

Muhammad Alfiyandy HARIANSYAH

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🇮🇩 Nationality : Indonesia 🗣️ Indonesian, English, Japanese



A passionate engineer and a dedicated student with a track record of developing machine learning techniques for aerodynamic design optimization. Knowledgeable in creating the environment and tools for modeling and simulations.

🎓 EDUCATION

- 2021 - 2023 **M.Eng. in Aerospace Engineering, Tohoku University, CGPA : 4.00/4.00 (Scholaro Link)**
Classes : Mathematical Modeling and Computation, System Control Engineering, Numerical Analysis, Fluid Design Informatics, High Performance Computing, Fluid Dynamics, Structural Mechanics, etc.
Thesis : *Deep Learning Techniques for Aerodynamic Wing Shape Optimization* (tentative)
Advisors : Prof. Shigeru Obayashi and Prof. Koji Shimoyama
- 2017 - 2021 **B.Eng. in Mechanical and Aerospace Engineering, Tohoku University, CGPA : 3.96/4.00 (Scholaro Link)**
Classes : Aircraft Design, Fluid Mechanics I and II, Theory of Elasticity, Computational Fluid Dynamics, etc.
Thesis : *An Artificial Neural Network-Assisted Genetic Algorithm with Application to Multi-Objective Transonic Airfoil Shape Optimization*. Advisor : Prof. Koji Shimoyama.

📁 EXPERIENCE

- August 2022 - Present** **Aerodynamics Engineer (part-time) | teTra aviation corp., Tokyo, Japan**
- Performed a multi-objective design exploration study of a tandem wing configuration to maximize aerodynamic performances and meet stability requirements for a forward flight of our eVTOL (Mk-5).
 - Spearheading the development of an aircraft-level integration environment (aerodynamics, structures, propulsion, weights, controls) using the SUAVE framework (from ADL Stanford University).
 - Performing multi-fidelity subsonic aerodynamic analyses of eVTOL fixed-wing multi-rotor systems.
 - Managing simulation portfolio (3D geometry, mesh, CFD data, automation pipeline, etc.)
 - Performing conceptual design (eVTOL iterative sizing, weight breakdown analysis, required battery power over an intended flight profile, reversed engineering process, what-if analyses, etc.)
 - Assisted manned flight test preparation at Fukushima RTF (operation, flight log analysis, PID tuning).
 - Involved in the propulsion system requirements capture and selection for the new model (Mk-7).
 - Writing technical reports, drawing conclusions, and making suggestions.
- Python Linux OpenVSP Xflr5 XFOIL ANSYS Fluent SUAVE Flight Review (PX4) Notion
- April 2020 - Present** **Student Researcher | Fluids Engineering with Data Science Laboratory, TOHOKU UNIVERSITY, Japan**
- Worked on collaborative research projects under “The Program for Promoting Research on the Super-computer Fugaku” by MEXT and “Boeing Higher Education Program” by the Boeing Japan.
 - 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 generative method to produce synthetic wing designs and a CNN-based geometric filtering method to filter abnormal shapes and efficiently explore the design space.
 - Collaborated with researchers at IFS to apply the framework to 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.
- Python C Linux HPC SU2 Pointwise MACH-Aero Tecplot PyTorch Pymoo
- July 2022 - January 2023** **English Teaching Support | Sendai Daisan High School, SENDAI, Japan**
- Assisted high school students in improving their English communication and presentation skills by participating in several special English classes.
 - Facilitated discussions about their research projects in STEM fields presented at an innovation festival.
- January 2021 - March 2021** **Administrative Assistant | Global Learning Center, TOHOKU UNIVERSITY, Japan**
- 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.
 - Organized and compiled exam preparation materials.

SKILLS

Programming Languages	Proficient (Python, C, Matlab/Simulink); Knowledgeable (C++, HTML5, CSS3)
Operating System and SCM	Microsoft Windows, Linux Ubuntu; Git, GitHub, GitLab, Sublime Merge
Text Editing and Documentation	Sublime Text, VIM, Jupyter Notebook, Microsoft Word, Notion, LaTeX Overleaf
ML and Data Science	NumPy, Pandas, SciPy, Scikit-Learn, PyTorch, TensorFlow, Pymoo, Spreadsheet
CFD and Meshing	SU2, ADflow, Pointwise, ANSYS Fluent
3D Geometry and Visualization	OpenVSP, PyGeo, SolidWorks, FreeCAD; Matplotlib, Plotly, Tecplot, Paraview
Aircraft Conceptual Design	SUAVE, OpenVSP, Xflr5, XFOIL, XROTOR
Flight Control and Analysis	Knowledgeable (Flight Review); Informed (PX4, jMAVSIM, QGroundControl)
Language Proficiency	Full professional (English : iBT 107/120); Limited working (Japanese); Native (Indonesian)

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).

DEEP LEARNING TECHNIQUES FOR AERODYNAMIC WING SHAPE OPTIMIZATION 2021 - 2022

 [Boeing Higher Education \(BHE\) Program organized by Prof. Shigeru Obayashi](#)

Conducted research funded by the BHE Program and reported the results to Mr. Will Shaffer, the President of Boeing Japan.

ALFIFLOW JAN 2023 - PRESENT

 [GitHub Repository](#)

Developing a CFD code from scratch that (currently) solves 1-D Euler equations and 1-D linear scalar advection equations using Finite Difference Method and Finite Volume Method (MUSCL+Limiter with Roe-averaging flux scheme).

VORTEX PANEL METHOD FEB 2023 - PRESENT

 [GitHub Repository](#)

Developing a vortex panel method from scratch based on potential flow applied to airfoils and wings (wip : rotors).

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/jsmcmd.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

June 2022	IFS Graduate Student Overseas Presentation Award (a travel grant 350k 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).
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.