Yiren Shen

Postdoctoral Researcher, Stanford University Department of Aeronautics and Astronautics

[redacted] | [redacted] | yiren6 | yiren-shen

Education

Stanford University *Stanford, CA*

Ph.D. in Aeronautics and Astronautics *Jan. 2022 - Jun. 2026*

- Doctoral thesis: Multi-fidelity aerodynamic surrogate modeling for conceptual design using graph neural networks, accessible through https://purl.stanford.edu/cp141hk7861.
- Reading Committee: Juan J. Alonso Ph.D. (Thesis Advisor), Daniel M. Tartakovsky Ph.D., Mykel J. Kochenderfer Ph.D.

Stanford University *Stanford, CA*

M.S. in Aeronautics and Astronautics *Sep. 2017 - Jun. 2019* *(conferred 2024)*

- Advisor: Juan J. Alonso Ph.D.
- Masters Research Presentation: Investigation of Noise Generation in a Forward-Moving SR2 Propeller
- Selected Coursework: Machine Learning, Data Mining, Numerical Methods, Machine Learning, Linear Algebra, Numerical Analysis, Statistics and Optimization, Acoustics, Finite Element Analysis.

Cornell University *Ithaca, NY*

B.S. in Mechanical Engineering *Aug. 2014 - Jan. 2017*

- *Magna Cum Laude*
- Awardee of Tau Beta Pi and ELI Research fellowship.
- Research assistant at Thermal Science Laboratory under the supervision of Professor C. Thomas Avedisian Ph.D.

University of Illinois Urbana-Champaign *Champaign, IL*

Freshman Coursework in Aerospace Engineering *Aug. 2013 - May 2014*

- Transferred to Cornell University to complete B.S. degree.

Research Experience

Research Interests:
Machine learning–based surrogate modeling, multi-fidelity analysis, uncertainty quantification, and design automation. I integrate physics-informed ML surrogates, multidisciplinary solvers, and automated workflows into new product development environment to accelerate assessment, multidisciplinary design optimization (MDO), and design space exploration to enable the development of sustainable unconventional vehicles with reduced program risk.

University of Washington, NSF AI Institute in Dynamic Systems *Seattle, WA*

Postdoctoral Researcher *Oct. 2026 - now*

- Developing state-of-the-art benchmarks for coupled aerodynamic, structural, and control optimization..

Stanford University, Aerospace Design Lab *Palo Alto, CA*

Postdoctoral Researcher *Jul. 2026 - Sep. 2026*

- Metroplex Overflight Noise Analysis (MONA) departure noise analyst.

Stanford University, Aerospace Design Lab *Palo Alto, CA*

Doctoral Researcher *Jan. 2022 - Jun. 2026*

- Advisor and Lab PI: Juan J. Alonso
- Research focuses on physics-informed machine learning, applied surrogate modeling, AI driven design space exploration, automated design tools, and multi-fidelity analysis methods for sustainable unconventional vehicle developments.
- Developed VortexNet, a first-of-its-kind physics-informed GNN that augments low-fidelity aerodynamic tools with high-fidelity CFD field data for conceptual aircraft design.
- Established empirical data-scaling law for VortexNet and released a multi-fidelity aerodynamic dataset.
- Demonstrated VortexNet's integration into the design pipeline through a stability-constrained shape optimization problem.
- Contributor of the Supersonic Configurations at Low Speeds (SCALOS) project with specialization in surrogate modeling, SST design space exploration, and planform optimization.
- 6 publications in the domain of applied surrogate modeling using machine learning (Physics AI), 1 publication in the domain of agentic engineering AI, and 1 publication in the domain of vehicle design-analysis tool.

GE Aerospace Research, Probabilistic Design and Material Informatics *Niskayuna, NY*

Research Fellow *June 2025 - Sep. 2025*

- Proposed and composed a Large Eddy Simulation (LES) flow super-resolution program, that enhances low-order LES flow field to high-order equivalent with sufficient credibility in integrated quantities of interests statistics.
- Surveyed the state-of-the-art methods in physics-informed machine learning and integrated selected methods into GE property software environment.

SRI International, Intelligent Systems Lab *Palo Alto, CA*

Research Intern *Jun. 2023 - Sep. 2023*

- Composed one Finite Element Analysis (FEA) program for structural simulation using MITC4 Shell element.
- Integrated the FEA code with topology optimization heuristic to enable reinforcement fiber layout optimization for engineering design optimization applications.

