

Muhammad Alfiyandy HARIANSYAH

Master's Student in Aerospace Engineering

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🇮🇩 Nationality : Indonesia



I am a student, engineer, and researcher with experience in data science for aircraft design **looking for a PhD opportunity**.

My research primarily lies in the intersection between machine learning and aerospace design optimization. Specifically, I have focused on surrogate-based optimization and its applications in the design optimization of transonic aircraft wings. Recently, I am interested in researching the Urban Air Mobility (UAM) vehicle (eVTOL and eSTOL) design and operations toward a sustainable future. I aspire to become an expert involved in the R&D of these vehicles. My goal is to realize **a large-scale adoption of UAM vehicles** for passenger and cargo transport. I aim to conduct research to overcome technical challenges to make it a reality.

Current topic areas of interest : Aircraft Design, Multidisciplinary Optimization, Aerodynamics, Structures, Sustainable Aviation, System Integration, Air Transportation, UAM Vehicle Concepts, Physics-Informed Machine Learning

EDUCATION

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| 2017 - 2021 | B.Eng. in Mechanical and Aerospace Engineering, Tohoku University, CGPA : 3.96/4.00 (US Grade)
Classes : Fluid Mechanics I and II, Theory of Elasticity, Computational Fluid Dynamics, and Aircraft Design
Thesis : <i>An Artificial Neural Network-Assisted Genetic Algorithm with Application to Multi-Objective Transonic Airfoil Shape Optimization</i> . Supervisor : Prof. Koji Shimoyama. |
| 2021 - 2023 | M.Eng. in Aerospace Engineering, Tohoku University, CGPA : 4.00/4.00 (US Grade)
Classes : Fluid Design Informatics, Fluid Dynamics, Structural Mechanics, High Performance Computing.
Thesis : <i>Deep Learning Techniques for Aerodynamic Wing Shape Optimization</i> (tentative)
Thesis committee : Prof. Koji Shimoyama, Prof. Shigeru Obayashi, and Prof. Tomonaga Okabe (tentative) |

EXPERIENCE

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|---------------------------|--|
| April 2020 - Present | Research Assistant Fluids Engineering with Data Science Laboratory, TOHOKU UNIVERSITY, Japan <ul style="list-style-type: none">➢ Developed an in-house surrogate-based optimization framework that utilizes a dynamically retrained multilayer perceptron combined with a genetic optimizer.➢ Tested the framework on several test functions : ZDT1, ZDT2, ZDT3, OSY, Ackley, Pressure Vessel.➢ Applied the framework to aerodynamic design optimization of 2D and 3D transonic wings : PARSEC, B-spline airfoils, and NASA Common Research Model (CRM) wing.➢ Developed a DCGAN-based method to produce synthetic wing designs and a CNN-based geometric filtering method to efficiently explore the design space.➢ Collaborated with researchers at IFS to apply the framework to a wing structural layout optimization.➢ Automated the geometry production, meshing, CFD analysis and optimization on an HPC system.➢ Presented the research results at several domestic and international conferences.➢ Presented seminars to other lab members on multi-objective optimization and CFD techniques. <div>Python C pyGeo pyHyp Pointwise SU2 ADflow PyTorch Pymoo</div> |
| August 2022 - Present | Aerodynamics Engineer (part-time) teTra aviation corp., Tokyo, Japan <ul style="list-style-type: none">➢ Performing multi-fidelity subsonic aerodynamic analyses of eVTOL fixed-wing multi-rotor systems.➢ Performing a design optimization study to minimize wake interaction effects between fore and aft wings with winglets in a tandem configuration of our eVTOL commercial model (Mk-5).➢ Intregating Multidisciplinary Design Optimization (MDO) within aerodynamics team projects. <div>OpenVSP Xflr5 XFOIL ANSYS Fluent Python</div> |
| October 2022 - Present | Teaching Assistant Future Global Leadership Program, TOHOKU UNIVERSITY, Japan <ul style="list-style-type: none">➢ Assisting Prof. Yumiko Watanabe in a field trip for an "Introduction to Academic Learning" class.➢ Facilitating group project discussions in the class on academic integrity, education and society. |
| July 2022 - Present | English Teaching Support Sendai Daisan High School, SENDAI, Japan <ul style="list-style-type: none">➢ Assisting students in improving their communication and research presentation skills in English. |
| January 2021 - March 2021 | Administrative Assistant Global Learning Center, TOHOKU UNIVERSITY, Japan <ul style="list-style-type: none">➢ Helped new students settle down in Sendai : residence registration, opening bank account, etc.➢ Taught STEM subjects to undergraduate students for their exam preparation. |

