Xiao He

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RESEARCH INTEREST

- Machine learning and data science for modeling and analysis of fluids system.
- RANS/LES turbulence modeling for internal flows.
- Simulation and measurement of compressor aerodynamics and aeroelasticity.

EDUCATION

10/2018 – 09/2022	Ph.D. in Mechanical Engineering	Imperial College London
08/2015 – 07/2018	M.S. in Power Engineering and Engineering Thermophysics	Tsinghua University
08/2011 – 07/2015	B.E. in Vehicle Engineering	Tsinghua University

RESEARCH EXPERIENCE

10/2018 – 03/2022 **President's PhD Scholar** with Prof. Mehdi Vahdati — Imperial College London

Data-Driven Turbulence Modeling for Compressor Tip Leakage Flow

- Incorporated explainable machine learning tools in Python to develop a data-driven turbulence model.
- Developed hybrid RANS/LES CFD solver in Fortran to generate high-fidelity turbulence data.
- Analyzed TB-scale turbulence data by in-house Python scripts of SPOD and anisotropy calculator.
- Employed Python and Linux bash to build a metamodel-based UQ workflow.

08/2015 – 07/2018 **Graduate Research Assistant** advised by Prof. Xinqian Zheng — Tsinghua University

Surge and Rotating Stall in Centrifugal Compressors

- Designed similitude-based model test for centrifugal compressors with and without casing treatment.
- Measured compressor performance map in a turbocharger rig and dynamic wall pressure with Kulite probes.
- Performed URANS simulation for compressor stall and proposed a phenomenological stall onset model.

07/2017 – 09/2017 **Visiting Graduate Research Assistant** advised by Prof. Hiroto Tanaka — Tokyo Institute of Technology

Bionic Skin Friction Reduction in Turbulent Boundary Layer

- Skin friction reduction was achieved in a numerical water tunnel by the penguin-inspired micro-structure.

09/2013 – 06/2015 **Undergraduate Research Assistant** advised by Prof. Xinqian Zheng — Tsinghua University

Transonic Flow in Centrifugal Compressors

- Performed RANS simulation and built the link between flow phenomena and compressor efficiency.
- Applied genetic algorithm and artificial neural network to optimize the 3D blade shape.

TEACHING AND MENTORING EXPERIENCE

10/2019 – 06/2021 **Graduate Teaching Assistant**, Fluid Mechanics (Year 2 undergraduate) — Imperial College London

- Led tutorial sessions in class size of 15; wrote and graded exams.

01/2020 – 06/2021 **Mentor** for Master Thesis and Research Internship — Imperial College London

- Mentored three students with weekly supports in six months each.

01/2016 – 06/2018 **Mentor** for Undergraduate Thesis — Tsinghua University

- Mentored three students with weekly supports in six months each.

AWARDS AND HONORS

2020, 2021	Young Engineer Turbo Expo Participation Award (10/year globally)	ASME IGTI
2019	Student Advisory Committee Travel Award (20/year globally)	ASME IGTI
2018	President's PhD Scholarship (50/year in Imperial College)	Imperial College London
2017	National Scholarship (top 1% in Department)	Ministry of Education of China
2015	Honored Graduate Award (top 1% in Department)	Ministry of Education of China
2015	Best Undergraduate Thesis Award (top 3% in Department)	Tsinghua University

PUBLICATIONS

I have authored/co-authored 13 peer-reviewed journal papers and 8 peer-reviewed conference papers, including 4 papers as the lead author in ASME Journal of Turbomachinery, ASME Journal of Fluids Engineering, and AIAA Journal of Propulsion and Power. My Google Scholar statistics are Citation≥119, h-index≥7, i10-index≥5. Selected publications are as follows. (*: corresponding author)

Journal Papers

[1] **He, X.***, Tan, J., Rigas, G., Vahdati, M., "Towards Explainable Machine Learning Assisted Turbulence Modelling for Transonic Flows," **Physical Review Fluids** (under review).

[2] **He, X.*,** Fang, Z., Rigas, G., Vahdati, M., "Spectral Proper Orthogonal Decomposition of Compressor Tip Leakage Flow," **Physics of Fluids**, 2021, 33(10), 105105.

[3] **He, X.*,** Zhao, F., and Vahdati, M., "Detached Eddy Simulation: Recent Development and Application to Compressor Tip Leakage Flow," **ASME Journal of Turbomachinery**, 2022, 144(1), 011009.

[4] **He, X.*,** Zhao, F., and Vahdati, M., "Uncertainty Quantification of Spalart-Allmaras Turbulence Model Coefficients for Compressor Stall," **ASME Journal of Turbomachinery**, 2021, 143(8), 081007.

[5] **He, X.*,** Zhao, F., and Vahdati, M., "Uncertainty Quantification of Spalart-Allmaras Turbulence Model Coefficients for Simplified Compressor Flow Features," **ASME Journal of Fluids Engineering**, 2020, 142(9), 091501.

[6] **He, X.,** and Zheng, X., "Roles and Mechanisms of Casing Treatment on Different Scales of Flow Instability in High Pressure Ratio Centrifugal Compressors," Aerospace Science and Technology, 2019, 84, 734-746.

[7] **He, X.,** and Zheng, X., "Flow Instability Evolution in High Pressure Ratio Centrifugal Compressor with Vaned Diffuser," Experimental Thermal and Fluid Science, 2018, 98, 719-730.

[8] **He, X.,** and Zheng, X., "Performance Improvement of Transonic Centrifugal Compressors by Optimization of Complex Three-Dimensional Features," IMechE, Part G: Journal of Aerospace Engineering, 2017, 231(14), 2723-2738.

[9] **He, X.,** and Zheng, X., "Mechanisms of Sweep on the Performance of Transonic Centrifugal Compressor Impellers," Applied Sciences, 2017, 7(10), 1081.

[10] **He, X.,** and Zheng, X., "Mechanisms of Lean on the Performance of Transonic Centrifugal Compressor Impellers," **AIAA Journal of Propulsion and Power**, 2016, 32(5), 1220-1229.

Conference Proceedings

[1] Zhu, M., **He, X.*,** Klausmann, F., Teng, J., and Vahdati, M., "Validation and Verification of RANS Solvers for TUDa-GLR-OpenStage Transonic Axial Compressor," GPPS Paper No. GPPS-TC-2021-0050.

[2] **He, X.*,** Zhao, F., and Vahdati, M., "Evaluation of Spalart-Allmaras Turbulence Model Forms for a Transonic Axial Compressor," GPPS Paper No. GPPS-CH-2020-0013.

[3] **He, X.,** Zheng, X., Wei, J., and Zeng, H., "Investigation of Vaned Diffuser Splitters on the Performance and Flow Control of High Pressure Ratio Centrifugal Compressors," ASME Paper No. GT2016-56255.

ACADEMIC SERVICE

Referee for Journals and Conferences

ASME Journal of Turbomachinery	IMechE Journal of Power and Energy	Advances in Mechanical Engineering
Aerospace Science and Technology	IMechE Journal of Automobile Engineering	ASME Turbo Expo
International Journal of Mechanical Sciences	IMechE Journal of Aerospace Engineering	GPPS Conference

Conference Session Organizer

GPPS Xi'an21: 1st GPPS Turbomachinery CFD Workshop

PROFESSIONAL SOCIETIES

ASME (ID: 000101977824), AIAA (ID: 937472), APS (ID: 62075782)