Zhejiang University, Lab of Flexible Sensors and Intelligent Interaction *Hangzhou, China*

Visiting Scholar *Aug. 2020 - October. 2021*

- Performed conformal mapping simulation for hyper-elastic soft sensor deployment on complex robot arm surface.
- Proposed, designed, and simulated one soft hair-like flow sensor that is applicable for small drone air speed sensing.

Cornell University, Thermal Science Lab *Ithaca, NY*

Research Assistant *Jan. 2015 - Jan. 2017*

- Advisor and Lab PI: C. Thomas Avedisian Ph.D.
- Research focuses on fuel droplet combustion assessment, including burning rate and soot production, for surrogate gasoline fuel, jet fuel and renewable jet fuel. Developed various automatic image analysis software to facilitate data acquisition.

Publications

Journal Articles

- **Yiren Shen**; Jacob T. Needels; Juan J. Alonso. (2026). A Multi-Fidelity Workflow for Conceptual Design Using Graph Neural Network-Based Field Prediction Surrogate Model. *Computers & Fluids*, Vol. 317.
- Yuhao Xu; **Yiren Shen**; C. Thomas Avedisian; Michael C. Hicks; Mun Y. Choi. (2023). Quantitative investigation of sooting dynamics in droplet combustion using an automated image analysis algorithm. *Fuel*, Vol. 354.
- Zhiqiu Ye; Gaoyang Pang; Kaichen Xu; Zeyang Hou; Honghao Lv; **Yiren Shen**; Geng Yang. (2022). Soft Robot Skin With Conformal Adaptability for On-Body Tactile Perception of Collaborative Robots. *IEEE Robotics and Automation Letters*, Vol.7.
- Yuhao Xu; Jordan D. Brunson; C. Thomas Avedisian; **Yiren Shen**; Ivan Keresztes; Anthony M. Condo; Daniel Phillips. (2020). Burning of Algae-Derived Biofuel Droplets and Their Mixtures with Jet Fuel. *Energy & Fuels*, Vol. 34.

Conference Proceedings

- **Shaghayegh Fazliani**; **Krissh Chawla**; **Jack Guo**; **Yiren Shen**; Matthias Ihme; Madeleine Udell (2026). ShapeBench: A Scalable Benchmark and Diagnostic Suite for Standardized Evaluation in Aerodynamic Shape Optimization, *preprint*, arXiv:2605.20763.
- **Yiren Shen**; Juan J. Alonso (2026). A Multi-Fidelity Double-Delta Wing Dataset and Empirical Scaling Laws for GNN-based Aerodynamic Field Surrogates, *AIAA SCITECH 2026 Forum*, AIAA 2026-0686.
- **Yiren Shen**; Juan J. Alonso (2025). Graph Neural Network-Guided Aerodynamic Shape Optimization for Conceptual Design of Supersonic Transport Wings, *AIAA AVIATION 2025 Forum*, AIAA 2025-3228.
- **Yiren Shen**; Juan J. Alonso (2025). Performance Evaluation of a Graph Neural Network-Augmented Multi-Fidelity Workflow for Predicting Aerodynamic Coefficients on Delta Wings at Low Speed. *AIAA SCITECH 2025 Forum*, AIAA 2025-2360.
- **Yiren Shen**; Jacob T. Needels; Juan J. Alonso (2025). VortexNet: A Graph Neural Network-Based Multi-Fidelity Surrogate Model for Field Predictions. *AIAA SCITECH 2025 Forum*, AIAA 2025-0494.
- **Yiren Shen**; Harsh C. Patel; Zan Xu; Juan J. Alonso (2024). Application of Multi-Fidelity Transfer Learning with Autoencoders for Efficient Construction of Surrogate Models . *AIAA SCITECH 2024 Forum*, AIAA 2024-0013.
- **Yiren Shen**; Harsh C. Patel; Marshall C. Galbraith; Juan J. Alonso (2023). Towards a Framework for Parametric Models and Geometric Sensitivity Computations with SU2 and pyCAPS. *AIAA AVIATION 2023 Forum*, AIAA 2023-3312.
- Yuhao Xu; **Yiren Shen**; Tom Avedisian; Michael Hicks; Hyun Kyu Suh; Mun Choi (2020). Quantitative Soot Volume Fraction Measurements from Droplet Combustion Experiments of Sooty Fuels. *36th Annual Meeting for the American Society for Gravitational and Space Research (ASGSR).*
- Yuhao Xu; Tanvir Farouk; **Yiren Shen**; Michael C. Hicks; C. Thomas Avedisian; Yiting Xie; Anthony P. Reeves; Frederick L.

