

# Pan Du

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## Education

- 2026 - present      **Postdoctoral Researcher**, University of California, Berkeley, CA  
Department of Mechanical Engineering  
Advisor: Prof. Shawn Shadden
- 2020 - present      **Ph.D. student, University of Notre Dame, IN**  
Department of Aerospace and Mechanical Engineering  
Advisor: Prof. Jian-Xun Wang
- 2018 - 2020        **M.S., Washington University in St. Louis, MO**  
Department of Energy, Environmental & Chemical Engineering  
Advisor: Prof. Richard Axelbaum
- 2015 - 2017        **M.S., Washington University in St. Louis, MO**  
Department of Mechanical Engineering & Materials Science  
Advisor: Prof. Ramesh Agarwal  
Thesis: *(Numerical Drag Prediction of NASA Common Research Models Using Different Turbulence Models)*
- 2011 - 2015        **B.S., Tsinghua University, Beijing, China**  
*Admitted via Pre-Admission Program (without Gaokao), Class of 2011*  
Department of Energy, Power System & Automation  
Advisor: Prof. Yanguo Zhang

## Awards and Skills

- USNCCM18 Best Poster Award (**Top 10%**), July 20-24, 2025, USACM Administrative
- USNCCM18 Conference 2025 Student Travel Award, July 20-24, 2025, USACM Administrative
- UQ-MLIP Conference 2024 Student Travel Award, USACM Administrative
- 2022 SES Annual Technical Conference Student Travel Award, Society of Engineering Science
- USNCCM16 Conference Award, July 25-29, 2021, Ruth Hengest, USACM Administrative
- Poster session award (**2<sup>nd</sup> in 30**), Fall Symposium, Oct 27, 2021, Lucy Family Institute for Data and Society
- Top 10 of the Final of Electronic Information Contest, college level at Tsinghua University
- Top 10 of the Final of Energy Dynamic Design Contest, college level at Tsinghua University
- First prize of 2011 Chinese Physics Olympiad (CPhO) Shaanxi district, China, State level (**Top 0.6%**)
- Professional skills: Ansys Fluent, Python, FORTRAN, COMSOL. Matlab, Solidworks, C/C++, PhotoShop.

## Publications

### Submitted & In preparation

1. Wang, X., **Du, P.**, Taneja K., Doon-Ralls, J., Reátegui, E., & Holland, M. (2026). Discovery of Self-Limiting Neutrophil Swarming Using Bayesian Physics-Informed Neural Network. (Submitting soon)

2. Guo, J., **Du, P.**, & Wang, J. X. (2026). Separable Conditional Neural Fields for In-Situ Compression of High-Fidelity Spatiotemporal Turbulence Simulation Data. (Submitting soon)
3. **Du, P.**, Xu, M., Li, Y., & Wang, J. X. (2026). DiFVM: A Vectorized Graph-Based Finite Volume Solver for Differentiable CFD on Unstructured Meshes. *arXiv preprint arXiv:2603.15920 (2026)*. (Under review at Journal of Computational Physics)
4. **Du, P.**, Xu, M., Zhu X., & Wang, J. X. (2026). HUG-VAS: A Hierarchical NURBS-Based Generative Model for Aortic Geometry Synthesis and Controllable Editing. *arXiv preprint arXiv:2507.11474*. (Submitted to *CMAME*. Submission Date: 03/19/2026)
5. An, D., **Du, P.**, Wang, J. X., & Wang C. (2026). TSGDiff: Text-Guided Diffusion via Segmentation Priors for Volumetric Medical Image Synthesis (Submitted to *MICCAI 2026*. Submission Date: 02/13/2026)

