

Muhammad Alfiyandy HARIANSYAH

Master's Student in Aerospace Engineering

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🇮🇩 Nationality : Indonesia 🌐 Indonesian, English, Japanese



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 aircraft design optimization. Specifically, I have concentrated on surrogate-based optimization and its applications in the design of transonic aircraft wings. I've recently become interested in researching the design and operations of Urban Air Mobility (UAM) vehicles (eVTOL and eSTOL) for a more sustainable future. For my PhD, I want to **develop tools for exploring novel aircraft concepts** using a multi-objective evolutionary robust approach. I aspire to become a researcher involved in the research and development of UAM vehicles for passenger transport.

Research interests : Aircraft Design, Multidisciplinary Design Optimization, Multi-Objective Optimization, Machine Learning, UAM Vehicle Concepts, Uncertainty Quantification, Sustainable Aviation, Aerostructures, Physics-Based Modeling

🎓 EDUCATION

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|-------------|---|
| 2017 - 2021 | B.Eng. in Mechanical and Aerospace Engineering, Tohoku University, CGPA : 3.96/4.00 (Scholaro Link)
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> . Advisor : Prof. Koji Shimoyama. |
| 2021 - 2023 | M.Eng. in Aerospace Engineering, Tohoku University, CGPA : 4.00/4.00 (Scholaro Link)
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 Introduction to Academic Learning Class, TOHOKU UNIVERSITY, Japan <ul style="list-style-type: none">➢ Assisted Prof. Yumiko Watanabe on a field trip to 2011 Tohoku Great Earthquake-affected areas.➢ Facilitating class group discussions on one's responsibility as a scholar in the Tohoku region.➢ Examining and grading students' essay assignments on academic integrity and social responsibility. |
| 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 first- and second-year undergraduate students for their exam preparation. |


HONORS & AWARDS

June 2022	IFS Graduate Student Overseas Presentation Award (a travel grant >450k JPY)
2021 - 2023	Mizuho International Foundation Scholarship Awardee (Top 15/ 60+ international applicants).
2021 - 2022	Boeing Higher Education (BHE) Program Student Research Project Awardee. (JPY 300k grant)
October 2021	Best Presentation Award at the 18th International Conference on Flow Dynamics (of 71 papers).
February 2020	Best Delegate, Indonesian Youth Delegation Program (IDEAS for Indonesia) at NUS, Singapore (1/100+)
2017 - 2021	Japanese Government (MEXT) Scholarship Awardee (Top 10/100+ applicants globally).
May 2015	Gold Medal at Physics National Science Olympiad for Senior HS Students in Indonesia. (4th/99)
May 2013	Gold Medal (absolute) at Physics National Science Olympiad for Junior HS Students in Indonesia. (1st/99)
July 2012	Silver Medal at Physics National Science Olympiad for Junior HS Students in Indonesia. (8th/99)
December 2012	Finalist at the International Junior and Science Olympiad (IJSO) in Tehran, Iran.

SKILLS

Programming Languages	Proficient (Python, C, Matlab/Simulink); Knowledgable (C++, HTML5, CSS3, LaTeX Overleaf)
ML and Data Science	NumPy, Pandas, SciPy, Scikit-Learn, PyTorch, TensorFlow, Pymoo
3D Geometry	OpenVSP, PyGeo, SolidWorks, FreeCAD
CFD and Meshing	SU2, ADflow, Pointwise, ANSYS Fluent
Visualization	Matplotlib, Tecplot, Paraview
Conceptual Design	SUAVE, OpenVSP, Xflr5, XFOIL, XROTOR
Language Proficiency	Full professional (English); Limited working (Japanese); Elementary (Arabic, Turkish); Native (Indonesian, Javanese, Madurese)

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.	

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.

Invited Talk

- > Hariansyah, M. A., "Deep Learning Techniques for High-Dimensional Surrogate-Based Aerodynamic Wing Shape Optimization," *JSME Technical Session on Surrogate Modeling for Analysis and Design*, December 2022, Sendai, Japan.

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. > Involved in a 1-year volunteer training, including team building etc.
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 - Present	Student Member the Japan Society for Aeronautical and Space Sciences, Tokyo, Japan <ul style="list-style-type: none"> > Presented at conferences, contributed articles, and joined discussions.
June 2021 - Present	Student Member the Japan Society of Mechanical Engineers, Tokyo, Japan <ul style="list-style-type: none"> > Presented at conferences and joined the annual meeting. > Invited to give a research talk.

REFERENCES

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