Structures*. 2014, 114: 127-137. [\[Link\]](#)
11. X. Sun, J. Liu, X. Han, C. Jiang, R. Chen. A new improved regularization method for dynamic load identification. *Inverse Problems in Science and Engineering*. 2014, 22(7): 1062-1076. [\[Link\]](#)

### Manuscripts under Review and in Preparation (\*Equal contribution)

1. N. Kovachki\*, B. Liu\*, X. Sun\*, H. Zhou\*, K. Bhattacharya, M. Ortiz, A. Stuart. Multiscale modeling of materials: computing, data science, uncertainty and goal-oriented optimization. *Mechanics of Materials*. Under revision. [\[Link\]](#)
2. X. Sun, B. Liu, K. Bhattacharya, M. Ortiz. Concurrent goal-oriented materials-by-design. *International Journal of Impact Engineering*. Under review. [\[Link\]](#)
3. X. Sun, M. P. Ariza, M. Ortiz. Atomistic investigation of hydrogen storage in palladium nanoparticles. In Preparation.
4. X. Sun, B. Liu, K. Bhattacharya, M. Ortiz. Optimal quantification of material uncertainty. In Preparation.

### Conference Proceedings

1. X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Atomistic simulation of hydrogen diffusion in palladium nanoparticles using a diffusive molecular dynamics method. *Proceedings of ASME-International Mechanical Engineering Congress and Exposition*. 2017. [\[Link\]](#)
2. X. Sun, M. P. Ariza, K. G. Wang. Deformation-diffusion coupled analysis of long-term hydrogen diffusion in nanofilms. *Proceedings of VII European Congress on Computational Methods in Applied Sciences and Engineering*. 2016, 1: 197-208. [\[Link\]](#)

### Technical Reports

1. X. Sun\*, B. Liu\*, K. Bhattacharya, M. Ortiz. Uncertainty quantification. *Highlights in Center for Materials in Extreme Dynamics Environments (CMEDE)*. 2020. [\[Link\]](#)
2. K. G. Wang, X. Sun. A pilot study on the feasibility of using shock waves for hull grooming. *Final Technical Report for Office of Naval Research (ONR)*. Report No. AD1084560. 2019. [\[Link\]](#)

### Dissertations and Theses

1. X. Sun. A computational framework for long-term atomistic analysis of solute diffusion in nanomaterials. Ph.D. Dissertation. *Virginia Tech*. 2018. [\[Link\]](#)
2. X. Sun. Research on the techniques of dynamic load identification for stochastic structures. M.S. Thesis. *Hunan University*. 2014. [\[Link\]](#)

## PROFESSIONAL SERVICE

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### Conference Organizer and Chair

- SIAM Conference on Uncertainty Quantification. Atlanta, GA. Apr 2022.
- Symposium of Slip, Twins, and Voids, Mach Conference. Apr 2022.
- Symposium of Slip, Twins, and Voids, Mach Conference. Apr 2021.

- James K. Knowles Lectures and Caltech Solid Mechanics Symposium. Pasadena, CA, Mar 2020.

### Journal Reviewer

- Applied Mathematical Modelling
- Engineering Structures
- Inverse Problems in Science and Engineering
- Journal of Sound and Vibration
- Measurement
- Applied Mathematics and Computation
- International Journal of Hydrogen Energy
- Journal of Cleaner Production
- Materials Science and Technology

## HONORS AND AWARDS

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Travel Award for “Computational Statistics and Data-Driven Models”, ICERM	<i>2020</i>
Travel Award for “Acoustics ’17 Boston”, ASA	<i>2017</i>
Aerospace and Ocean Engineering Graduate Fellowship, Virginia Tech	<i>2015, 2016</i>
Outstanding Master Thesis Award, Hunan Province of China	<i>2016</i>
National Graduate Fellowship, Ministry of Education of China	<i>2013</i>

## PRESENTATIONS

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### Seminars/Webinars

- X. Sun. Multiscale modeling of materials: uncertainty quantification and goal-oriented optimization. Department of Mechanical Engineering, University of Kentucky. Apr 16, 2021
- X. Sun. Diffusive molecular dynamics and its application to hydrogen diffusion in palladium nanoparticles. Engineering and Applied Science Forum (EASF\_Young Webinar). Feb 28, 2021.