**Published (as Leading author)**

1. **Du, P.**, An, D., Wang, C., & Wang, J. X. (2025). AI-Powered Automated Model Construction for Patient-Specific CFD Simulations of Aortic Flows. *Science Advances*, *11*(36), eadw2825.
2. **Du, P.**, Parikh, M. H., Fan, X., Liu, X. Y., & Wang, J. X. (2024). Conditional neural field latent diffusion model for generating spatiotemporal turbulence. *Nature Communications*, *15*(1), 10416.
3. **Du, P.**, & Wang, J. X. (2022). Reducing Geometric Uncertainty in Computational Hemodynamics by Deep Learning-Assisted Parallel-Chain MCMC. *Journal of Biomechanical Engineering*, *144*(12), 121009.
4. **Du, P.**, Zhu, X., & Wang, J. X. (2022). Deep learning-based surrogate model for three-dimensional patient-specific computational fluid dynamics. *Physics of Fluids*, *34*(8).
5. **Du, P.**, & Agarwal, R. K. (2017). Drag Prediction of NASA Common Research Models Using Different Turbulence Models. In *35th AIAA Applied Aerodynamics Conference* (p. 4233).
6. **Du, P.**, & Agarwal, R. K. (2019). Numerical drag prediction of NASA Common Research Models using different turbulence models. *Computers & Fluids*, *191*, 104238.

**Published (as Contributing author)**

1. Guo, J., **Du, P.**, & Wang, J. X. (2026). Conditional Neural Field for Spatial Dimensionality Reduction of Turbulence Data: A Comparison Study. *Physics of Fluids*, *38*(2).
2. Zhou, J., Li, R., Shang, W., Liu, Y., Panda, J. P., **Du, P.**, Liu X., Liang J., Ma, B., Wang, J. X., & Luo, T. (2025). Physics-Informed Neural Networks with Hard-Encoded Angle-Dependent Boundary Conditions for Phonon Boltzmann Transport Equation. *Materials Today Physics*. 101922.
3. An, D., **Du, P.**, Wang, J. X., & Wang C. (2025) AortaDiff: Volume-Guided Conditional Diffusion Models for Multi-Branch Aortic Surface Generation. *IEEE Transactions on Visualization and Computer Graphics*. (2025)
4. Shang, W., Zhou, J., Panda, J. P., Xu, Z., Liu, Y., **Du, P.**, Wang J. X., & Luo, T. (2025). JAX-BTE: A GPU-Accelerated Differentiable Solver for Phonon Boltzmann Transport Equations. *npj Computational Materials*, *11*(1), 129.
5. Akhare, D., **Du, P.**, Luo, T., & Wang, J. X. (2025). Implicit Neural Differential Model for Spatiotemporal Dynamics. *Computer Methods in Applied Mechanics and Engineering*, *446*(Part B), 118280. <https://doi.org/10.1016/j.cma.2025.118280>
6. An, D., **Du, P.**, Gu, P., Wang, J. X., & Wang, C. (2025). Hierarchical LoG Bayesian Neural Network for Enhanced Aorta Segmentation. In *2025 IEEE 22nd International Symposium on Biomedical Imaging (ISBI)* (pp. 1-5). IEEE.
7. Prashanth, M., **Du, P.**, Wang, J. X., & Wu, H. (2024). A neural network-based algorithm for the reconstruction and filtering of single particle trajectory in magnetic particle tracking. *Review of Scientific Instruments*, *95*(5).
8. Prashanth, M. N., **Du, P.**, Wang, J. X., & Wu, H. (2022). AI-based Hybrid Model for Denoising Particle Trajectories Reconstructed from Magnetic Particle Tracking Method. In *AIAA SCITECH 2022 Forum* (p. 1162).

