

Aoife Henry

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- Doctor of Philosophy (Ph.D), Electrical, Computer & Energy Engineering – University of Colorado Boulder / National Renewable Energy Laboratory - Graduating in May 2025
- Master of Science (M.Sc), Energy Science & Technology – ETH Zürich – Excellence Scholarship & Opportunity Program Scholar - Graduated May 2021
- Bachelor of Engineering (B.Eng), Electrical Engineering – University of College Dublin – Ad Astra Academic Scholar, Irish Language Scholar - Graduated May 2018

Industry & Research Experience

PhD Candidate, Machine-Learning Augmented Control of Wind Farms, University of Colorado Boulder (CU Boulder) & National Renewable Energy Laboratory (NREL) (09/2021 -> 05/2025, Full-Time (FT)):

My research is supported by the wind farm controls team at NREL. My role is to develop a Python module for wind farm forecasting and control with machine learning components which will be used by NREL and the greater research community in conjunction with several other modules under development.

- Awards:
 - o Ascent Deep Tech Accelerator Fellowship, CU Boulder College of Engineering and Applied Science Innovation & Entrepreneurship Fellowship Program
 - o Three-Minute Thesis Competition Finalist
- Research Interests:
 - o Deep Learning (Transformers, Recurrent Neural Networks) for Spatiotemporal Wind Field Forecasting with Uncertainty Quantification
 - o Statistical Learning (SINDy, Gaussian process regression, Support Vector Machines, Random Forest) for Efficient Online Modeling
 - o Reinforcement Learning for Control of Floating Offshore Wind Farms which are Robust to Moving Turbine Platforms and Turbine Failures
 - o Stochastic Model Predictive Control for Control of Wind Farms
 - o Robust H-Infinity Control Methods for Individual Pitch Control of Wind Turbines
- Open-Source Software Development
 - o NREL [Wind-Hybrid-Open-Controller](#) Open-Source Python library
 - o NREL [Wind Forecasting](#) Open-Source Python library
 - o High-Performance Computing Systems, High-Performance Programming Paradigms, Memory/Performance profiling, Big Data processing
 - o C++, Python, PyTorch, TensorFlow, MATLAB, Simulink, FORTRAN
- Teaching
 - o Masters' Thesis Supervisor – Modeling of Wind Farm Dynamics and Disturbances
 - o Teaching Assistant - [Control System Analysis](#)
- Publications/Projects/Presentations:
 - o Ultra-Short-Term Probabilistic Spatiotemporal Modeling of Wind Farm Dynamics and Disturbances for Controls, IEEE Transactions on Control Systems Technology · 2025 (pending)
 - o Stochastic Model Predictive Control with Gaussian Wind Direction Preview for Wake Steering, IEEE Transactions on Control Systems Technology, 2025 (pending)
 - o **Henry A**, Pusch M, Pao L. [Investigation of \$\mathcal{H}_\infty\$ -Tuned Individual Pitch Control for Wind Turbines](#). Wind Energy & NAWEA/WindTech Conference. 2024 Oct;27(10):1074-94.
 - o Stockhouse D, Phadnis M, **Henry A**, Abbas NJ, Sinner M, Pusch M, Pao LY. [A tutorial on the control of floating offshore wind turbines: Stability challenges and opportunities for power capture](#). IEEE Control Systems. 2024 Sep 19;44(5):28-57.
 - o Stockhouse D, Phadnis M, **Henry A**, Abbas N, Sinner M, Pusch M, Pao LY. [Sink or swim: A tutorial on the control of floating wind turbines](#). In 2023 American Control Conference (ACC) 2023 May 31 (pp. 2512-2529). IEEE.
 - o **Henry A**. [Modeling Downstream Turbine Wind Speeds with Wind Speeds with Recurrent Neural Networks for Wind Farm Control](#). Class Project, Neural Networks and Deep Learning, CU Boulder 2023.
 - o **Henry A**, Myers-Dean J. [Reinforcement Learning for Firm Power Tracking in Wind Farms](#). Class Project, Reinforcement Learning, CU Boulder 2023.