### Academic Conferences

- X. Sun, K. Bhattacharya, M. Ortiz. Goal oriented materials by design: multilayer plate subject to high speed impact. MEDE Fall Meeting. Oct 2020.
- X. Sun, T. Kirchdoerfer, M. Ortiz. Rigorous uncertainty quantification and safe design with uncertain material models. MEDE Fall Meeting. Oct 2020.
- B. Liu, X. Sun, K. Bhattacharya, M. Ortiz. Rigorous multi-scale uncertainty quantification and its application to ballistic impact. MEDE Fall Meeting. Oct 2020.
- X. Sun, T. Kirchdoerfer, K. Bhattacharya, M. Ortiz. Uncertainty quantification and optimal design with application to ballistic impacts. SES. Oct 2020.
- X. Sun, T. Kirchdoerfer, M. Ortiz. Rigorous uncertainty quantification and design with focus on material uncertainty. MEDE Fall Meeting. Baltimore, MD. Oct 2019.
- M. P. Ariza, X. Sun, K. G. Wang, M. Ortiz. Hydrogen storage in nanoparticles. EMRS Fall Meeting. Warsaw, Poland. Sep 2019.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. A diffusive molecular dynamics method for the simulation of long-term mass transport in nanomaterials. TMS. San Antonio, TX. Mar 2019.
- J. Ramos, X. Sun, M. Ortiz, M. P. Ariza. Diffusive molecular dynamics simulation of hydrogen diffusion in magnesium. STAMS. Madrid, Spain. Mar 2019.
- M. Ortiz, X. Sun, T. Kirchdoerfer. Rigorous uncertainty quantification with focus on material uncertainty. USACM Thematic Conference on Uncertainty Quantification in Computational Solid and Structural Materials Modeling. Baltimore, MD. Jan 2019.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Long-term atomistic characterization of hydride phase transformation in palladium nanoparticles. USNCTAM. Rosemont, IL. Jun 2018.
- X. Sun, K. G. Wang. Controlled shock waves for underwater hull grooming: a feasibility study. ICMCF. Melbourne, FL. Jun 2018.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Atomistic simulation of hydrogen diffusion in palladium nanoparticles using an accelerated diffusive molecular dynamics method. ASME-IMECE. Tampa, FL. Nov 2017.

- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. A novel deformation-diffusion coupled computational model for hydrogen diffusion in nanomaterials. COMPLAS. Barcelona, Spain. Sep 2017.
- X. Sun, K. G. Wang, M. P. Ariza. Deformation-diffusion coupled analysis of long-term hydrogen diffusion in nanofilms. CMN. Valencia, Spain. Jul 2017.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. An accelerated diffusive molecular dynamics method for the simulation of nonlinear mass transport in nanomaterials. USNCCM14. Montreal, Canada. Jul 2017.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Modeling and characterization of long-term hydrogen absorption in palladium nanoparticles. ISDMM. Lyon, France. Jun 2017.
- X. Sun, M. P. Ariza, K. G. Wang. Long-term analysis of deformation-diffusion coupled hydrogen absorption in nanomaterials. WHEC. Zaragoza, Spain. Jun 2016.
- X. Sun, M. P. Ariza, K. G. Wang. Deformation-diffusion coupled analysis of long-term hydrogen diffusion in nanomaterials. ECCOMAS. Crete Island, Greece. Jun 2016.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Long-term atomistic analysis of hydrogen diffusion in nanomaterials. ASME-IMECE. Houston, TX. Nov 2015.
- X. Sun, M. P. Ariza, M. Ortiz, K. G. Wang. Long-term deformation-diffusion coupled analysis of hydrogen absorption in nanomaterials. USNCCM13. San Diego, CA. Jul 2015.

## WORKSHOPS AND SYMPOSIUMS

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- Computational Statistics and Data-Driven Models Workshop. Providence, RI. Apr 2020.
- Southern California Mechanics Workshop. La Jolla, CA. Jan 2020.
- A Symposium in Honor of Professor Ravichandran on the Occasion of His 60th Birthday. Pasadena, CA. Jun 2019.
- James K. Knowles Lectures and Caltech Solid Mechanics Symposium. Pasadena, CA. May 2019.
- Southern California Applied Mathematics Symposium. Pasadena, CA. Apr 2019.