9. Corpuz, A. M., Jaiswal, M., **Du, P.**, Ramachandra, A. B., Wang, J. X., & Hsu, M. C. (2025). Direct medical image to simulation using auto-segmentation and point cloud-based CFD. *Advances in Computational Science and Engineering*, 3, 95-124.
10. Liu, X. Y., Parikh, M. H., Fan, X., **Du, P.**, Wang, Q., Chen, Y. F., & Wang, J. X. (2024). CoNFILD-inlet: Synthetic Turbulence Inflow Using Generative Latent Diffusion Models with Neural Fields. *arXiv preprint arXiv:2411.14378*. (Accepted by *Physical Review Fluids*)
11. Sun, L., **Du, P.**, Sun, H., & Wang, J. X. (2022). Group sparse Bayesian learning for data-driven discovery of explicit model forms with multiple parametric datasets. *Numerical Algebra, Control and Optimization*.
12. Wu, H., **Du, P.**, Kokate, R., & Wang, J. X. (2021). A semi-analytical solution and AI-based reconstruction algorithms for magnetic particle tracking. *Plos one*, 16(7), e0254051.
13. Wang, X., Yablonsky, G. S., ur Rahman, Z., Yang, Z., **Du, P.**, Tan, H., & Axelbaum, R. L. (2021). Assessment of sulfur trioxide formation due to enhanced interaction of nitrogen oxides and sulfur oxides in pressurized oxy-combustion. *Fuel*, 290, 119964.
14. Wang, X., Adeosun, A., Yablonsky, G., Gopan, A., **Du, P.**, & Axelbaum, R. L. (2018). Synergistic SO<sub>x</sub>/NO<sub>x</sub> chemistry leading to enhanced SO<sub>3</sub> and NO<sub>2</sub> formation during pressurized oxy-combustion. *Reaction Kinetics, Mechanisms and Catalysis*, 123, 313-322.

### **Poster and Presentations**

- Presenter (**Invited seminar talk**) **Pan Du**. “AI-powered automated model construction for patient-specific CFD simulations of aortic flows”, Dr. Ching-Long Lin’s lab at University of Iowa.
- Chair Host (Incoming **Invited Chair Host**) **Pan Du**. Biological Fluid Dynamics: Cardiac Flow II, 78rd Annual Meeting of the APS Division of Fluid Dynamics, Nov 23–25, 2020, Houston Texas.
- Presenter (Incoming presentation) **Pan Du**, Yongqi Li, Jian-Xun Wang. “Differentiable Graph-Based Finite Volume Solver for Patient-Specific Cardiovascular Flow Simulation.” 78rd Annual Meeting of the APS Division of Fluid Dynamics, Nov 23–25, 2020, Houston Texas.
- Presenter (**Invited seminar talk**) **Pan Du**. “HUG-VAS: A Hierarchical NURBS Generative Model for Aortic Vascular Geometry Synthesis.” USACM Student Chapter Seminar Series, Oct 26, 2025, online.
- Presenter: **Pan Du**, Mingqi Xu, Xiaozhi Zhu, Jian-Xun Wang. “NURBS-Diffusion: generative modeling of multi-branch aortic geometries via NURBS-based diffusion model.” 18th U.S. National Congress on Computational Mechanics, July 20–24, 2025, Chicago, Illinois, U.S.
- Presenter (Future Faculty Poster Session): **Pan Du**. “Integrative AI for Cardiovascular flow: From Imaging and Geometry to Flow Hemodynamics” SB3C, June 22-25, 2025, Santa Ana Pueblo, New Mexico, U.S.
- Presenter (Poster): **Pan Du**, Mingqi Xu, Xiaozhi Zhu, Jian-Xun Wang. “A Hierarchical NURBS Generative Model for Aortic Vascular Geometry Synthesis.” SB3C, June 22-25, 2025, Santa Ana Pueblo, New Mexico, U.S.
- Presenter (**Invited seminar talk**): **Pan Du**. “CoNFILD: Conditional Neural Field Latent Diffusion Model Generating Spatiotemporal Turbulence.” Frontiers in Scientific Machine Learning (FSML) Seminar Series, University of Michigan.
- Presenter: **Pan Du**, Junyi Guo, Jian-Xun Wang. “A Multi-Modal Implicit Neural Representation Method for Dimensionality Reduction of Spatiotemporal Flow Data.” 77th Annual Meeting of the Division of Fluid Dynamics, Nov 24–26, 2024, Salt Lake City, UT, U.S.
- Presenter (Poster): **Pan Du**, Meet H. Parikh, Xiantao Fan, Xin-Yang Liu, Jian-Xun Wang. “CoNFILD: Conditional Neural Field Latent Diffusion Model Generating Spatiotemporal Turbulence.” 77th Annual Meeting of the Division of Fluid Dynamics, Nov 24–26, 2024, Salt Lake City, UT, U.S.
- Ashton M. Corpuz, **Pan Du**, Monu Jaiswal, Jian-Xun Wang, Ming-Chen Hsu. “PointStream: CT to Simulation Using Point Clouds.” 12th International Conference on IsoGeometric Analysis, Oct 27–30, 2024, St. Augustine, Florida, U.S.

