

Nicholas Geneva

Personal Information

Mechanical Engineering Ph.D. Candidate
South Bend, Indiana, USA
Website: nicholasgeneva.com
Email: ngeneva@nd.edu

Education

Spring 2022 **PhD, Mechanical Engineering**
 (*Expected*) University of Notre Dame
 South Bend, Indiana, USA

Summer 2020 **MS, Applied and Computational Mathematics and Statistics**
 University of Notre Dame
 South Bend, Indiana, USA

Spring 2017 **BS, Honors Mechanical Engineering with Mathematics Minor**
 University of Delaware
 Newark, Delaware, USA

Research Experience

July 2017 - **Research Assistant with Dr. Nicholas Zabaras**
Present *University of Notre Dame*
 South Bend, Indiana, USA
 Integration of physical knowledge into deep/machine learning methods for modeling and uncertainty quantification of dynamical systems. Developed deep neural network models for learning complex non-linear dynamic systems and closure models.

Oct 2014 - **Undergraduate Research with Dr. Lian-Ping Wang**
Mar 2017 *University of Delaware*
 Newark, Delaware, USA
 Researched and developed simulation codes for convection, turbulence, and particle-laden flows designed to execute in highly parallel environments on large peta-scale clusters. Simulations primarily used the lattice Boltzmann method, a mesoscopic approach to directly solve the Navier-Stokes equations.

Jun 2014 - **Research Assistant with Dr. Patricia Delgado**
Aug 2014 *Jug Bay Wetlands Sanctuary*
 Lothian, Maryland, USA
 Sampled wetland vegetation using plots and transects to determine plant response to changing sea levels. Conducted sampling and data recording on stream water chemistry, fish and plankton populations for ongoing research.

Work Experience

- Sept 2017 - May 2018 | **Graduate Teaching Assistant**
University of Notre Dame
South Bend, Indiana, USA
Supervised and mentored senior undergraduate students in their capstone design course. Ensured safety of the students in the undergraduate fabrication lab and gave design advice for their projects.
- Sept 2016 - Dec 2016 | **Mechanical Engineering Teaching Assistant**
University of Delaware
Newark, Delaware, USA
Machine shop assistant for the mechanical engineering department. Mentored and supervised undergraduates with industrial mill and lathe usage.
- Jun 2014 - Aug 2014 | **Front End Mobile Web Developer**
Jug Bay Wetlands Sanctuary
Lothian, Maryland, USA
Designed and developed a custom mobile website system for quick response codes to provide information through audio and text.

Peer Reviewed Journal Publications

- [1] N. Geneva and N. Zabarar. “Transformers for Modeling Physical Systems”. In: *Neural Networks* (2021). Accepted. url: <https://arxiv.org/abs/2010.03957>.
- [2] N. Geneva and N. Zabarar. “Transformers with Graph Embeddings for Modeling Physical Systems on Unstructured Domains”. In: (2021). (In preparation).
- [3] N. Geneva and N. Zabarar. “Modeling the dynamics of PDE systems with physics-constrained deep auto-regressive networks”. In: *Journal of Computational Physics* (2020). doi: [10.1016/j.jcp.2019.109056](https://doi.org/10.1016/j.jcp.2019.109056).
- [4] N. Geneva and N. Zabarar. “Multi-fidelity generative deep learning turbulent flows”. In: *Foundations of Data Science 2* (2020), p. 391. doi: [10.3934/fods.2020019](https://doi.org/10.3934/fods.2020019).
- [5] N. Geneva and N. Zabarar. “Quantifying model form uncertainty in Reynolds-averaged turbulence models with Bayesian deep neural networks”. In: *Journal of Computational Physics* (2019). doi: [10.1016/j.jcp.2019.01.021](https://doi.org/10.1016/j.jcp.2019.01.021).
- [6] N. Geneva, C. Peng, X. Li, and L.-P. Wang. “A scalable interface-resolved simulation of particle-laden flow using the lattice Boltzmann method”. In: *Parallel Computing* (2017). doi: [10.1016/j.parco.2017.07.005](https://doi.org/10.1016/j.parco.2017.07.005).
- [7] C. Peng, N. Geneva, Z. Guo, and L.-P. Wang. “Direct numerical simulation of turbulent pipe flow using the lattice Boltzmann method”. In: *Journal Of Computational Physics* (2017). doi: [10.1016/j.jcp.2017.11.040](https://doi.org/10.1016/j.jcp.2017.11.040).
- [8] C. Peng, N. Geneva, Z. Guo, and L.-P. Wang. “Issues associated with Galilean invariance on a moving solid boundary in the lattice Boltzmann method”. In: *Physical Review E* (2017). doi: [10.1103/PhysRevE.95.013301](https://doi.org/10.1103/PhysRevE.95.013301).
- [9] L.-P. Wang, H. Min, C. Peng, N. Geneva, and Z. Guo. “A lattice-Boltzmann scheme of the Navier-Stokes equation on a three-dimensional cuboid lattice”. In: *Computers & Mathematics with Applications* (2016). doi: [10.1016/j.camwa.2016.06.017](https://doi.org/10.1016/j.camwa.2016.06.017).

