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

AWARDS AND HONORS

2021	Great Britain China Educational Trust Grant (35/year in UK)	Great Britain-China Centre
2021	Henry Lester Trust Grant (35/year in UK)	Henry Lester Trust
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
2017	Japan Student Services Organization Scholarship (20/year globally)	Tokyo Institute of Technology
2016	Overall Excellent Scholarship (top 5% in Department)	Tsinghua University
2015	Honored Graduate Award (top 1% in Department)	Ministry of Education of China
2015	Best Undergraduate Thesis Award (top 3% in Department)	Tsinghua University
2012, 2013, 2014	Academic Excellent Scholarship (top 30% in Department)	Tsinghua University
2012	1st Prize in the 29th National College Student Physics Competition (Beijing)	Beijing Physics Society
2010	1st Prize in the 27th National High School Student Physics Competition (Hunan)	Chinese Physical Society

RESEARCH EXPERIENCE

10/2018 – 09/2022	**President's PhD Scholar** with Prof. Mehdi Vahdati	Imperial College London

Data-Driven Turbulence Modeling for Compressor Flows

- Incorporated explainable machine learning tools in Python to develop a data-driven turbulence model.
- Developed hybrid RANS/LES branch of the in-house solver HADES in Fortran to generate turbulence data.
- Developed and maintained turbomachinery features of the in-house solver HADES in Fortran.
- 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

- 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 a 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.

INVITED TALKS

[1] "Data-Driven RANS Turbulence Modeling for Compressor Stall" Seminar talk at Institute of Gas Turbines and Aerospace Propulsion (GLR), Department of Mechanical Engineering, Technische Universität Darmstadt, June 2022.

[2] "Data-Driven RANS Turbulence Modeling for Compressor Stall" Seminar talk at Institute of Turbomachinery, School of Mechanical Engineering, Shanghai Jiao Tong University, April 2022.

PUBLICATIONS

I have authored/co-authored 16 peer-reviewed journal papers and 10 peer-reviewed conference papers. My Google Scholar statistics are Citation$\geq$161, h-index$\geq$9, i10-index$\geq$7. Selected publication list is as follows. (*: corresponding author; †: equal contribution)

Journal Papers

[1] **He, X.***, Tan, J., Rigas, G., and Vahdati, M., "On the Explainability of Machine-Learning-Assisted Turbulence Modeling for Transonic Flows," 2022, International Journal of Heat and Fluid Flow.

[2] **He, X.***, Zhao, F., and Vahdati, M., "A Turbo-Oriented Data-Driven Modification to the Spalart-Allmaras Turbulence Model," 2022, ASME Paper No. GT2022-80456. ASME IGTI Committee Best Paper Finalist.

[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. Recommended for ASME IGTI Committee Best Paper.

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

[5] **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. Recommended for ASME IGTI Committee Best Paper.

SOFTWARE

HADES: an unstructured finite volume CFD solver for internal and external flows. The solver is featured by advanced turbulence modeling capabilities, turbomachinery capabilities and multiphase flow capabilities.

SPOD Python: an open-source Pythonic realization of SPOD and its applications to a range of fluid mechanics problems. https://github.com/HexFluid/spod_python

TurbAna: a Python toolkit that calculates and visualizes turbulence anisotropy and turbulent viscosity from Reynolds stress components. https://github.com/HexFluid/TurbAna

ACADEMIC SERVICE

Referee for Journals and Conferences

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

Conference Session Organizer

GPPS Xi'an21: 1st GPPS Turbomachinery CFD Workshop	GPPS Chania22: 2nd GPPS Turbomachinery CFD Workshop

PROFESSIONAL SOCIETIES

ASME Student Member (ID: 000101977824), AIAA Student Member (ID: 937472),

APS Student Member (ID: 62075782), GPPS Ambassador Member