- **Henry A**, Sinner M, King J, Pao LY. [Online Learning of Effective Turbine Wind Speed in Wind Farms](#). In 2023 62nd IEEE Conference on Decision and Control (CDC) 2023 Dec 13 (pp. 1569-1574). IEEE.
- **Henry A**, Pusch M, Pao L. [Modeling blade-pitch actuation power use in wind turbines](#). In 2023 American Control Conference (ACC) 2023 May 31 (pp. 1480-1485). IEEE.

Platform Architecture & Controls Engineer, Apple Inc. (05/2023 – 08/2023, FT)

Over the course of an internship, I led a R&D effort to design controller auto-tuning procedures for power management on Apple devices using Python, C++, hardware-in-the-loop testing, and internal company tools.

Research Engineer, National Renewable Energy Laboratory (05/2022 – 11/2022, FT until 09, Part-Time (PT) thereafter):

I worked as a contractor for two semesters at NREL after which they agreed to fund the remainder of my PhD research. The research I developed as a contractor involved:

- modeling wind farm dynamics using Gaussian process regression
- firm power tracking in wind farm control

Masters' Thesis, CU Boulder - Europe-Colorado Exchange Scholar (09/2020 -> 03/2021, FT):

In 2021 I completed my Masters' Thesis with the Systems & Control group at CU Boulder as part of their Europe-Colorado scholarship programme. I developed a Model Predictive Control scheme in which the objective function and the dynamic state equation were approximated by Gaussian processes and the problem was solved with an online primal-dual algorithm at each time-step with proven convergence properties.

- **Henry A**. [Real-Time Learning-Based Model Predictive Control: Online Algorithms and Applications in Energy Systems](#). Master's thesis, ETH Zurich 2021 Mar 1.

Co-Founder of Fidensio (01/2020 – 08/2021, PT):

Fidensio's mission was to develop a software as a service solution to tackle the difficulties which large and complex organizations face in neutralizing their carbon footprint. I managed a lean team of three to investigate our target customer's problems, brainstorm and build minimal solutions and test those solutions in tight feedback loops.

Smart Grid Engineer, EKZ (09/2019 -> 02/2020, FT):

I completed a six-month internship with the electricity provider EKZ in Switzerland through the language medium of German. During my time there, I was responsible for developing:

- A data analysis pipeline and a Python-based mobile application for real-time monitoring for a frequency-control battery system
- A data analysis pipeline customer energy consumption/generation time-series data,
- A database management interface and a controller for the intelligent management of electric vehicle charging stations.

Undergraduate Research Engineer, Computational Geoscience & Engineering Group, Imperial College London (06/2018 – 07/2018, FT):

I spent two months building a software toolbox that could be used by the department and industry partners to model marine current turbine wakes.

Undergraduate Research Engineer, Bachelors' Thesis, University College Dublin (UCD) (01/2017 -> 07/2018, PT):

I worked with MATLAB and Python scripts to simulate the impact a penetration of Marine Current Turbine energy would have on the Irish power grid, which already exemplifies a grid with a high penetration of non-synchronous energy resources (namely wind).

- **Henry A**, Jónsdóttir GM, Milano F. [Modeling and control of marine current turbines and energy storage systems](#). IFAC-PapersOnLine. 2019 Jan 1;52(4):425-30.

Junior Engineer, Marine Physical Laboratory Research Group, Scripps Institution of Oceanography (09/2016 -> 05/2017, PT):

I worked as part of a team of engineers to design, build, deploy and maintain ocean instruments and energy generation devices. My tasks were:

- to design, program, prototype and test a device for taking oceanographic measurements from a boat over the full depth of the ocean

- develop a user interface and microcontroller system to calibrate shear probes (tiny fluid flow measurement devices).

