Ryan Scott

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Journal Publications: 15
Citations: 95
h-index: 5

Summary

Doctor of mechanical engineering with a focus on applying turbulent fluid mechanics to solve challenges in renewable energy. Self-motivated with 10+ years of research experience including 3+ years at the National Renewable Energy Laboratory. Comfortable with multiple programming languages, high-performance computing, and hands-on experiments. 10+ years of CAD design and rapid prototyping experience in industrial and laboratory settings.

Education

2024 **Ph.D. Mechanical Engineering, 4.0 GPA, Portland State University**
Advisor: Professor Raúl Bayoán Cal
Dissertation: *Consequences of Spatial Heterogeneity for Turbulent Wake Development*

2019 **M.Sc. Mechanical Engineering, 4.0 GPA, Portland State University**
Thesis: *Characterizing Tilt Effects on Wind Plants*

2017 **B.S. Mechanical Engineering, 3.7 GPA, Portland State University Honors College**
Honors Thesis: *Autonomous Navigation and Hazard Evasion Platform for Personal UAV's*

Relevant Experience

Graduate Research Participant
June 2021 – Current
National Renewable Energy Laboratory, Boulder, CO

- Proposed cooperative strategy to enhance regional wind plant performance by identifying key factors driving wake losses between neighboring plants and optimizing turbine operation using NREL's open-source wind plant simulation tool (FLORIS).
- Optimized FLORIS wake model input parameters against measured wind plant power in Python to ensure accurate energy production forecasting.
- Generated accessible wind power datasets by developing a scalable pipeline to automate raw turbine SCADA processing in Python with Pandas, XArray, and NREL's OpenOA toolkit.
- Produced wind turbine reference models using NREL's open-source turbine design toolchain (WISDEM/WEIS) and contributed models to centralized repository to improve wind plant simulation reproducibility.
- Created atmospheric reference datasets for broad use by synthesizing measurements from multiple sources in Python using Pandas and XArray.
- Communicated findings to varied stakeholders through presentations, milestone reports, and peer-reviewed journal publications.

Relevant Experience (continued)

PhD Candidate, Graduate Research Assistant
October 2018 – June 2024
Dr. Raúl Bayoán Cal, Portland State University, Portland, OR

- Conceptualized broadly applicable metric for quantifying spatial heterogeneity in high-dimensional systems and published open-source MATLAB and Python implementations.
- Advanced wind energy state of the art by creating an analytic representation of turbulence generation in wind turbine wakes and by quantifying the impact of vertical wake steering (tilt) on turbulent wake recovery and wind plant efficiency.
- Led studies on varied topics across turbulent fluid dynamics. Defined experimental matrices, maintained project budgets, and managed team members to ensure timely delivery of results. Employed multiple measurement techniques including hot wire anemometery, stereo particle image velocimetry, particle tracking velocimetry.
- Supported multiple research efforts with high-fidelity wind turbine Large Eddy Simulations. Performed simulations on NREL's Eagle and Kestrel high performance computers using SOWFA-6 and AMR-Wind.
- Designed and fabricated custom wind tunnel facilities with experimental apparatus to facilitate reduced scale experiments. Completed CAD designs and PCB layouts using SolidWorks, OnShape, and Autodesk Eagle. Utilized various manufacturing techniques to assemble finished products including laser cutting, CNC machining, and various 3D printing methods. Programmed sensor interfaces and microcontrollers with C++ and Python.
- Mentored junior graduate students in research group. Assisted with experimental design, data collection, data analysis, and communicating results. Created shared resource repository for research group to standardize data management processes and improve new student onboarding.
- Initiated collaborations with national laboratories and international academic institutions
- Communicated findings through journal publications and presentations at national and international conferences.

Graduate Student Summer Intern
June 2017 – August 2017
National Renewable Energy Laboratory, Golden, CO

- Developed portable thermocouple and hot wire anemometer system to enable on-site convection measurements in active solar arrays. Designed and fabricated portable fixture in SolidWorks and programmed data logging system with MATLAB.
- Manufactured a hybrid thermal camera with data logger and touch screen interface for remote temperature monitoring. Programmed sensor drivers in C++ and user interface in Python.
- Implemented data processing pipeline in MATLAB to reduce data processing times from days to hours.

Awards and Achievements

2023 **Excellence in Research**, Portland State University Department of Mechanical Engineering recognition of exceptional student research.

2018 **NSF GRFP**, Recipient of the National Science Foundation Graduate Research Fellowship Program.

2017 **Honors Graduate**, Graduated *cum laude* from the Honors College at Portland State University.

