

Asmelash Haftu Amaha

Aerospace Engineering, IIT Bombay, India, 400076

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Professional Summary

Proficient in computational fluid dynamics (CFD) with strong skills in OpenFOAM simulation and improving aerodynamics. Improved torque by 10% in vertical-axis wind turbines (VATs) through innovative track-based design. Has experience mentoring students and working on research for renewable energy, aerospace, and mechanical engineering. Skilled in hybrid renewable energy systems for better efficiency. Has a strong background in developing technology for sustainable energy solutions.

Work and Research Experience

Research Scholar

July 2016 – 2023

Indian Institute of Technology Bombay — Powai 400076, India

- Generated accurate meshes (snappyHexMesh, etc.) for simulating complex geometries/motions, including flapping airfoil (MAV) on circular/elliptical paths and rotating turbines.
- Modeled and simulated H-rotor Darrieus vertical axis turbine (VAT) using sliding and overset meshes, presenting the turbine performance and comparatively studying the techniques.
- Demonstrated a proof of concept to simulate an innovative multi-blade track-based turbine using overset meshes, pushing the boundaries of turbine design and aerodynamic analysis.
- Explored various numerical tools for multi-body & complex flow. Demonstrated adaptive Smoothed Particle Hydrodynamics (SPH) for accuracy and efficiency across varied scenarios.
- Comparatively studied OpenFOAM and SPH methods for simulating geometrically complex moving bodies, contributing to understanding their respective strengths and limitations.
- Simulated Horizontal axis wind turbine using the NREL FAST solver; highlighting the specific software application, and providing insights into turbine performance.

Skills

- OpenFOAM, PySPH, Paraview, Inkscape, Onshape, Gmsh, OpenFAST, SU2.
- ANSYS-Fluent, COMSOL, CAE, OpenVSP, Salome, QGIS, SAM NREL.
- Python, C++, LaTeX, Git, HPC, Linux, automation.

Education

Indian Institute of Technology Bombay — Mumbai, India

2024 – 2025

M.Tech. Center for Technology and Development

- Thesis Title:* Comparative Assessment of Solar PV and Hybrid Minigrid Systems

Indian Institute of Technology Bombay — Mumbai, India

07/2016 – 02/2023

Ph.D., Aerospace Engineering

- Thesis Title:* Numerical Simulation of Track-Based Turbines
- Supervisors:* Professor Prabhu Ramachandran & Professor Shiva Gopalakrishnan

Selected Coursework

Computational Fluid Dynamics and Heat Transfer; Aerodynamics of Compressors and Turbines; Gas Dynamics; Numerical Methods; Microfluidics; Applied Statistical Methods and Data Analysis; Project Management and Project Analysis; Ecology and Environment

Publications

Journal Publications

- **Asmelash Haftu**, Abhinav Muta, and Prabhu Ramachandran, Parallel adaptive weakly-compressible SPH for complex moving geometries, Computer Physics Communications, Volume 277, 108377, April 2022 (<https://doi.org/10.1016/j.cpc.2022.108377>).
- Pawan Negi, Prabhu Ramachandran, and **Asmelash Haftu**, An improved non-reflecting outlet boundary condition for weakly-compressible SPH, Computer Methods in Applied Mechanics and Engineering, Volume 367, 113119, 1 August 2020, (<https://doi.org/10.1016/j.cma.2020.113119>).
- **Asmelash Haftu Amaha**, Shivasubramanian Gopalakrishnan, Prabhu Ramachandran, and Joel Guerrero, Vertical axis turbine simulation based on sliding and overset meshes, IOP Conference Series: Materials Science and Engineering, 2024, (<http://doi.org/10.1088/1757-899X/1312/1/012010>).
- **Amaha AH**, Singh AM, Martis RR, Numerical simulation of ramp induced shock wave boundary layer interaction in turbulent flow, The Royal Aeronautical Journal, Cambridge University Press, January 2016, (<https://doi.org/10.1017/S0001924000008253>).
- **Asmelash Haftu Amaha**, Numerical Investigation of Shock wave Turbulent Boundary Layer Interaction over a 2D Compression Ramp, Advances in Aerospace Science and Applications, Research India Publications, 2014, (https://www.ripublication.com/aasa-spl/aasav4n1spl_05.pdf).
- *Submitted to ICAER 2025*: **Asmelash Haftu Amaha**, Keshava Reddy D. C, Suman Kumar Saha, and Anand B. Rao. Utilization and Socio-Economic Outcomes of Sustainable Rural Solar Minigrids: Case Study of Girang Minigrad, Jharkhand.
- *Under preparation*: **Asmelash Haftu Amaha**, Abhinav Muta, Prabhu Ramachandran, and S. Gopalakrishnan, Comparison of OpenFOAM and Adaptive SPH for simulating geometrically complex moving bodies.
- *Under preparation*: **Asmelash Haftu Amaha**, Prabhu Ramachandran, and S. Gopalakrishnan. Numerical simulation of track-based turbines.