PUBLICATIONS

Articles

- Hariansyah, M. A., and Shimoyama, K., "An Artificial Neural Network-Assisted Genetic Algorithm With Application to Multi-Objective Transonic Airfoil Shape Optimization," *JAXA Special Publication : Proceedings of the 53rd Fluid Dynamics Conference/39th Aerospace Numerical Simulation Symposium*, 2022, pp. 115-124, JAXA-SP-21-008, ISSN 2433-2232.
- Hariansyah, M. A., and Shimoyama, K., "On the Use of a Multilayer Perceptron Based Surrogate Model in Evolutionary Optimization," *Proceedings of the Computational Mechanics Conference*, 2021, Vol. 2021.34, Online ISSN 2424-2799, DOI:10.1299/jsmecmd.2021.34.235


Presentations

- Hariansyah, M. A., and Shimoyama, K., "Deep Learning Techniques for High-Dimensional Surrogate-Based Aerodynamic Design," *33rd Congress of the International Council of the Aeronautical Sciences*, Oral, September 2022, Stockholm, Sweden.
- Hariansyah, M. A., and Shimoyama, K., "Aerodynamic Wing Shape Optimization via Deep Learning-Assisted Genetic Algorithm" *JSME Annual Meeting 2022*, Oral, September 2022, Toyama, Japan.
- Inaba, Y., Date, S., Hariansyah, M. A., Abe, Y., Shimoyama, K., Okabe, T., and Obayashi, S., "Optimization of Structural Layout for Composite Aircraft Wings," *the 18th International Conference on Flow Dynamics*, Online Poster Session, 2021.
- Hariansyah, M. A., and Shimoyama, K., "On the Use of a Multilayer Perceptron as an Aerodynamic Performance Approximator in Multi-Objective Transonic Airfoil Shape Optimization," *the 18th International Conference on Flow Dynamics*, 2021.

HONORS & AWARDS

2021 - 2023	Mizuho International Foundation Scholarship Awardee (allowance throughout my master).
2021 - 2022	Boeing Higher Education (BHE) Program Student Research Project Awardee.
October 2021	Best Presentation Award at the 18th International Conference on Flow Dynamics (first author).
2017 - 2021	Japanese Government (MEXT) Scholarship Awardee (allowance + tuition throughout my undergrad).
May 2015	Gold Medal at Physics National Science Olympiad for Senior High School Students in Indonesia.
May 2013	Gold Medal (absolute) at Physics National Science Olympiad for Junior High School Students in Indonesia.
July 2012	Silver Medal at Physics National Science Olympiad for Junior High School Students in Indonesia.
December 2012	Finalist at the International Junior and Science Olympiad (IJSO) in Tehran, Iran.

PROJECTS

LEADING RESEARCH ON INNOVATIVE AIRCRAFT DESIGN TECHNOLOGIES TO REPLACE FLIGHT TEST	2020 - 2022
 Fugaku Supercomputer Project	
Contributed research studies with Prof. Koji Shimoyama on AI applications in aircraft design (led by Prof. Soshi Kawai).	
AERODYNAMIC SHAPE OPTIMIZATION OF AIRCRAFT WINGS VIA NEURAL NETWORK-ASSISTED GENETIC ALGORITHM	2021 - 2022
 Boeing Higher Education (BHE) Program organized by Prof. Shigeru Obayashi	
Conducted a research study funded by the BHE Program and will report to Mr. Will Shaffer, the President of Boeing Japan.	
ECONOMIC SUPPORT POLICY DESIGN BY SOCIAL SIMULATION	FALL 2021
 EC-COMP21  Presentation Slides  DOI:10.11394/tjpnsec.13.23	
Contributed a solution to a Covid-19 financial support policy design by Japanese Govt. using evolutionary optimization.	

LEADERSHIP, SERVICE & MEMBERSHIP

June 2020 - June 2021	President Indonesian Student Association in Japan, Miyagi Branch, SENDAI, Japan <ul style="list-style-type: none">➤ Led an association of approximately 110 students (mostly from Tohoku University).➤ Represented the association in meetings with the Indonesian embassy and university executives.➤ Organized monthly talks : research highlights by students, lectures by experts, etc.➤ Organized cultural performance : traditional dances and musical instruments at festivals.
July 2021	Team Member Tokyo Olympic 2020 Event Service, MIYAGI STADIUM, Japan <ul style="list-style-type: none">➤ Provided language support (English) to the visitors/other members.➤ Helped visitors with mobility vehicles and guided them to their seats.
August 2019 - August 2020	Head of Social Service Division Indonesian Student Association in Japan, Tokyo, Japan <ul style="list-style-type: none">➤ Organized fund raising projects : Covid19 Donation, Jakarta Flood Relief, Beirut Explosion, etc.➤ Held weekly talks about scholarships in Japan, see more on  PPI Jepang Website
October 2019 - November 2020	Member Speaker Team of TEDx Tohoku University, SENDAI, Japan <ul style="list-style-type: none">➤ Recruited speakers, evaluated and edited their drafts, helped them prepare for the conference.
May 2021 - Now	Student Member the Japan Society for Aeronautical and Space Sciences, Tokyo, Japan
June 2021 - Now	Student Member the Japan Society of Mechanical Engineers, Tokyo, Japan