Daniel B. Arnold

Contact Information

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Education and Training

Ph.D.
University of California Berkeley, Mechanical Engineering, Dec. 2015
Advisors: *Dave Auslander* and *Duncan Callaway (Energy and Resources Group)*

M.S. Engineering Science
University of California San Diego, Mechanical and Aerospace Engineering, Dec. 2006
Advisor: Miroslav Krstic

B.S. Mechanical Engineering
University of California San Diego, Mechanical and Aerospace Engineering, Sept. 2005, *cum laude*

Professional Experience

Research Scientist, Energy Technologies Area (ETA), Energy Storage and Distributed Resources (ESDR) Division, Grid Integration Group, Lawrence Berkeley National Lab (July 2017 - present)

- Developing reinforcement-learning based techniques and software for stochastic optimization of electric power distribution systems
- Conducting research into black-box model-free optimization algorithms
- Designing adaptive control schemes for Distributed Energy Resource (DER) cybersecurity

Lecturer, Civil and Environmental Engineering Dept., U.C. Berkeley
(Jan. 2018 - present)

- CEE 191 - Systems Analysis (Introduction to Optimization)

ITRI-Rosenfeld Postdoctoral Fellow, Energy Technologies Area (ETA), Lawrence Berkeley National Lab (Jan. 2016 – July 2017)

- Researched model-free optimal control strategies for managing solar photovoltaic systems
- Semi-supervised learning of electric grid legacy control equipment control parameters

Marine Renewable Energy Engineer, Naval Facilities Engineering Service Center (NAVFAC-ESC), U.S. Navy (Sept. 2008 – Aug 2009)

Research and Development Engineer, Space and Naval Warfare Center (SPAWAR), U.S. Navy (Dec. 2006 – Sept. 2008)

Journal Publications

R. Dobbe, W. Van Westering, S. X. Liu, D. Arnold, D. S. Callaway and C. Tomlin, "Linear Single- and Three-Phase Voltage Forecasting and Bayesian State Estimation with Limited Sensing," IEEE Transactions on Power Systems, 2019, doi: 10.1109/TPWRS.2019.2955893

E. Schweitzer, S. S. Saha, A. Scaglione, N. G. Johnson and D. Arnold, "Lossy DistFlow Formulation for Single and Multiphase Radial Feeders," IEEE Transactions on Power Systems, 2019, doi: 10.1109/TPWRS.2019.2954453

R. Dobbe, O. Sondermeijer, D. Fridovich-Keil, D. Arnold, D. Callaway, C. Tomlin, "Towards Distributed Energy Services: Decentralizing Optimal Power Flow with Machine Learning", IEEE Transactions on Smart Grid, 2019, doi: 10.1109/TSG.2019.2935711

M.D. Sankur, R. Dobbe, A. von Meier, E. Stewart, and D. Arnold, "Model-Free Optimal Voltage Phasor Regulation in Unbalanced Distribution Systems", IEEE Transactions on Smart Grid, Oct. 2019, 10.1109/TSG.2019.2950875

C. Roberts, A. Scaglione, M. Jamei, R. Gentz, S. Peisert, E. Stewart, C. McParland, A. McEachern, and D. Arnold, "Learning Behavior of Distribution System Discrete Control Devices for Cyber-Physical Security", IEEE Transactions on Smart Grid, 2019, doi: 10.1109/TSG.2019.2936016

J. Johnson, A. Summers, R. Darbali, J. Hernandez-Alvidrez, J. Quiroz, D. Arnold, and J. Anandan, "Distribution Voltage Regulation using Extremum Seeking Control with Power Hardware-in-the-Loop", IEEE Journal of Photovoltaics., Oct. 2018, doi: 10.1109/JPHOTOV.2018.2869758

D. Arnold, M. Negrete-Pincetic, M. Sankur, and D. Callaway, "Model-Free Optimal Coordination of Distributed Energy Resources for Provisioning Transmission-Level Services" IEEE Transactions on Power Syst., vol. 33, issue 1, pp. 817-828, 2018.

D. Arnold, M. Negrete-Pincetic, M. Sankur, D. Auslander, and D. Callaway, "Model-Free Optimal Control of VAR Resources in Distribution Systems: An Extremum Seeking Approach," IEEE Transactions on Power Systems, vol. 31, issue 5, pp. 3583-3593, 2016.

C. Zhang, D. Arnold, N. Ghods, A. Siranosian, and M. Krstic, "Source Seeking with Nonholonomic Unicycle Without Position Measurement and with Tuning of Forward Velocity," Systems and Control Letters, vol. 56, pp. 245-252, 2007.

