ZHICHENG KAI

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EDUCATION

University of Michigan Ann Arbor — 08/2022 – now
Master of Science in Mechanical Engineering — Ann Arbor, MI
GPA 4.00/4.00

Computational Fluid Dynamics I, II; Advanced Fluid Mechanics;Turbulent Flow.

Rose-Hulman Institution of Technology — 07/2018 – 03/2022
Bachelor of Science in Mechanical Engineering — Terre Haute, IN
Member of Tau Beta Pi
Dean's List for seven Quarters
GPA 3.70/4.00

Data Structure & Algorithm Analysis; Competitive Programing; Fluid Systems; Mechanical Systems; Applications of Thermodynamics; Adv Finite Element Analysis; Gas Dynamics; Theoretical Aerodynamics; Computation Fluid Dyn; Linear Algebra; Boundary Value Problems.

PUBLICATIONS

Zhicheng Kai and Amir H. Danesh-Yazdi *"Quantifying aerodynamic coupling for side-by-side piezoelectric harvesters in fractal-grid-generated turbulent flow"*, *Proc. SPIE 12043, Active and Passive Smart Structures and Integrated Systems XVI, 120430O (20 April 2022); https://doi.org/10.1117/12.2610953* — 04/2022

Zhicheng Kai; Amir H Danesh-Yazdi. *"Evaluation of Aerodynamic Coupling in Side-by-side Piezoelectric Beams in Quiescent and Grid-generated Turbulent Flow,"* *SPIE Vol. 11588* — 03/2021

Fang Wang; Lanfang Yao; **Zhicheng Kai**; Dayong Guan. *"The Effect of CO_2 Activation Temperature on the Performance of Carbon Aerogel Supercapacitors,"* *Journal of University of Shanghai for Science and Technology* — 04/2016

PROJECT AND RESEARCH AT UNIVERSITY OF MICHIGAN

Data-driven Nonmodal Analysis — 09/2022-now
Individual Research
- Derived the data-driven formula that produced similar results as traditional nonmodal analysis.
- Linearized the flow system and used singular values to reveal transient energy growth.
- Validated with the Ginzburg-Landau equation.
- Investigated methods of including a regularization factor that enhanced the robustness of the method.

Implemented Discontinuous Galerkin Solver for Unstructured Mesh — 01/2023-03/2023
Group Project
- Implemented first and second order FVM solver with three different flux and two different limiters in `C++`.
- Carried out with algorithms for mesh adaptation.
- Designed and Implemented projection-based shock capturing methods for DG.
- Used Git for version control.
- Managed the team and integrated each part together.

PROJECT AND RESEARCH AT ROSE-HULMAN INSTITUTE OF TECHNOLOGY

Machine Learning Utilized in Early Detection of Alzheimer's Decease　　06/2022-08/2022
Researcher Assistant
- Apply PCA and neural network to EEG data collected by previous researchers from senior citizens.
- Applied different methods of prepossessing the EEG data.

Mesh Improvement for Early Detection of Breast Cancer　　06/2021-06/2022
Student Researcher
- Automated the data analyzing process of a tumor detection method with command line codes.
- Modified and created mesh for scanned STL file.
- Validated the mesh generated workable.

Drum Mechanics Analysis　　06/2021-06/2022
Individual Research
- Derived finite element models for membranes and thin plates directly from Hamilton's equations
- Validated modal and transient simulations for taut, circular membranes and plates against analytic series approximations.
- Documented project approach and results in a technical document written in LaTeX.

Finite Element Analysis Program for Truss Elements　　11/2020 – 03/2021
Team Project
- Successfully created a MATLAB program based on FEA in statics.
- Enabled users to compute stresses and displacement in complicated truss structures.

Finite Element Analysis on Beam Elements　　09/2020 – 03/2021
Individual Research
- Investigated beam behavior under static and transient conditions through ANSYS.
- Provided complete validation report in verifying the simulation results.

Aerodynamic Coupling in Piezoelectric Beams Evaluation　　03/2020 – 03/2021
Individual Research
- Analyzed the effect of aerodynamic coupling on two side-by-side piezoelectric energy harvesters.
- Introduced the aerodynamic coupling-to-input ratio and aerodynamic coupling effectiveness to measure the influence of the aerodynamic coupling on the energy conversion process.
- Participated at the SPIE Conference as the co-author of this project.

PROFESSIONAL EXPERIENCE

Graduate Student Instructor (GSI) for Undergrad Fluid Class　　01/2023 – 03/2023
University of Michigan, Ann Arbor, US
- Offered review sessions and office hours.
- Created marking scheme and graded weekly quizzes.
- Created marking scheme and graded midterm and final exams.

Assistant Teacher　　06/2016 – 08/2017
Zhiyong Education, Shanghai, China
- Participated in editing secondary school level physics, biology, and science after-school supplementary curriculums and teaching materials.
- Provided intensive science lectures and practices for 25 7th-grade students and offered guidance on exam reviews.
- Designed educational animations through.
- Researched BrainPop teaching courses, and introduce picked videos and classes to students to reinforce the learned content.

LEADERSHIP

Orientation Leader 01/2018 – 08/2019
Rose-Hulman Institute of Technology
- Organized the welcome event and orientation seminar for freshmen for two consecutive years.
- Led the team of 6 to plan activities, allocate budgets, and cooperate with different school departments to arrange for new students' registration process.
- Introduced the school norms, cultures, and fun facts to help students avoid culture shock, and better adapt to the new environment.

HONORS & TEAM ACTIVITIES

International RoboMaster Competition. 07/2019
Shenzhen, China
- Leader of the Mechanical Group with six team members.
- Designed and manufactured an easy detachable robot that moves along an overhead rail.
- Got the 16th place in the Competition.

RHIT Diversity Connect Student Design Competition. 01/2018
Rose-Hulman Institute of Technology
- Member of a group of four
- Proposed a plan to resolve the coverage issue of the alarming system on campus.
- Got the 1st place in the Competition

LANGUAGE & SKILLS

Languages: Native in Chinese, Fluent in English
ProgrammingMATLAB, Python, C, C++, ANSYS, SOLIDWORKS, Maple, Microsoft Office (Word, Excel, PowerPoint)
Harware: Drills, Bandsaw, Scroll Saw, Laser Cut, and 3D Printing