Kaleb Kassa Lafebo

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Summary

Energy Engineering M.Sc. candidate with a high-distinction mechanical engineering background and interdisciplinary expertise from computational modeling to Robot design and programming. Proven ability to bridge theory and practice, highlighted by a ***co-invented patented portable wind generator*** and hands-on experience developing ***Digital Twin frameworks*** for modern building technology applications ***(UniZEB)***. Highly proficient in CFD tools, Python programming, and machine learning algorithms for complex system simulation. Eager to apply advanced numerical modeling, thermodynamic analysis, and technical innovation to drive high-impact engineering solutions across the clean energy and technology sectors.

Areas of Expertise

Programming & Algorithms: Python, C++, R, LaTeX, Jupyter Notebook, Prompt Engineering, Microsoft Office, OpenCV, YOLO, SLAM, and other sensor fusion algorithms.

Engineering Software: SolidWorks (CSWA Certified), Autodesk (AutoCAD, Revit); ANSYS Workbench; OpenFoam; RoboDK; CoppeliaSim (V-REP); SimaPro; LabVIEW; EES; REFPROP; KeyShot; Canva; EnergyPlus; PVSyst; FEAM; GUROBI Solver; NASA CEA.

Patent

A Portable Wind Energy Generator Sep 2023
VIT University, Vellore, India | Project guide and co-inventor: Dr. Bibhuti B. Sahoo

- B.Tech project on the design and development of a portable wind energy generator awarded patent recognition by IPA India through VIT.
- Design No.: 366876-001.

Education

M.Sc. Energy Engineering 2024 – 2026
University of Padova, Padova, Italy ongoing

B.Tech. Mechanical Engineering 2018 – 2022
Vellore Institute of Technology, Vellore, India 9.33/10

Professional Experience

Researcher | VM Thomas Robotics Lab, IIT Madras Aug 2023 – Aug 2024

- Built a camera-only find-and-approach robot (YOLOv5, A* planning, pure-pursuit control): 8 of 8 missions completed, vs. 3 of 8 for a CNN-steered baseline.
- Made the live vision pipeline 2.4× faster (17 → 41 fps) with a 50× cheaper camera path; vision-only search centred the target in 18 of 18 trials (mean error 3.8°).
- Validated the robot's kinematic model to within 0.33 % of measured speed, backed by 252 automated tests.
- Designed sensor and control electronics and CAD / 3D-printed parts, then integrated and field-tested them on mobile robots.

Awards & Scholarships

- Certified SolidWorks Associate (CSWA)
- MAECI Scholarship – Italian Ministry of Foreign Affairs, for academic excellence and international mobility.
- Global Engagement Scholarship – Indian Institute of Technology Madras, Research Scholarship.
- BETRE Science Ethiopia Scholarship – Ethiopian government scholarship for UG studies based on merit.
- VIT Merit Student – Consistently ranked in the top 5 of the School of Mechanical Engineering for the entire duration of the B.Tech program.

- STAT-A-THON Winner – Led a group to win First place in a national-level problem-solving competition.
- Student Leadership Recognition – Student Council Member received a Certificate of Appreciation from the Dean.

Academic Projects & Research

Developing Digital Twin Frameworks for Modern Building Technology Applications: UniZEB
University of Padova, Italy | Master's Thesis | Oct 2026 – March 2027 (Ongoing)

- Engineering a Python co-simulation middleware linking Digital model to supervisory building automation via runtime callback hooks.
- Developing an asynchronous data pipeline to couple building physics with BMS logic.
- Implementing runtime actuator overrides and sub-stepping routines to eliminate numerical instability across mismatched time scales for the UniZEB facility.

Thermo-Fluidic Characterization of an Actively Cooled EV Charging Cable
University of Padova, Italy | Prof. Stefano Bortolin Nov 2025 – March 2026

- Designed a computational fluid dynamics (CFD) model in Ansys Fluent to simulate a multiphysics thermal transport within a high-amperage electric vehicle charging cable.
- Conducted conjugate heat transfer (CHT) simulations, mathematically coupling volumetric Joule heating in the solid conductor with forced laminar convection in the annular fluid domain.
- Quantified bulk fluid thermal absorption and localized heat transfer coefficients to prove the active cooling mechanism safely prevents polymer dielectric degradation under extreme electro-thermal loads.

Design and ML - Based Optimization of Micro - Wind Turbines Sep 2025 – December 2025
University of Padova, Italy | Guide: Prof. Giorgio Pavesi

- Developed machine-learning models to predict turbine output from key design and operating conditions.
- Generated large datasets by sweeping operating points around the optimal tip speed ratio to identify rotor speeds that maximize power within design limits.
- Built a user interface where site-specific and design parameters yield maximum achievable power and optimal rotational speed.

Predictive Life-Cycle and Carbon Impact Assessment of Energy-Intensive Infrastructure
University of Padova, Italy | Guide: Prof. Anna Stoppato Oct 2024 – Dec 2024

- Performed life-cycle assessment of a large-scale power generation system using SimaPro to quantify environmental impacts across the supply chain.
- Trained machine-learning models on process-level inventory data to predict CO_2-equivalent emissions under varying operational scenarios.

Workshops & Events

- CISM Advanced Course, Udine (Jun 2026): Wind Engineering: Bridging Experimental, Field, and Numerical Techniques.
- Empowering Energy Engineers, University of Padova (Feb 2026): Open Badge for a course on carbon-neutrality strategies, intellectual property, scientific communication and EU project proposals.
- IN MOTION Idea Contest, NOI Techpark, Brunico (May 2025): pitched a multi-energy system algorithm in an industry challenge on decarbonization.
- Automotive Next Gen seminar, MathWorks, Padova (Feb 2025): Software Architectures and Hybrid-Electric Systems.
- Python programming training (3 days, online), Orange Digital Center Ethiopia with Addis Ababa University (Dec 2022).

References

Available on request.