Asmelash Haftu Amaha

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Professional Summary

Computational fluid dynamics (CFD) researcher with strong expertise in OpenFOAM-based aerodynamic analysis and turbine optimization. Achieved a 10% torque improvement in vertical-axis wind turbines through an innovative track-based turbine concept. Experienced in mentoring students and conducting interdisciplinary research across renewable energy, aerospace, and mechanical engineering. Possesses solid expertise in hybrid renewable energy systems and the development of sustainable energy technologies.

Work and Research Experience

Research Scholar   July 2016 – 2023

Indian Institute of Technology Bombay — *Powai 400076, India*

- Performed high-fidelity CFD simulations of complex moving aerodynamic systems using OpenFOAM, including mesh generation (snappyHexMesh) for flapping airfoils (MAVs) on circular/elliptical paths, rotating and track-based turbines, and multi-body configurations.
- Modeled and analyzed wind turbine systems, including H-rotor Darrieus VAWTs using sliding and overset meshes with comparative performance assessment, and developed a CFD model for an innovative multi-blade track-based turbine using overset mesh techniques.
- Investigated advanced numerical methods for complex flows, benchmarking OpenFOAM against adaptive SPH for multi-body and moving-geometry problems. Also, conducted HAWT turbine simulations using the NREL FAST solver to evaluate 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 - [MTP1-PPT] , [PhD-PPT]

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).

- *Communicated:* **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 Minigrid, Jharkhand.

- *Prepared:* **Asmelash Haftu Amaha**, Anand B. Rao, and Omkar Buwa. Comparative Assessment of Multi-Source Hybrid Renewable Energy for Off-grid Electrification - Advanced Multi-Dimensional Review.

- *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
   Professor,
   Department of Aerospace Engineering,
   Indian Institute of Technology Bombay
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2. Prof. Shivasubramanian Gopalakrishnan
   Professor,
   Department of Mechanical Engineering,
   Indian Institute of Technology Bombay
   e-mail:sgopalak@iitb.ac.in

3. Prof. Avijit Chatterjee
   Professor,
   Department of Aerospace Engineering,
   Indian Institute of Technology Bombay
   e-mail:avijit@aero.iitb.ac.in