- Presenter (Poster): **Pan Du**, Delin An, Yongqi Li, Chaoli Wang, Jian-Xun Wang. “AI-Enabled Rapid Image-Based Hemodynamic Modeling with Quantified Uncertainty.” UQ-MLIP, Aug 12–14, 2024, Crystal City, Arlington, Virginia, U.S.
- Presenter: **Pan Du**, Meet H. Parikh, Xiantao Fan, Xin-Yang Liu, Jian-Xun Wang. “CoNFILD: Conditional Neural Field Latent Diffusion Model Generating Spatiotemporal Turbulence.” UQ-MLIP, Aug 12–14, 2024, Crystal City, Arlington, Virginia, U.S.
- Presenter: **Pan Du**, Jian-Xun Wang. “Synthesizing Multi-Branch Aortic Vessels Using a Diffusion Model.” SB3C, June 11–14, 2024, Lake Geneva, Wisconsin, U.S.
- Presenter: **Pan Du**, Jian-Xun Wang. “Neural Field-Based Sequential Networks for Parametric Spatiotemporal PDEs.” 76th Annual Meeting of the Division of Fluid Dynamics, Nov 19–21, 2023, Washington, D.C., U.S.
- Presenter: **Pan Du**, Delin An, Chaoli Wang, Jian-Xun Wang. “Automatic Model Construction for Patient-Specific Aortic Flow Simulations Using Geometric Deep Learning.” SB3C, June 4–8, 2023, Vail, Colorado, U.S.
- Presenter: **Pan Du**, Jian-Xun Wang. “Geometric Deep Learning for Automatic Model Construction of Patient-Specific Aortic Flow Simulations.” 17th U.S. National Congress on Computational Mechanics, July 23–27, 2023, Albuquerque, New Mexico, U.S.
- Presenter: **Pan Du**, Xiaozhi Zhu, Jian-Xun Wang. “Fast Surrogate of 3D Patient-Specific Computational Fluid Dynamics Using Statistical Shape Modeling and Deep Learning.” Hybrid Conference: 2022 SIAM Conference on Uncertainty Quantification, Apr 12–15, 2022, Atlanta, Georgia, U.S.
- Mohit Nahar Prashanth, **Pan Du**, J.-X. Wang, Huixuan Wu. “AI-Based Hybrid Model for Denoising Particle Trajectories Reconstructed from Magnetic Particle Tracking Method.” AIAA SciTech Forum, Jan 3–7, 2022, San Diego, CA, U.S.
- Presenter: Huixuan Wu, **Pan Du**, Mohit Nahar Prashanth, J.-X. Wang. “Denoising Particle Trajectories Containing Measurement Uncertainties from Magnetic Particle Tracking Using Neural Networks.” 74th Annual Meeting of the APS Division of Fluid Dynamics, Nov 21–23, 2021, Phoenix, Arizona, U.S.
- Presenter: **Pan Du**, Xiaozhi Zhu, Jian-Xun Wang. “Fast Surrogate of 3D Patient-Specific Computational Fluid Dynamics Using Statistical Shape Modeling and Deep Learning.” 74th Annual Meeting of the Division of Fluid Dynamics, Nov 21–23, 2021, Phoenix, Arizona, U.S.
- Presenter: **Pan Du**, Xiaozhi Zhu, Jian-Xun Wang. “Surrogate Modeling for 3D Patient-Specific Hemodynamics Using Statistical Shape Modeling and Deep Learning.” 16th U.S. National Congress on Computational Mechanics (USNCCM16), July 25–29, 2021.
- Poster Presentation: **Pan Du**, Nicholas Burriss, Julio Sotelo, Jian-Xun Wang. “Patient-Specific CFD Modeling of Aortic Dissection Augmented with 4D Flow MRI.” 2021 SIAM Conference on Computational Science and Engineering (CSE), July 19–23, 2021, Virtual.
- Poster Presentation: **Pan Du**, Xiaozhi Zhu, Jian-Xun Wang. “Developing a New Surrogate Model for Computational Fluid Dynamics Simulation of the Aorta Using Statistical Shape Modeling and Deep Neural Networks.” SB3C, 2021, Eastern Shore, Maryland, U.S.
- Presenter: **Pan Du**, Han Gao, Jian-Xun Wang. “Bayesian Data Assimilation for Cardiovascular Flow Using Bi-Fidelity Ensemble Kalman Inversion.” 2021 Ensemble Kalman Filter (EnKF) Workshop, June 7–11, 2021.
- Poster Presentation: **Pan Du**, Nicholas Burriss, Julio Sotelo, Jian-Xun Wang. “Computational Simulation of Aortic Dissection with Comparison to 4D Flow MRI.” 73rd Annual Meeting of the APS Division of Fluid Dynamics, Nov 22–24, 2020, Virtual.
- Presenter: **Pan Du**, Zhiwei Yang, Benjamin M. Kumfer, Richard L. Axelbaum. “Radiative Heat Transfer Modeling in Pressurized Oxy-Fuel Combustion Systems.” 44th International Technical Conference on Clean Energy, June 16–21, 2019, Clearwater, Florida, U.S.
- Presenter: **Pan Du**, Zhiwei Yang, Akshay Gopan, Richard L. Axelbaum. “Simulation of the Thermal Behavior of Heat Exchangers in a Pressurized Combustion System.” 2018 Clearwater Clean Energy Conference, June 3–7, 2018, Clearwater, Florida, U.S.

