

# Muhammad Alfiyandy HARIANSYAH



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📍 Room 6111, 6/F (Lift 19), Academic Building, HKUST, Clear Water Bay, Hong Kong  
🇮🇩 Nationality : Indonesia   🗣️ Indonesian, English, Japanese

**An engineer and a student** with a track record of developing machine learning techniques for aerodynamic design optimization and industrial experience in structural analysis. Currently pursuing his research interest in the conceptual design of eVTOL aircraft.

## 🎓 EDUCATION

- 2024 - present   **Ph.D. in Mechanical Engineering, HKUST**  
Advisor : Prof. Rhea Liem
- 2021 - 2023   **M.Eng. in Aerospace Engineering, Tohoku University, CGPA : 3.92/4.00 (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*  
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 2023 - January 2024   **Structural Analysis Engineer (full-time) | PT Turkish Aerospace Indonesia, BANDUNG, Indonesia**
- Contributed as an analysis engineer for two projects : 1. Weight Reduction for ATA 27 Components (Flight Control System) of the TAI Hürjet (Advanced Jet Trainer), 2. Preliminary Design Study of the Horizontal Stabilizer for the TAI T625 Gökbey (Transport and Light Utility Helicopter).
  - Performed static (SOL 101) and normal mode (SOL 103) analyses to determine structural integrity (Reserve Factor) using finite element methods (MSC Patran/Nastran) backed with hand calculations.
  - Responsible for analyzing ATA 27 Components : 1) Rudder (Installation, Mounting Bracket, Lever Arm), 2) LEFAS Assy. (PDU Instl., Control Module Fitting, Bevel Gear), 3) Flaperon Instl., 4) IMU Instl.
  - Performed hand calculation analyses for : 1) bolted joint, 2) lug and pin, 3) flanged stud.
  - Prepared FEM : Load and BCs, 3D Mesh TET10, SPC, MPC (RBE2 vs RBE3), CBUSH, CGAP, etc.
  - Automated the application of MPC and CBUSH using scripting in Patran Command Language.
  - Generated detailed documentation for modification in designs and their analysis reports.
  - Performed aerodynamic analysis of the HorzStab using the Schrenk method, Vortex Lattice Method, and 3D Panel method to provide spanwise and chordwise load distribution.
  - Calculated the shear force, bending moment, and torsion due to aerodynamic forces on the HorzStab.
  - Aeroelastic modeling for divergence and flutter analyses : AERO, CAERO1, SET1, MKAERO1, etc.
  - Wrote pyNastran code to extract forces/stresses automatically from HorzStab GFEM via OP2 files.
  - Joined training about regulations : DOA (CS-21 Subpart J) and CS-29 for large helicopter.
  - Presented in several weekly meetings with the team in the Turkish Aerospace Industries.

MSC Patran   Nastran   Patran Command Language   Hypermesh   PyNastran   OpenVSP   Python   MS Office

- August 2022 - July 2023   **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).
  - Spearheaded the development of an aircraft-level integration environment (aerodynamics, structures, propulsion, weights, controls) using the SUAVE framework (from ADL Stanford University).
  - Spearheaded the development of a tool for airfoil exploration and selection (1500+ airfoils database).
  - Performed multi-fidelity subsonic aerodynamic analyses of eVTOL fixed-wing multi-rotor systems.
  - Managed simulation portfolio (3D geometry, mesh, CFD data, automation pipeline, etc.)
  - Performed 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).
  - Wrote technical reports, drew conclusions, and made suggestions.

Python   Linux   OpenVSP   Xflr5   XFOIL   ANSYS Fluent   SUAVE   Flight Review (PX4)   Notion

- April 2020 - September 2023 | **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

<b>Programming Languages</b>	Proficient (Python, C, Matlab/Simulink); Knowledgeable (C++, HTML5, CSS3)
<b>Operating System and SCM</b>	Microsoft Windows, Linux Ubuntu; Git, GitHub, GitLab, Sublime Merge
<b>Text Editing and Documentation</b>	Sublime Text, VIM, Jupyter Notebook, Microsoft Word, Notion, LaTeX Overleaf
<b>ML and Data Science</b>	NumPy, Pandas, SciPy, Scikit-Learn, PyTorch, TensorFlow, Pymoo, Spreadsheet
<b>CFD and Meshing</b>	SU2, ADflow, Pointwise, ANSYS Fluent
<b>Finite Element Analysis</b>	MSC Patran, Nastran, Hypermesh, PyNastran, Patran Command Language
<b>3D Geometry and Visualization</b>	OpenVSP, PyGeo, SolidWorks, FreeCAD; Matplotlib, Plotly, Tecplot, Paraview
<b>Aircraft Conceptual Design</b>	SUAVE, OpenVSP, Xflr5, XFOIL, XROTOR
<b>Flight Control and Analysis</b>	Knowledgeable (Flight Review); Informed (PX4, jMAVSim, QGroundControl)
<b>Language Proficiency</b>	Professional (English : iBT 107/120); Conversational (Japanese N3); 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.
- WORK PACKAGE : WEIGHT REDUCTION FOR ATA27 COMPONENTS OF THE TAI HÜRJET** AUG 2023 - NOV 2024
- [PT Turkish Aerospace Indonesia's Portfolio](#)  
Contributed as a structural analyst for the structures of the ATA 27 Components of an Advanced Jet Trainer.
- AVTOL : MULTI-CONFIGURATIONAL EVTOL SIZING** JUNE 2024 - PRESENT
- [GitHub Repository](#)  
Developing a sizing code for eVTOL with various configurations. This is my ongoing PhD project advised by Prof. Rhea Liem.

## PUBLICATIONS

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### 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

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January 2024	<b>Hong Kong PhD Fellowship Scheme</b> (prestigious program from the Research Grants Council)
June 2022	<b>IFS Graduate Student Overseas Presentation Award</b> (a travel grant 350k JPY)
2021 - 2023	<b>Mizuho International Foundation Scholarship Awardee</b> (Top 15/ 60+ international applicants).
2021 - 2022	<b>Boeing Higher Education (BHE) Program Student Research Project Awardee.</b> (JPY 300k grant)
October 2021	<b>Best Presentation Award at the 18th International Conference on Flow Dynamics</b> (of 71 papers).
2017 - 2021	<b>Japanese Government (MEXT) Scholarship Awardee</b> (Top 10/100+ applicants globally).
May 2015	<b>Gold Medal</b> at Physics National Science Olympiad for Senior HS Students in Indonesia. (4th/99)
May 2013	<b>Gold Medal (absolute)</b> at Physics National Science Olympiad for Junior HS Students in Indonesia. (1st/99)
July 2012	<b>Silver Medal</b> at Physics National Science Olympiad for Junior HS Students in Indonesia. (8th/99)
December 2012	<b>Finalist</b> at the International Junior and Science Olympiad (IJSO) in Tehran, Iran.