Yunjia Yang

Researcher for Machine Learning, Computational Fluid, and Aerodynamic Design Optimization
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EDUCATION

Tsinghua University, China **01.09.2020 – 01.07.2025**

- **Ph.D.** in **Aerospace Engineering**
  Advisor: Prof. Haixin Chen
  Research area: Data-based aerodynamic optimization
- Visiting student in **Dept. Statistics and Data Science, Yale University, USA** (02.12.2023 – 28.05.2024)
  Advisor: Assistant Prof. Lu Lu
  Research area: Scientific machine learning

Tsinghua University, China **17.08.2016 – 18.06.2020**

- **B.Sc.** in **Physics** **GPA** 3.68/4.00 (**Rank** 4/59)
- **Minor** in **Computer Science**

HONORS

- Excellent Doctoral Graduate of Beijing (2025)
- National Scholarship for doctoral student (2023) – given to top 5% students
- Tsinghua University First-class Scholarship (2022, 2024) – given to top 10% students
- Excellent Undergraduate Student of Tsinghua University (2020) – only 1 among the 59 students
- Tsinghua University Scholarship for Excellence (2017, 2018, 2019) – given to top 10% students

PUBLICATIONS

Preprints

1. **Yang Y**, Li J, Zhang Y, Chen H. Machine-learning-based multipoint optimization of fluidic injection parameters for improving nozzle performance, *submitted to Engineering Applications of Artificial Intelligence*. https://arxiv.org/abs/2409.12707.

Journal Papers

1. **Yang Y**, Li R, Zhang Y, Lu L, Chen H. Rapid aerodynamic prediction of swept wings via physics-embedded transfer learning, *AIAA Journal*, 2024. https://doi.org/10.2514/1.J064576.
2. **Yang Y**, Li R, Zhang Y, Chen H. Fast buffet-onset prediction and optimization method based on pretrained flowfield prediction model, *AIAA Journal*, 2024. https://doi.org/10.2514/1.J063634.
3. **Yang Y**, Li R, Zhang Y, Lu L, Chen H. Transferable machine learning model for the aerodynamic prediction of swept wings, *Physics of Fluids*, 2024. https://doi.org/10.1063/5.0213830.
4. **Yang Y**, Zhang Y, Chen H. Analysis and manipulation of the separation zone in an overexpanded combined exhaust nozzle, *Aerospace Science and Technology*, 2023. https://doi.org/10.1016/j.ast.2023.108196.
5. **Yang Y,** Li R, Zhang Y, Chen H. Flowfield prediction of airfoil off-design conditions based on a modified variational autoencoder, *AIAA Journal*, 2022. https://doi.org/10.2514/1.J061972.
6. **Yang Y**, Chen H, Xu L. Calculation method of cooling air distribution in nozzle based on fluid network analysis method, Journal of Aerospace Power, 2022. https://doi.org/10.13224/j.cnki.jasp.20210027. (in Chinese)

7. Liu M, **Yang Y**, Wu C, Zhang Y. A Fast Prediction Model of Supercritical Airfoils Based on Deep Operator Network and Variational Autoencoder Considering Physical Constraints, *Aerospace Research Communications*, 2024. https://doi.org/10.3389/arc.2024.13901.

8. Tang W, Wu C, **Yang Y**, Zhang Y. A fast transonic airfoil flow field prediction model based on a modified Fourier Neural Operator, *SCIENCE CHINA Physics, Mechanics & Astronomy*, 2025.

Selected Conference Papers

1. **Yang Y,** Li R, Zhang Y, Chen H. Buffet onset optimization for supercritical airfoils with prior-based pressure profile prediction model, *AIAA SCITECH 2024 Forum*, 2024. https://doi.org/10.2514/6.2024-1227.

2. **Yang Y**, Li J, Li R, Zhang Y, Chen H. Interactive optimization of fluidic injection for single expansion ramp nozzle based on a modified autoencoder, *Joint 10th EUCASS – 9th CEAS Conference*, 2023.

3. Li J, **Yang Y**, Zhang Y. Airfoil Pressure Prediction Based on Physics-Informed Deep Learning Approach, *34th Congress of the International Council of the Aeronautical Sciences*. 2024.

4. Duan Y, **Yang Y**, Chen H. Design of Two-Dimensional External Pressure Supersonic Inlet with Throat Suction, Joint Conference of APCATS, AJSAE & AAME 2023, 2023. (Best Paper Award)

SOFTWARES

- FloGen (GitHub, Docs)
  - Machine learning library for 3D multi-design-point flow field generation
  - Interactive design tools for transonic swept wings
  - Includes source codes for publications
- AeroMOC (GitHub, Docs)
  - Method of Characteristic codes based on Python for supersonic flow field simulation and nozzle design
- AeroCooling (GitHub)
  - 1-D Fluid Network Method codes based on Python for nozzle effusion cooling design with coupling computation ability with Ansys Fluent and CFD++

RESEARCH EXPERIENCE

1. Machine learning for wing flow field prediction **Dec. 2023 — May 2024**

supported by the Tsinghua Scholarship for Overseas Graduate Studies

- Developed a *2D-to-3D transfer learning framework* to efficiently train a 3D wing flowfield prediction model.
  → demo app: webWing (in FloGen)

2. Data-based optimization for buffet performance of supercritical airfoils **Jan. 2020 — Dec. 2023**

supported by the National Natural Science Foundation of China

- Developed a *novel prior-based VAE model* to predict flowfield under off-design conditions with the reference of the cruise flowfield, and introduced *physics-based loss terms* to raise the accuracy. → *AIAA J*, 2022
- *Offline deployed* the pretrained flowfield prediction model in a multi-target evolutionary algorithm to optimize transonic buffet performance, and developed an *uncertainty-aware framework* for model-based optimization to enhance the reliability of the results. → *AIAA J*, 2024

3. Robust and multi-discipline optimization for aero-engine nozzle **Jan. 2019 — Dec. 2023**

supported by the National Natural Science Foundation of China

- Developed tools for nozzle design and *nozzle effusion cooling* simulation. → code: AeroMOC, AeroCooling
- Analyzed the separation patterns in the aero-engine nozzle under off-design conditions and developed a *separation manipulation method* to improve nozzle performance. → *AST*, 2023

- Established and offline deployed a machine learning-based nozzle flowfield prediction model to rapidly obtain nozzle performance and gradients of the performance to design variables for *multi-condition gradient-based optimization*.

SKILLS

Programming

- **Proficient:** Python (PyTorch, SciPy, Pandas, Flask…), FORTRAN
- **Experienced:** C/C++, Matlab, Bash

Simulation / Design

- **Proficient:** CFL3D, CFD++, Fluent, ICEM, Pointwise, Tecplot
- **Experienced:** OpenFOAM, ADflow, OpenMDAO, CATIA, NX

Tools / Platforms

- Linux, Git, Docker

Languages

- Mandarin (Native), English (TOEFL 107/120)