Conference Abstracts/Proceedings

- [1] N. Geneva and N. Zabarar. “Bayesian Geometric Convolutional Neural Networks for Engineering Applications”. In: *SIAM Conference on Computational Science and Engineering*. 2019.
- [2] N. Geneva and N. Zabarar. “Uncertainty Quantification of RANS Turbulence Models Using Bayesian Deep Learning with Stein Variational Gradient Descent”. In: *SIAM Conference on Uncertainty Quantification*. 2018.
- [3] L.-P. Wang, X. Wen, N. Geneva, P. Wang, and Z. Guo. “Simulations of high-Rayleigh-number convection flows using mesoscopic methods.” In: *International Conference on Discrete Simulation of Fluid Dynamics Abstracts*. 2016.
- [4] N. Geneva and L.-P. Wang. “Different Scalable Implementations of Collision and Streaming for Optimal Computational Performance of Lattice Boltzmann Simulations”. In: *APS Division of Fluid Dynamics Meeting Abstracts*. 2015.
- [5] C. Peng, N. Geneva, H. Min, and L.-P. Wang. “Investigation of turbulence modulation in particle-laden flows using the lattice Boltzmann method”. In: *APS Division of Fluid Dynamics Meeting Abstracts*. 2015.

Fellowships and Awards

- **Notebaert Professional Development Award**
University of Notre Dame 2018
- **Graduate Student Union Conference Presentation Award**
University of Notre Dame 2018 & 2020
- **NSF Graduate Research Fellowship Program**
National Science Foundation 2017
- **National Defense Science and Engineering Graduate Fellowship**
Department of Defense 2017
- **Charles B. Evans Award**
University of Delaware, Department of Mechanical Engineering 2017
- **Mary and George Nowinski Award for Excellence in Undergraduate Research**
University of Delaware, Department of Mechanical Engineering 2017
- **ASME Outstanding Senior Design Award FSAE**
University of Delaware, Department of Mechanical Engineering 2017
- **NSF Research Experience for Undergraduates**
University of Delaware, Computational Multi-phase Flow Group 2016-2017
- **W. David & W. Corder Teter Mechanical Engineering Scholarship**
University of Delaware, Department of Mechanical Engineering 2015-2017
- **University of Delaware Summer Scholar**
University of Delaware 2015-2017
- **University of Delaware Scholar**
University of Delaware, Department of Mechanical Engineering 2013-2017
- **NASA Delaware Space Grant Undergraduate Tuition Award**
University of Delaware 2016
- **W. Francis Lindell Mechanical Engineering Achievement Award**
University of Delaware, Department of Mechanical Engineering 2015

- **APS DFD Travel Award**
American Physical Society, Division of Fluid Dynamics 2015
- **Northern High School Music Boosters Scholarship**
Northern High School 2013
- **Eagle Scout**
Boy Scouts of America 2010

Skills

Machine Learning:	Bayesian Statistics, Bayesian Neural Networks, Graph Neural Networks, Transformers, Generative Models, Physics-Informed Deep Learning, Uncertainty Quantification
Programming:	Python, PyTorch, Fortran, MPI, Angular 2, Javascript, C++, C#, Java
Data Processing:	Matplotlib, Matlab, Paraview, D3.js, NCAR Command Language (NCL), Microsoft Excel, Blender
Word Processing:	Latex, Microsoft Word, Microsoft Power Point