- Zhiwei Yang, Dishant Khatri, Akshay Gopan, **Pan Du**, Tianxiang Li, Adewale Adeosun, Benjamin M. Kumfer, Richard L. Axelbaum. “Progress in Commissioning a Pilot-Scale Staged, Pressurized Oxy-Combustion System.” 2018 Clearwater Clean Energy Conference, Clearwater, Florida, U.S.
- Presenter: **Pan Du**, Ramesh Agarwal. “Drag Prediction of NASA Common Research Models Using Different Turbulence Models.” 35th AIAA Applied Aerodynamics Conference, June 5–9, 2017, Denver, Colorado, U.S.

### **Reviewed Journals**

- *AI Thermal Fluids*
- *Biomedical Physics & Engineering Express*
- *Engineering Research Express*
- *Nature Scientific Reports*
- *Npj Digital Medicine*
- *Journal of Heat and Mass Transfer*
- *Journals of Computational Physics*
- *Physica Scripta*
- *Physiological Measurement*
- *Physics of Fluids*
- *SoftwareX*
- *Theoretical and applied mechanics letters*

### **Highlighted Teaching Experience**

2025 Fall	<b>Course Instructor</b> of AME 40411 Introduction to Artificial Intelligence Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN • Design, developed, and taught a senior-level undergraduate course on AI for engineering applications.
2024 Spring	<b>Teaching assistant</b> for <i>AME 20222 Mechanics II -01</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2023 Fall	<b>Teaching assistant</b> for <i>AME 30331-01 Fluid Mechanics</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2023 Spring	<b>Teaching assistant</b> for <i>AME 20222-01 - Mechanics II</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2022 Fall	<b>Teaching assistant</b> for <i>AME 30331-01 Fluid Mechanics</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2022 Spring	<b>Teaching assistant</b> for <i>AME 30315 Differential Equations, Vibrations, and Controls II</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2021 Fall	<b>Teaching assistant</b> for <i>AME30331-01 Fluid Mechanics</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2021 Spring	<b>Teaching assistant</b> for <i>AME30315-01 Differential Equations, Vibrations, and Control II</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2020 Fall	<b>Teaching assistant</b> for <i>AME30315-01 Differential Equations, Vibrations, and Control I</i> Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2019 Fall	<b>Teaching assistant</b> for <i>E44 503 Mathematical Methods in EECE</i> Dept. of EECE Washington University in Saint Louis
2017 Fall	<b>Teaching assistant</b> for <i>Teaching assistant for E37 5412 Computational Fluid Dynamics</i>