Dryer (2017). Comprehensive Study of the Initial Diameter for Combustion of n-Heptane/iso-Octane Mixture Droplets. *10th U.S. National Combustion Meeting.*

Work Experience

AGI House *Hillsborough, CA*

Research Fellow *Jul. 2026 - Now*

- Organize research talks by inviting and coordinating speakers for the community.

Honda Aircraft Company *Greensboro, NC*

R&D Engineer, Department of Advanced Research *Jun. 2018 - Sep. 2018*

- Evaluated one stability augmentation system, determined voting thresholds to ensure low false alarm rate.
- Improved the efficiency (+10%) of data extraction and analysis by introducing a plotting framework.
- Investigated flight incidences, analyzed data and potential scenarios in offline and Hardware-In-Loop simulations.

Boston Consulting Group (BCG) *Shanghai, China*

Intern *Jun. 2017 - Sep. 2017*

- Solidified the market size estimation for three pharmatech products in South Asia.
- Led performance analysis of a large portfolio of potential loan beneficiaries, driving a $300M uplift for the client and defining key success factors for future operations.

Goldwind Science and Technology *Beijing, China*

Simulation Engineer, System Control and Simulation Department *Mar. 2017 - Jun. 2017*

- Worked on a comprehensive investigation on muffler designs and their performances for one generator's cooling blower; identified the best solution under the working constrains.
- Designed and simulated a particular type of muffler; drafted a noise reduction test protocol for testing.
- Prototyped the nacelle geometry for one future generator model.

Teaching Experience

Applied Aerodynamics (AA200) *Stanford University*

Teaching Assistant *Jan. 2026 - Mar. 2026*

- Responsible for supporting teaching tasks, including holding office hours, leading problem sessions, and grading assignments.

Engineering of Systems (ENGR21) *Stanford University*

Teaching Assistant *Apr. 2024 - Jun. 2024*

- Responsible for supporting teaching tasks, including project coaching, holding office hours, and grading assignments.
- High review marks including "helpfulness", "communication" and "project shaping".

Sustainable Aviation (AA260) *Stanford University*

Teaching Assistant *Apr. 2023 - Jun. 2023*

- Responsible for supporting teaching tasks, including project coaching, holding office hours, and grading assignments.
- High review marks including "helpfulness", "knowledge" and "coaching".

Introduction to Mechanical Engineering (ME1170) *Cornell University*

Teaching Assistant *Aug. 2016 - Dec. 2016*

- Responsible for supporting teaching tasks, leading robot lab sessions, and holding office hours.
- High review marks including "helpfulness", "communication" and "technical expertise".

Presentations & Talks

Multi-Fidelity Aerodynamic Surrogate Modeling for Conceptual Design Using Graph Neural Networks *Mountain View, CA*

NASA Advanced Modeling and Simulation (AMS) Seminars *July 2026*

Multi-Fidelity Aerodynamic Surrogate Modeling for Conceptual Design *Menlo Park, CA*

SRI International Western ML Seminar *May 2026*

A Multi-Fidelity Double-Delta Wing Dataset and Empirical Scaling Laws for GNN-based Aerodynamic Field Surrogates *Orlando, FL*

AIAA SciTech 2026 Forum *Jan. 2026*

Recent Advances in ML & Surrogate Modeling: Highlights from AIAA Meetings *Niskayuna, NY*

Presented at the GE Aerospace LearnER Seminar Series *Sep. 2025*

VortexNet: A Graph Neural Network-Based Multi-Fidelity Surrogate Model for Field Predictions — *Online*
Presented at Altair Inc — *Aug. 2025*

Graph Neural Network-Guided Aerodynamic Shape Optimization for Conceptual Design of Supersonic Transport Wings — *Las Vegas, NV*
AIAA AVIATION FORUM AND ASCEND 2025 — *Jul. 2025*