Conference Publications

M.Sankur and D. Arnold, "Extremum Seeking Control of Distributed Energy Resources with Decaying Dither and Equilibrium-based Switching" 2019 Hawaii International Conference on System Sciences (HICSS) (best paper nominee)

M. Sankur, D. Arnold, L. Schector, and E. Stewart, "Computation and Visualisation of Reachable Distribution Network Substation Voltage", CIRED-Open Access Proceedings Journal, Issue 1, pp. 985-988, 2017

J.Y. Joo, M. Chava, M. Sankur, D. Arnold, and E. Stewart, "Model Predictive Control of Flexible Demand for Voltage Support in Unbalanced Distribution Systems", IEEE Power & Energy Society General Meeting, 2017

J. Johnson, S. Gonzalez, D. Arnold, "Experimental Distribution Circuit Voltage Regulation using DER Power Factor, Volt-Var, and Extremum Seeking Control Methods", IEEE PVSC, Washington, DC, 2017

D. Arnold, C. Roberts, O. Ardakanian, and E. Stewart, "Synchrophasor Data Analytics in Distribution Grids," IEEE Innovative Smart Grid Technologies Conference, Washington D.C., 2017

D. Arnold, M. Sankur, R. Dobbe, K. Brady, D. Callaway, and A. von Meier, “Optimal Dispatch of Reactive Power for Voltage Regulation and Balancing in Unbalanced Distribution Systems,” IEEE Power and Energy Society General Meeting, Boston Mass. 2016.

O. Sondermeijer, R. Dobbe, D. Arnold, C. Tomlin, and T. Keviczky, “Regression-based Inverter Control for Decentralized Optimal Power Flow and Voltage Regulation,” IEEE Power and Energy Society General Meeting, Boston Mass. 2016.

R. Dobbe, D. Arnold, S. Liu, D. Callaway, and C. Tomlin, “Real-Time Distribution Grid State Estimation with Limited Sensors and Load Forecasting,” ACM/IEEE 7th International Conference on Cyber Physical Systems, Vienna, Austria. 2016

D. Arnold, M. Negrete-Pincetic, E. Stewart, D. Auslander, D. Callaway, “Extremum Seeking Control of Smart Inverters for VAR Compensation,” IEEE Power and Energy Society 2015 General Meeting, Denver Co. USA, 2015.

E.M. Stewart, S. Kiliccote, D. Arnold, A. von Meier, R. Arghandeh, “Accuracy and Validation of Measured and Modeled Data for Distributed PV Interconnection and Control,” IEEE Power and Energy Society General Meeting, best paper award, Denver, Co. 2015.

M. Sankur, D. Arnold, and D. Auslander, “Dynamic Programming for Optimal Load Shedding of Office Scale Battery Storage and Plug Loads,” IEEE Power and Energy Society 2015 General Meeting, best paper award, Denver, Co. 2015.

M. Sankur, D. Arnold, and D. Auslander, “Model Predictive Control of Plug-Loads and Battery Storage Systems,” ASME Dynamic Systems and Controls Conference, San Antonio, Tx. 2014.

D. Arnold, M. Sankur, and D. Auslander, “Optimal Control of Office Plug-Loads for Commercial Building Demand Response,” ASME Dynamic Systems and Controls Conference, Palo Alto, Ca. 2013.

D. Arnold, M. Sankur, and D. Auslander, “An Energy Information Gateway for use in Residential and Commercial Environments,” IEEE Power and Energy Society General Body Meeting, San Diego, Ca. 2012.

J. Cochran, A. Siranosian, N. Ghods, D. Arnold, and M. Krstic, “GPS-Denied Source Seeking for a Nonholonomic Unicycle via Heading Control,” 7th IFAC Symposium on Nonlinear Control Systems, South Africa. 2007.

C. Zhang, D. Arnold, N. Ghods, A. Siranosian, and M. Krstic, “Source Seeking with a Nonholonomic Unicycle Without Position Measurement – Part I: Tuning of Forward Velocity,” IEEE Conference on Decision and Control, San Diego, Ca. 2006.

Fellowships and Awards

Best Paper Nominee: M.Sankur and D. Arnold, “Extremum Seeking Control of Distributed Energy Resources with Decaying Dither and Equilibrium-based Switching” 2019 Hawaii International Conference on System Sciences (HICSS)

2015 ITRI-Rosenfeld Postdoctoral Fellowship recipient, Lawrence Berkeley National Laboratory

DOW Sustainability Innovation Student Challenge winner, 2011: The Energy Information Gateway as a Sustainability Solution

Best Paper in session award: C. Zhang, D. Arnold, N. Ghods, A. Siranosian, and M. Krstic, “Source seeking with nonholonomic unicycle without position measurement - Part I: Tuning of forward velocity,” IEEE Conference on Decision and Control, 2006.

Funding

“Supervisory Parameter Adjustment for Distribution Energy Storage (SPADES)”
Sponsor: Cyber Security and Energy Delivery Systems (CEDS) program, Cybersecurity Energy Security and Emergency Response (CESER) office, U.S. Department of Energy
PI: Daniel Arnold
Amount: $3,000,000
Overview: Creation of reinforcement learning-based controllers to manage battery storage systems to counteract cyber attacks on the electric grid.

“Cybersecurity for Inverter-Grid Automatic Reconfiguration (CIGAR)”
Sponsor: Cyber Security and Energy Delivery Systems (CEDS) program, U.S. Department of Energy
Co-PIs: Daniel Arnold and Sean Peisert
Amount: $2,500,000
Overview: Creation of reinforcement learning-based controllers to manage rooftop solar panels to counteract cyber attacks on the electric grid.

“GRIP: Grid Resiliency and Intelligent Platform”
Sponsor: Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy
LBNL PI: Daniel Arnold
Amount: $800,000
Overview: Developing model-free optimal control strategies to manage rooftop solar panels and battery storage systems to improve electric grid operation and resiliency.