Whizzkids Inc Founder and Tutor (09/2014 – 05/2017, PT):

In 2014 I established a private tutoring company that offered exam mentorship and private tutoring in math, physics, chemistry, economics and Irish, for second-level and third-level exams, through the language medium of English or Irish Gaelic (through which a proportion of students study and take exams in Ireland). In 2016 I evolved the business by providing students with interactive essential exam-preparation materials to teach self-autonomy and linking these students with a group of online tutors under my management in Ireland to ensure full understanding of the subject and exam paper content.

Volunteering Experience

Computer Skills Instructor & Fundraiser, UCD Volunteer Overseas (10/2014 – 08/2015, PT):

Following the application and interviewing process, I was accepted into the year-long UCDVO programme, which involved fundraising and training (on volunteer conduct, the CAMARA operating system and teaching skills), I worked for a month in the town of Morogoro in Tanzania as part of a team. We held Camara Computer Skills Beginner and Improver course for teachers, and taught English to teachers and primary school children alike. In 2016 I organized the 5 km Irish-language event RÁS in support of the charity.

Founder & Director of fundraising organization Students for CRY (10/2012 -05/2013, PT):

I visited India for one month in 2012 and was struck by the level of childhood poverty. On return I established Students for CRY. Child Rights and You (CRY) is a charity that has been working for the past 30 years, to ensure lasting change for India's children. Students for CRY represented the Irish chapter of CRY, and its purpose was to raise awareness and fundraise for CRY via publicising and fundraising events.

Coding Instructor (2011 – 2013, PT):

I taught young children how to code on a volunteer basis at 3 different Coder Dojo locations.

Professional Skills

Entrepreneurship:

Customer discovery and interviewing, Business Model Canvas development, Hypothesis formulation and testing - learned and practised through [NSF's Innovation Corps \(I-Corps™\)](#) intensive Starting Blocks and Research-to-Market programs, and to be continued through their national training program.

Languages:

English – Native Proficiency, German – Professional Working Proficiency, Irish Gaelic – Native Proficiency

Sport:

Competitive Mountain Marathon Running (current holder of Fastest Known Time on the Irish Munros, Winner of 1st Woman at Blue Sky Marathon 2021), Competitive ultra cycling (2018 -> 2020), Shotokan Karate 1st Dan Black Belt (2013)

Predoctoral Education and Qualifications

ETH Zürich MSc Energy Science & Technology (2018 -> 2021):

In 2021 I graduated from ETH, ranked among the top five global universities for Engineering & Science.

- Excellence Scholarship & Opportunity Programme (ESOP) Scholar - I was selected from all course applicants as the single representative scholar of the prestigious ESOP scholarship, which provided me with funding and additional mentorship.

University College Dublin BEng Electrical Engineering Graduate (2014 -> 2018):

I received a 1st Class Honors and remained top of my class of 76 Electrical & Electronic Engineering students.

- Ad Astra Academic Scholar - this is awarded to students who have achieved maximum marks in the Leaving Certificate examination (the national entry examination into 3rd level education in Ireland), and provides them with funding, personal academic mentorship and tuition in areas such as leadership, innovation and creative thinking.

- 'Teach na Gaeilge' (translates to 'Irish Language Home') Irish Language Scholar – this is awarded to students who are fluent in the Irish Language and who demonstrate a commitment to promoting Irish language and culture both within the university campus and further afield.

University of California San Diego (UCSD) Study Abroad Program (2016 -> 2017):

I studied here for a year as part of an exchange programme.

- Provost Honours Award - this is awarded to students of UCSD who complete a minimum of 12 graded units and maintain a GPA of 3.5 or higher for a full academic year.

Award for Highest Leaving Certificate (2014) and Junior Certificate (2011) Score in High School Cohort

These are the two national secondary level qualification exams in the Republic of Ireland, taken at ages 18 and 15 years. In my final Leaving Certificate exam, I was ranked in the highest 0.01% percentile of all students in the country. Throughout my secondary education, I was taught and studied entirely through the language medium of Irish Gaelic, which is possible for 3.6% of schools in Ireland.