Conference Presentations

- 18th OpenFOAM Workshop, Genoa, Italy, July 11-14, 2023.
- 72nd Annual Meeting of the APS Division of Fluid Dynamics, Seattle, United States, November 2019, (<http://meetings.aps.org/Meeting/DFD19/Session/Q14.4>).
- 7th International Conference on Advances in Energy Research, Indian Institute of Technology Bombay, Mumbai, India, December 2019, (https://link.springer.com/chapter/10.1007/978-981-15-5955-6_15).
- Asmelash Haftu Amaha, Advances in Aerospace Science and Applications, Research India Publications, Jawaharlal Nehru University, New Delhi, India, February 2014, (http://www.ripublication.com/aasa-spl/aasav4n1spl_05.pdf).

Book Chapter

- Simulation of Horizontal Axis Wind Turbine Using NREL FAST Solver. **Asmelash Haftu Amaha**, Prabhu Ramachandran and Shivasubramanian Gopalakrishnan. Springer Proceedings in Energy book series (SPE), October 2020, (<https://www.amazon.in/Proceedings-International-Conference-Advances-Research/dp/9811559546>).

Training and Certification

Training

- Jan - Feb 2022: **OpenFOAM Advanced Training Course**, Wolf Dynamics, Genova, Italy
- May - Jun 2023: **Student CFD Workshop**, Aeronautical Society of India, CFD Division

Certification

- July 2023: **Presenter**: 18th OpenFOAM Workshop, Genoa, Italy
- Nov 2019: **Presenter**: 72nd Annual Meeting of the American Physical Society Division of Fluid of Dynamics (APS DFD), Seattle, Washington, November 2019
- Dec 2019: **Presenter**: 7th International Conference on Advances in Energy Research (ICAER), Mumbai, December 2019, India
- March 2024: **Thank you Certificate**: Conducted, Hands-on OpenFOAM Workshop, AZEOTROPY'24, Symposium IITB
- June 2024: **Participation**: First UK-Indian Online OpenFOAM Symposium
- January 2023: **Participation**: Ansys Fluent CFD workshop - AZeotropy, CADFEM India
- Dec 2024: **Completion**: Machine Learning by Amazon (AWS), TechFest IIT Bombay, India
- June 2024: **Attendance**: Webinar: MSCA-PF Call 2024, How to write a successful MSCA-Postdoctoral Fellowships Proposal

Internship Certification - Directed Research on solar minigrids - off-grid rural development.

- Host NGO: Transform Rural India Foundation (TRIF), 12 May 2025 to 15 July 2025.

Seminar Projects

- PhD Credit Seminar: Design of Supersonic Stage for Gas Turbines.
- MTech Dissertation: A Study of Shock Wave Turbulent Boundary Layer Interaction.
- MTech Credit Seminar: Preliminary Design of Gas Turbine Stage.
- BTech Project: Analysis of noncircular shaft using Finite Element Packages (TDFIELD and ISOFIELD).

List of References

1. Prof. Prabhu Ramachandran
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2. Prof. Shivasubramanian Gopalakrishnan
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Department of Mechanical Engineering,
Indian Institute of Technology Bombay
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3. Prof. Avijit Chatterjee
Professor,
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Indian Institute of Technology Bombay
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Presentations

<https://drive.google.com/file/d/1SfTTb6G8-uQzp0koC9ZZvH8r70OMdmYA/view?usp=sharing>