VortexNet: A Graph Neural Network-Based Multi-Fidelity Surrogate Model for Field Predictions — *Orlando, FL*
AIAA SciTech 2025 Forum — *Jan. 2025*

AI-driven Simulations for Automotive Industry — *Online*
Presented at Li Auto Strategic Investment Meetings — *Jan. 2025*

Performance Evaluation of a Graph Neural Network-Augmented Multi-Fidelity Workflow for Predicting Aerodynamic Coefficients on Delta Wings at Low Speed — *Orlando, FL*
AIAA SciTech 2025 Forum — *Jan. 2025*

Application of Multi-Fidelity Transfer Learning with Autoencoders for Efficient Construction of Surrogate Models — *Orlando, FL*
AIAA SciTech 2024 Forum — *Jan. 2024*

Towards a Framework for Parametric Models and Geometric Sensitivity Computations with SU2 and pyCAPS — *San Diego, CA*
AIAA AVIATION 2023 Forum — *Jun. 2024*

Evaluating Droplet Burning Dynamics of Surrogate Fuels Using Convolutional Neural Networks for Image Analyses — *Maui, HI*
2nd Pacific Rim Thermal Engineering Conference — *Dec. 2019*

Combustion of Jet-A, Renewable Jet Fuel Derived from Algae and Their Mixtures — *Ithaca, NY*
ASEE St. Lawrence Section 2016 Annual Conference — *Apr. 2016*

Awards and Service

Awards

- Cornell Engineering Learning Initiatives (ELI), Undergraduate Research Student Grant Program, Cornell University, Ithaca, NY, 2017
- First Place Award for Artistic Merit Award, 32nd Annual Meeting of the American Society for Gravitational and Space Research (ASGSR) - Art Competition, Cleveland, OH, 2016.
- Best Graduate and Undergraduate Team Poster Award, ASEE St. Lawrence Section 2016 Annual Conference, Ithaca, NY, 2016.

Service

- Technical Committee Member — American Institute of Aeronautics and Astronautics, Multidisciplinary Design Optimization Technical Committee (MDO TC), member (2026 – 2027)
- Reviewer — AIAA Journal (2026).
- Reviewer — Communications Engineering (2026).
- Reviewer — Aerospace Science and Technology (2025, 2026).
- Reviewer — Materials & Design (2026).
- Reviewer — Engineering Applications of Artificial Intelligence (2026).
- Reviewer — Computer-Aided Design (2026).
- Reviewer — AIAA Aviation 2026, MDO Student Paper Competition (2026).
- Reviewer — Knowledge-Based Systems (2026).
- Reviewer — ASME Journal of Computing and Information Science in Engineering (2025, 2026).
- Reviewer (IEEE Conferences) — IEEE conferences in Artificial Intelligence, Computer/Data Sciences, Electrical & Energy Technologies, including ICRA (2024), ICECER (2024), and ICECET (2025).
- Student Research Outreach — 2022 S.T. Yau High School Science Award, August 2021. Held bi-weekly one-on-one research meetings with the following students: Juan Zibo and Feng Siyu on drone aerodynamics with thesis titled “Delaying Tip Stall By Self-adaptive Morphing Wing System”, resulting in Silver Prize (highest awarded in 2022).

References

Juan J. Alonso, Ph.D.

- Affiliation: James and Anna Marie Spilker Chair of the Department of Aeronautics and Astronautics at Stanford University
- Address: 496 Lomita Mall Rm 260, Durand Building, Stanford, California, 94305-4035
- Email: jjalonso@stanford.edu

Yigitcan Comlek, Ph.D.

- Affiliation: Research Engineer, Probabilistic Design and Materials Informatics Lab, GE Aerospace
- Address: 1 Research Cir, Niskayuna, NY 12309
- Email: yigitcan.comlek@geaerospace.com

Amirmassoud Mirzendehdel, Ph.D.

- Affiliation: Senior Research Scientist at SRI International, now Assistant Professor of Aerospace Engineering at the University of Kansas
- Address: 1530 W. 15th Street, Lawrence, Kansas, 66045
- Email: amirzend@ku.edu

C. Thomas Avedisian, Ph.D.

- Affiliation: Professors of the Sibley School of Mechanical and Aerospace Engineering at Cornell University
- Address: 134 Rhodes Drive, Grumman Hall Room 193, Ithaca, New York, 14850
- Email: cta2@cornell.edu