2016 Fall Dept. of MEMS Washington University in Saint Louis  
**Teaching assistant** for *E37 5410 Fluid Dynamics*

2016 Fall Dept. of MEMS Washington University in Saint Louis  
**Teaching assistant** for *E37 301 Thermodynamics*

2015 Fall Dept. of MEMS Washington University in Saint Louis  
**Teaching assistant** for *E37 411 Design Project*

2015 Fall Dept. of MEMS Washington University in Saint Louis

### Highlighted Research Experience

2026-present **Postdoctoral Researcher**, Advised by Prof. Shawn Shadden  
 Dept. of Mechanical Engineering, University of California, Berkeley, CA  
**Differentiable framework for 1D-3D coupled hemodynamics.**  
 Develop an end-to-end differentiable solver for efficient and accurate hemodynamic prediction in coupled 1D–3D vascular systems.

2020-2025 **Graduate Research Assistant**, Advised by Prof. Jian-Xun Wang,  
 Dept. of Aerospace and Mechanical Engineering, University of Notre Dame, IN  
**MVGNN: A Multilevel Vascular Graph Neural Framework for Patient-Specific Hemodynamics.** (On-going / Leading role)

- Develop a hierarchical graph neural network that couples 1D centerline and 3D surface representations to predict wall pressure and shear stress in patient-specific vascular models.

**Patient-Manifold-Based Differentiable Framework for Vascular Graft Optimization.** (On-going / Co-leading role)

- Use generative model to create patient-based geometric manifold.
- Create a differentiable optimization framework operating within a patient-derived generative manifold to design physiologically consistent and optimal shape of vascular grafts.

**Discovering the reaction–diffusion dynamics of neutrophil swarming using physics-informed machine learning.** (On-going / Collaboration with Prof. Maria Holland in AME in University of Notre Dame, IN)

- Develop a physics-informed neural framework that learns the governing equations underlying for neutrophil swarming behavior from microscopy data
- Quantify uncertainty of the inferred PDE parameter.

**Develop a dimension-reduction method for turbulence using a conditional neural field.** (On-going/Leading role)

- Create a decomposed conditional neural field model that improves compressibility and generalizability over state-of-the-art dimensionality reduction methods for turbulence data.

**Create a differentiable Finite Volume-based GPU-enabled Fluid solver for Cardiovascular flow featuring fluid-structure interaction.** (On-going/Leading role)

- Implement Computational Fluid Dynamics (CFD) algorithms using JAX and the Finite Volume Method.
- Combine the solver with machine learning models to create a hybrid neural solver for enhanced efficiency and accuracy.

**Create a robotic system that prints sensors on the moving heart surface.** (On-going/ Collaboration with Prof. Yanliang Zhang in AME in University of Notre Dame, IN)

- Developed point registration algorithm to build correspondence between point cloud scans of the moving surface.
- Create an algorithm that predicts the movement of the printing nozzle to achieve accurate sensor printing on a moving heart surface.

**Direct medical image-to-simulation using auto-segmentation and point cloud-based CFD.** (Collaboration with Prof. Ming-Chen Hsu, Department of Mechanical Engineering, Iowa State University; One paper published in Advances in Computational Science and Engineering)

- Designed a ML-based automatic segmentation model that extracts aorta surface point clouds from raw CT data. Down-stream immersogeometric analysis (IMGA) was handled by the collaborator.

**Synthesize turbulence inflow using generative latent diffusion models with neural fields.** (Collaboration with Google Research; One paper accepted in Physics review fluids)

- Designed the core component of turbulence data compression and generation framework CoNFILD. The downstream a priori and a posteriori tests were handled by the others.