Research Publications

Journal Articles

1. Hendrickson, E., **Scott, R**, Holt, D., Cal, R. B., & Cruzan, M. (2024). Pollen and seed dispersal in a continuous and clear-cut ponderosa pine forest. *In prep*.
2. Hendrickson, E., Warner, R., **Scott, R**, Williams, R., & Cruzan, M. (2024). Fine-scale phenotypic variation of seed traits in a wind-dispersed species. *Under consideration for the American Journal of Botany*.
3. Kadum, H., **Scott, R**, Smith, S., Calaf, M., & Cal, R. B. (2024). Momentum transport in heterogeneous forest canopies. *In production, Boundary-Layer Meteorology*.
4. **Scott, R**, Hamilton, N., & Cal, R. B. (2024a). Graph network heterogeneity predicts interplant wake losses. *Journal of Renewable and Sustainable Energy*, *16*(6).
5. **Scott, R**, Hamilton, N., & Cal, R. B. (2024b). Spatial heterogeneity as a measure of curled wake dynamics. *In prep*.
6. **Scott, R**, Hamilton, N., Cal, R. B., & Moriarty, P. (2024). Wind plant wake losses: Disconnect between turbine actuation and control of plant wakes with engineering wake models. *Journal of Renewable and Sustainable Energy*, *16*(4).
7. **Scott, R**, Hendrickson, E., Cabrera-Booman, F., Cruzan, M., & Cal, R. B. (2024). Canopy structure drives turbulence and particle transport. *In prep*.
8. **Scott, R**, Hendrickson, E., Cabrera-Booman, F., Taylor, K., Cruzan, M., & Cal, R. B. (2024). Characterizing turbulent flow over a live moss canopy: Comparison to surrogate models. *In prep*.
9. Smith, S., **Scott, R**, Aliseda, A., Calaf, M., Djeridi, H., Bayoán, R., & Obligado, M. (2024). Linking lacunarity to inertial particle clustering: Applications in solar photovoltaics. *International Journal of Multiphase Flow*.
10. Sadek, Z., **Scott, R**, Hamilton, N., & Cal, R. B. (2023). A three-dimensional, analytical wind turbine wake model: Flow acceleration, empirical correlations, and continuity. *Renewable Energy*.
11. **Scott, R**, Martínez-Tossas, L., Bossuyt, J., Hamilton, N., & Cal, R. B. (2023). Evolution of eddy viscosity in the wake of a wind turbine. *Wind Energy Science*, *8*(3), 449–463.
12. Bossuyt, J., **Scott, R**, Ali, N., & Cal, R. B. (2021). Quantification of wake shape modulation and deflection for tilt and yaw misaligned wind turbines. *Journal of Fluid Mechanics*, *917*. doi:https://doi.org/10.1017/jfm.2021.237
13. **Scott, R**, Kadum, H., Salmaso, G., Calaf, M., & Cal, R. B. (2021). A lacunarity based index for spatial heterogeneity. *Earth and Space Science*, e2021EA002180.
14. **Scott, R**, Bossuyt, J., & Cal, R. B. (2020). Characterizing tilt effects on wind plants. *Journal of Renewable and Sustainable Energy*, *12*(4), 043302. doi:https://doi.org/10.1063/5.0009853
15. **Scott, R**, Viggiano, B., Dib, T., Ali, N., Hölling, M., Peinke, J., & Cal, R. B. (2020). Wind turbine partial wake merging description and quantification. *Wind Energy*, *23*(7), 1610–1618. doi:https://doi.org/10.1002/we.2504

Conference Proceedings

1. **Scott, R**, Hamilton, N., & Cal, R. B. (2023). Spatial heterogeneity as an indicator of multiple wind plant performance. In *Nawea/windtech 2023*. NAWEA.
2. **Scott, R**, Hamilton, N., & Cal, R. (2022). Characterizing spatially heterogeneous wind turbine wakes under yaw and tilt misalignment. In *Bulletin of the american physical society*, APS.

3 **Scott, R**, Martínez-Tossas, L., Hamilton, N., & Cal, R. B. (2022). Wind turbine wake evolution of eddy viscosity. In *Nawea/windtech 2022*. NAWEA.

4 **Scott, R**, Martínez-Tossas, L., Hamilton, N., & Cal, R. B. (2021). Downstream evolution of eddy viscosity in the wake of a wind turbine. In *Division of fluid dynamics meeting abstracts* (E22–009). APS.

5 **Scott, R**, Kadum, H., Calaf, M., & Cal, R. B. (2020). Considerations for spatially heterogeneous forest canopies. In *Spatial heterogeneity in land-atmosphere interactions and boundary-layer development*. University of Wisconsin.

6 **Scott, R**, Kadum, H., Salmaso, G., Calaf, M., & Cal, R. B. (2020). A spatial heterogeneity parameter for canopy flows. In *Division of fluid dynamics meeting abstracts* (P16–008). APS.

7 **Scott, R**, Kadum, H., Salmaso, G., Higgins, C. W., Calaf, M., & Cal, R. B. (2020). Spatial heterogeneity as a bridge between canopy turbulence and numerical weather prediction. In *Fall meeting 2020*. AGU.

8 **Scott, R**. (2019). Characterizing tilt effects on wind plants. In *Wind energy science conference*. EAWE.

9 **Scott, R**, Falih, H., Smith, S., Ali, N., Bossuyt, J., Calaf, M., & Cal, R. (2019). Considering spatial inhomogeneities in forest canopies. In *Division of fluid dynamics meeting abstracts* (G18–007). APS.

10 **Scott, R**, Viggiano, B., Dib, T., Ali, N., Hölling, M., Peinke, J., & Cal, R. B. (2018). Wind turbine wake merging descriptions and quantification. In *Division of fluid dynamics meeting abstracts* (pp. L29–010). APS.