Daniel M. Glover

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EDUCATION

Washington State University **Pullman, WA**
Doctor of Philosophy - Electrical and Computer Engineering *expected Dec 2025*

University of Oklahoma (GPA 3.83) **Norman, OK**
Master of Science - Electrical and Computer Engineering *May 2021*

University of Oklahoma (GPA 3.69) **Norman, OK**
Bachelor of Science - Electrical Engineering *May 2020*

EXPERIENCE

Pacific Northwest National Laboratory **Richland, WA**
Distributed Systems Group, Electrical Engineering Ph.D. Intern *May 2021 - Present*

- *Modeling and Analysis/Power Electronics* teams, contributed to various projects for the Department of Energy (DoE) Solar Energy Technology Office (SETO), and the Open Energy Data Initiative (OEDI).
- Autonomous control and modeling framework for solar photovoltaic (PV) grid-forming (GFM) and grid-following (GFL) inverters, NN-based protection zone classification of faults in distribution feeders with high PV penetration, electromagnetic transient (EMT) case studies, project roadmap content contributor

University of Oklahoma **Norman, OK**
GRA Lab Manager - Laboratory for Electrical Engineering and Power Systems *Jan 2020 - May 2021*

- Solar Energy Technology Office (SETO) 480V lab distribution feeder test bay design to study the impacts of inverter based resources on distribution protection schemes.
- Control room design and build supervising multiple undergraduate students, SEL digital relay calibration, low voltage control and visual display system design, including medium voltage modular busbar system and switchgear installation for testbed circuit protection studies after topology reconfiguration.

Intel Corporation **Hillsboro, OR**
Devices Development Group, Software Engineering Intern *May 2019 - August 2019*

- Design for Testability (DFT) validation scripting for systems on chip (SOC) testing on a variety of fabrics, updated legacy scripts for in-dye variation modules.
- Created *TCL* tracing script for SOC visualization and micro-architectural mapping contributing to future testing methodologies for DFT and Validation teams.

AWARDS, ACHIEVEMENTS & ORGANIZATIONS

- National GEM Fellow Pacific Northwest National Laboratory & WSU, 2021 - present
- GAANN Fellowship recipient for EECS in power systems and machine learning WSU, 2022-present
- AIGC Science Post Graduate Scholarship Fund recipient for STEM, 2020 - 2021
- Distinguished Mentor Award, OU College of Electrical and Computer Engineering outstanding senior, 2019
- National Intel Scholar and AISES Intel Growing the Legacy Scholarship recipient, 2019 - present
- William H. Barkow and Ernest W. Reynolds Scholarships for Electrical Engineering OU, 2017 - 2020
- Muscogee Creek Nation Higher Education Tribal Grant Award Recipient for STEM, 2019-2023
- American Indian Science and Engineering Society (AISES) member, guest technical speaker
- IEEE Graduate Student Member, Climate Change AI, Open Energy Data Initiative

TECHNICAL COMPETENCIES

- Programming Languages - *Python, Julia, R, C/C++, TCL*
- Software Platforms/Libraries - *PandaPower, OpenDSS, PSCAD, PyTorch/TensorFlow, Matlab, EMTPWorks, ATP, PowerWorld, AiGym, AutoDesk EAGLE, MultiSim, MCUXpresso, SEL Acselerator QuickSet*
- Proficient in PC and Linux operating systems, remote high performance computing (HPC) applications
- Hardware - LPC1769 and Arduino micro-controllers, power system test bed switchgear (modular bus bar & terminal block systems, contactors, programmable logic controllers, digital relays, equipment rack assembly, soldering and PCB design, audio/video equipment, comfortable with hand and power tools

RELEVANT COURSEWORK

- *Electrical/Power Engineering*: Power systems analysis (transmission and distribution), protection, power electronics, solid-state electronics, control theory, stability (small signal and transient), energy conversion
- *Computer Science*: Machine learning, deep learning, computational science, statistics, data mining, energy analytics, network optimization, cryptography & modern algebra, computer architecture, digital logic/design

ACADEMIC & PROFESSIONAL PROJECTS

WSU Data-Driven Coordination of Grid Edge Devices *May 2022 - present*

- Development of pythonic wrapper for AIGym environment and Stable Baselines 3 Deep Reinforcement Learning (DRL) algorithm library with OpenDSS power systems distribution simulator environment.
- Training agents for centralized and local adaptive optimal solar inverter control e.g. volt/var control, on IEEE 13, 34, and 123-bus distribution networks constrained under IEEE 1547-2018 regulations.
- Documented processes for converting mathematical optimization formulations for grid service tasks into Markov models solved using Deep Reinforcement Learning (DRL) algorithms.