**Created a generative AI-based machine learning model (CoNFILD) to generate spatiotemporal turbulence flows for unstructured domains and diverse conditions.** (Leading role; One paper published in Nature Communications)

- Designed a conditional neural field-based encoder to compress spatiotemporal turbulence flow into a compact latent space.
- Create a diffusion-based generative model to synthesize spatiotemporal turbulence flow for irregular domains and diverse conditions without retraining. The CoNFILD model can solve various inverse problems such as data-restoration, super-resolution, flow reconstruction from sensor measurements, etc.

**Developed AI-based automatic segmentation and surrogate models for patient-specific CFD simulation.** (On-going/Leading role; Collaboration with Prof. Chaoli Wang in Dept. of Computer Science and Engineering in University of Notre Dame. Three papers published/accepted (see publications), two submitted, two in preparation)

- Created a CNN U-Net-based ML model that automatically segments and reconstructs simulation-ready mesh from raw medical image. The model can also quantify uncertainty of the segmented geometry.
- Use generative AI to synthesize cardiovascular structures (e.g., aorta, heart, liver) from patient-specific geometries to create sufficient training data for downstream flow surrogate models.
- Create graph-neural-network (GNN)-based surrogate model to predict hemodynamics in cardiovascular systems such as the aorta with supra-aortic branches.

**Use Transformer and Neural field to predict blood flow dynamics in latent space for left ventricular assist device (LVAD).** (Leading role; Collaboration with PhysicsX Ltd., UK.)

- Encoded spatiotemporal flow field within the LVAD using neural field.
- Created a transformer-based model to predict the dynamics in latent space.

**Create a group sparse bayesian learning framework to discover explicit forms of equations in dynamics systems with uncertainties.** (One paper published to Numerical Algebra, Control and Optimization)

- Designed the ML-based denoising module to reduce the noise presented in the data. The equation discovery tasks are handled by others.

**Built deep neural networks (DNNs) to denoise magnetic particle tracking data.** (Collaboration with Prof. Huixuan Wu, Department of Aerospace Engineering, School of Engineering, University of Kansas. Three papers published (see publications))

- Create AI-based denoise models to suppress the noise in particle trajectory, velocity, and orientation signals. The proposed models outperform traditional denoising methods such as wavelet filtering

2018 - 2019

**Graduate Research Assistant**, Prof. Richard Axelbaum Group, Dept. of Energy, Environmental & Chemical Engineering, Washington University in St. Louis, MO

**Radiative Heat Transfer Modeling in Pressurized Oxy-fuel Combustion Systems.** (Two papers published (see publications))

- Developed a new WSGG (Weighted Sum of Grey Gas) model that accurately predicts radiation heat transfer in a Pressurized Oxy-fuel combustion system

2016 - 2017

**Graduate Research Assistant**, Prof. Ramesh Agarwal Group, Dept. of Mechanical Engineering & Materials Science, Washington University in St. Louis, MO

**Drag analysis of WB (Wing-body), WBT(Wing-body-tail) and WBNP (Wing-body-nacelle-pylon) model with SA& SST k- $\omega$  turbulence model using Ansys Fluent.** (Leading role; Two papers published (see publications))

- Conducted RANS simulations with SA (Spalart-Allmaras) and SST k- $\omega$  turbulence models. Results are compared with experimental data and other computations from NASA DPW (Drag Prediction Workshop) database
- Yields accurate drag and lift curves. Presented pressure distributions and flow separation pockets around wing, tail, nacelle and pylon at different angles of attack
- Evaluated the drag increment by comparing WBNP results with WB results

2014 – 2015

**Undergraduate Research Assistant**, Prof. Zhang Yanguo Group, Dept. of Energy, Power System & Automation, Tsinghua University, Beijing, China

**Maximize the yield of tar and hydrocarbon gas in Pyrolysis of Luliang lignite coal.**

- Conducted Pyrolysis at different temperatures and atmosphere. Measured solid weight loss and extracted tar from liquid products.
- Identified components of gas products. Investigated how proportions of the gas components change under different conditions