Nikhar J. Abbas

Curriculum Vitae

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Education

2017 – Pres. (Aug) **Doctor of Philosophy**, *University of Colorado Boulder*, Mechanical Engineering, Thesis Title: *Enabling Control for Wind Turbine Design.*

2015 – 2016 (Sept – Jun) **Master of Science**, *University of California, San Diego*, Mechanical Engineering, Thesis Topic: *Small Disturbance, Long Term Voltage Stabilization on a Distribution Feeder in Kathmandu, Nepal.*

2011 – 2016 (Sept – Jun) **Bachelor of Science**, *University of California, San Diego*, Environmental Engineering.

Employment

2017 – Pres. (Aug) **Graduate Research Assistant**, *University of Colorado Boulder*, Boulder, CO, Thesis Advisor: Professor Lucy Pao.

Conducted research concerning integration of wind turbine control systems into automated wind turbine design processes. This has been done in close collaboration with the National Renewable Energy Laboratory (NREL) for the entirety of my graduate research. The largest contributions of this work include:

- Creator and lead developer of the Reference OpenSource Controller (ROSCO) – a fully automated wind turbine controller tuning and implementation framework for use by the wind energy community (1.1K+ documentation visits from 45+ countries.)
- Integration of ROSCO into the ARPA-E funded Wind Energy with Integrated Servo-control (WEIS) framework, a multi-disciplinary optimization tool for fixed and floating offshore wind turbines.
- Co-design optimization of trailing-edge flaps on low specific power rotors and floating offshore wind turbines.
- Analysis of controller influence on floating wind turbine design optimization through robust stability margin constrained controller tuning processes.

2017 – 2018 (Aug – May) **Graduate Teaching Assistant**, *University of Colorado Boulder*, Boulder, CO, MCEN 4043 - System Dynamics.

Lead teaching assistant for the primary senior-level system dynamics laboratory course taught in the Mechanical Engineering Department at CU Boulder.

- Instructed and supervised 60+ students in bi-weekly laboratory experiments focused on the fundamentals of mechanical and electrical system dynamics.
- Hosted weekly office hours
- Graded homework and exams

2016 – 2017 (Jul – Jun) **Graduate Controls Intern**, *National Renewable Energy Laboratory*, Golden, CO.

- Unknown input, EKF design for Wave Energy Converter (WEC) state estimation
- Wave excitation force forecasting via autoregressive parameter estimation
- Model predictive control to maximize power production and minimize foundation loads

2015 – 2016 (Sept – Jun) **Graduate Research Assistant**, *University of California, San Diego*, San Diego, CA, Thesis Advisor: Professor Jan Kleissl.

Research in optimization and control of a grid connected solar-plus-battery system in Kathmandu, Nepal to improve voltage quality for local feeder connections. The work was primarily conducted through MATLAB and OpenDSS and in collaboration with the NGO, RIDS-Nepal.

Relevant Skills

- Extensive knowledge of wind turbine control systems, especially within the context of turbine design.
- Setting up, running, and post-processing simulation data from wind turbine design load cases and related large data sets.
- Use of version control for collaborative software development (git).
- Use of large-scale High Performance Computing systems for parallel processing.
- Multi-disciplinary optimization, particularly within the OpenMDAO framework.

Programing Languages

- Python
- MATLAB/Simulink
- Modern Fortran

Wind Energy Software Expertise

- ROSCO
- OpenFAST
- WEIS/WISDEM

Selected Publications

2022 Abbas, N. J. et al. (2022). "A Reference Open-Source Controller for Fixed and Floating Offshore Wind Turbines". In: *Wind Energy Science* 7.1, pp. 53–73. .

2020 Abbas, Nikhar J., Roland Feil, and Lucy Pao (2020). "Generic Controller Development for Distributed Aerodynamic Control Devices on Large Wind Turbine Blades". In: American Control Conference 2020.

2020 Abbas, Nikhar J. and Lucy Pao (2020). "On the Controllability of a Floating Offshore Wind Turbine". In: vol. 1452. IOP Publishing, p. 012001. .

2019 Abbas, Nikhar J., Daniel Zalkind, and Lucy Pao (2019). "Assessing Control of a Floating Wind Turbine Based on Harmonic Loads Analysis". In: *AIAA Scitech 2019 Forum*, p. 1802. .

Honors and Awards

2017 Aug — Outstanding Mechanical Engineering Research Potential Fellowship

Philanthropy

2018 – Pres. Dec — **Assisted Ski Instructor**, *National Sports Center for the Disabled*, Winter Park, Colorado.

Volunteer with the NSCD assisted program ski program, a program that brings disabled persons onto the ski slopes of the Winter Park Ski Resort in Colorado. Primary volunteering has been as a tethered and non-tethered bi-ski and mono-ski instructor.

2021 – Pres. Jul — **Surplus Food Distribution**, *Denver Food Rescue*, Denver, CO.

Help transport surplus food around the city of Denver, primarily by bicycle. The Denver Food Rescue works to collect unwanted food from various suppliers (e.g. grocers) and distributes it around town, preferably by bicycle, to community centers that then provide the food to those in need.