PNNL Open Energy Data Initiative Protection Zone Fault Classification *May 2023 - present*

- Conducted thousands of electromagnetic transient (EMT) fault studies on J1-EPRI distribution feeder with multiple single and multi-phase solar photovoltaic (PV) inverters.
- Trained Convolutional Neural Network (CNN) on transient waveforms for fault location classification based on topology zoning at distributed energy resource locations.

PNNL Solar Grid Integration Data and Analytics Library *July 2022 - May 2023*

- Contribute to the Open Energy Data Initiative (OEDI) via algorithmic development and data exchange to reduce startup costs and increase the impact of research into system integration of solar power.
- Developed quasi-static time series (QSTS) data sets for use in the International Electrotechnical Commission (IEC) Common Information Model (CIM) for modified IEEE distribution circuit models and GridLAB-D.

PNNL HWPV Autonomous Inverter Control for Grid-Forming Inverters *May 2021 - 2023*

- Develop DER dynamic models for GFM and GFL inverter automonous controls to allow for input/output learning-based approximations and technical parameter satisfaction under IEEE 1547-2018 regulations.
- Completed PSCAD automation scripting for transient waveform analysis of GFM models, implementing *dynoNet* neural networks and *pecblocks* architecture integration for *Hammerstein-Wiener* HWPV model.
- Developed Pythonic discrete-to-continuous LTI block conversion method for improved HWPV model flexibility and impact studies at variable time steps.

OU DoE Solar Energy Technology Office (SETO) 480V Testbed *April 2020 - June 2021*

- Studying power system protection technologies to overcome integration issues of inverter based resources (IBRs) in distribution feeders.
- Installation of 480V distribution test bed area switch gear components, low voltage control PLC, device communication network, digital SEL relays, solar inverters and Spears battery monitoring system.
- Conducted solar PV and battery storage penetration studies during fault scenarios to reproduce digital relay malfunction, including capacity hosting and multi-objective optimization cases on radial network topologies.

RESEARCH FOCUS

Ph.D. Graduate Thesis Work - Washington State University *Aug 2021 - present*

- Centralized and local adaptive optimal control of grid-edge resources in power distribution systems using Deep Reinforcement Learning (DRL), specifically regarding *risk-avert* or safeDRL, which combines constrained Markov model methods and stability guarantees for online implementation.
- Addressing the *sim-2-real* (simulation-to-reality) gap for data-driven power system dynamic controllers with domain adaptation and randomization to reduce policy degradation and distributional shift with improved transferability.
- Implementing model-free volt/var controllers for distributed solar PV inverters using Deep Q-learning and Actor-Critic algorithms under IEEE 1547-2018 standards.
- Aid in development of backend pythonic wrapper tool to merge existing Stable Baselines algorithms with OpenDSS power system simulator to improve open-source toolkit for RL applications.

MS Graduate Thesis Work - University of Oklahoma *Aug 2019 - May 2021*

- Research involving impacts of various solar PV penetration levels in distribution systems, distributed generation (DG) multi-objective optimization for solar PV sizing and placement on radial feeders for power loss minimization and voltage deviation correction.
- Distribution feeder protection scheme failure studies due to large amounts of renewable energy penetration under line-to-ground fault conditions using 480V testbed.

PUBLICATIONS

- D. Glover, A. Dubey, "Centralized Coordination of DER Smart Inverters using Deep Reinforcement Learning." *2023 IEEE Industry Applications Society Annual Meeting*, Oct 2023, pp 1-6.
- D. Glover, G. Krishnamoorthy, H. Ren, A. Dubey, A. Gebremedhin, "Deep Reinforcement Learning Simulations for the Power Grid." *Proceedings of the IEEE*, Oct 2023 (pending)
- H. Chipuio, D. Glover, P. Moses "Integration Issues of Solar PV in Distribution Feeder Protection Schemes." *2021 Photovoltaics Specialists Conference PVSC*, June 2021, pp 1-6.
- D. Glover, J. Devadason, P. Moses, "Multi-Solar PV Allocation for Optimal Sizing and Placement on Distribution Feeders." *SGES 2020 International Conference on Smart Grids and Energy Systems*, Nov 2020, pp 1-6.