

Curriculum Vitae

Matthew Ryan Overlin, Ph.D.

Citizenship: USA
 moverlin@gmail.com
 +1-515-661-2028
 Website: <https://moverlin.github.io/>
 <https://github.com/moverlin>
 14 River Village Dr. Milford, ME 04461



Research Interests

Power Systems, Modeling, Simulation, System Identification, Electric Vehicles, Machine Learning in Power Systems, Autonomous Operation of Microgrids, Energy Harvesting, Power Electronics, Multi-physics systems, Energy Storage, Cybersecurity in Power Systems

Education

Sep. 2017 – Aug. 2021	Massachusetts Institute of Technology , Cambridge, MA Ph.D. in Electrical Engineering and Computer Science. Thesis: <i>Methods for Parameter Estimation with Devices in Microgrids</i> .
Sep. 2016 – Aug. 2017	Massachusetts Institute of Technology , Cambridge, MA M.Eng. in Electrical Engineering and Computer Science. Thesis: <i>A Modular Real-Time Hardware-in-the-Loop Simulation Environment for Microgrids</i> .
Sep. 2009 – Jun. 2013	Massachusetts Institute of Technology , Cambridge, MA B.S. in Electrical Science and Engineering. Minor: Physics

Employment History

Aug. 2021 – Present	Autonomous Systems Scientist (Data Sciences Division) . Martin Defense Group. Portland, ME I work on a project funded by the Office of Naval Research (ONR) which seeks to implement the autonomous control of naval vessels. As part of this work, digital twin models of scaled-down naval shipboard power systems are modeled and simulated. Machine learning techniques are used as part of these digital twin models so that the digital twin's simulated waveforms show more agreement with the experiment's waveforms. Also, I am the principal investigator for a project funded by the National Aeronautics and Space Administration (NASA) which seeks to implement fault recognition strategies in space habitats. As part of this project, a mock space habitat was built consisting of a thermal control system and grey water filtering system.
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Employment History (continued)

Jun. 2017 – Aug. 2021	Research Assistant. Massachusetts Institute of Technology (MIT) Lincoln Laboratory, Energy Systems Group (47). Lexington, MA. I worked on a variety of projects, usually funded by the Office of Naval Research (ONR) related to tactical microgrids for the U.S military throughout my four years as a PhD student. I modeled the operation of hybrid microgrids (diesel gensets and renewable energy-based generation) and investigated methods for system identification for devices within such microgrids. Also, I worked with a power hardware in the loop (PHiL) set-up which allowed a programmable power amplifier to emulate a diesel generator (or any arbitrary generation device). Also, I utilized a supercomputing platform to perform parallelized time-domain simulations and implement parallel algorithms for system identification.
Sep. 2016 – May 2017	Teaching Assistant. Massachusetts Institute of Technology (MIT), Dept. of Electrical Engineering and Computer Science. Cambridge, MA. I was a teaching assistant for a sophomore-level electrical engineering class “Signals and Systems.” I led small group sessions, helped with the course’s administrative work, held office hours, answered questions in the class’s online forum, and typed homework assignments, homework solutions, exams, and exam solutions in LaTeX.
Jul. 2013 – Jul. 2016	Hardware Engineer. Oracle Corporation, Advanced Archive Development Group. Burlington, MA. I worked in a group which was developing a prototype for an optical tape storage drive. The storage medium was flexible tape (because of its high bits/area storage density), and the cartridges were to be used for cold storage for large quantities of data. In my role, I helped with the modeling, simulation, design, and testing of different circuits on the printed circuit boards in the system (1 “mother” board, and 1 “daughter” board). Some of the key functionality implemented in circuits on the boards included signal processing, the control of H-bridge amplifiers for actuation, and the selection of appropriate components used to provide adequate power on the boards.
Jan. 2013	Research Assistant. Delft University of Technology (TU Delft), Delft, The Netherlands. For one month, I helped assemble an experimental apparatus used for Raman Spectroscopy experiments.
Dec. 2012 – Jul. 2013	Technical Staff. Andrew Richards. TechLok, LLC., Cambridge, MA. Designed hardware for a phone-paired (via Bluetooth) USB dongle which contained a variety of sensors to perform dead reckoning navigation.
Jun. 2012 – Aug. 2012	Summer Intern. Bob Clark. NetApp, Sunnyvale, CA. Investigated QSFP cables, Mini-SAS cables, & Mini-SAS HD cables. Designed and tested a QSFP to Mini-SAS adapter board. Designed a QSFP to Mini-SAS HD adapter board. Studied I2C interface and QSFP memory map.

Employment History (continued)

Jun. 2011 – Jun. 2012

Undergraduate Research Assistant. Massachusetts Institute of Technology (MIT) Microsystems Technology Laboratory (MTL), Cambridge, MA.
Using electrospraying fabrication methods to make printable MEMS/NEMS and biological sensing using single layer maskless lithography techniques at room temperature and atmospheric pressure. Investigated and fabricated electrospray imprints. Discovered how adjusting different parameters affected electrospray imprints.

Feb. 2011 – May 2011

Grader. Massachusetts Institute of Technology (MIT) Physics Department, Cambridge, MA.
I graded problem sets for "Vibrations and Waves", a sophomore-level physics course required of all physics majors at MIT.

Research Publications

Journal Articles

1

[Submitted] **Matthew Overlin**, James Macomber, Christopher Smith, Luca Daniel, Edward Corbett, James L. Kirtley Jr. "Parameter Selection for Harmonic Mitigation in Rooftop Photovoltaic Systems," in *IEEE Transactions on Power Delivery*. 2021.

2

[Accepted] **Matthew Overlin**, James Macomber, Christopher Smith, Luca Daniel, Edward Corbett, James L. Kirtley Jr. "A Hybrid Algorithm for Parameter Estimation (HAPE) for Diesel Generator Sets," in *IEEE Transactions on Energy Conversion*. 2022.

3

Matthew Overlin, Christopher Smith, James L. Kirtley Jr. "A Hybrid Algorithm for Parameter Estimation (HAPE) for Dynamic Constant Power Loads," in *IEEE Transactions on Industrial Electronics*. 2020.

4

Colm O'Rourke, Mohammad M. Qasim, **Matthew Overlin**, James Kirtley Jr., "A Geometric Interpretation of Reference Frames and Transformations: d_{QO}, Clarke and Park," *IEEE Transactions on Energy Conversion*. 2019.

Conference Proceedings

1

Xia Miao, Marija Ilic, Christopher Smith, **Matthew Overlin**, Ryan Wiechens. "Toward Distributed Control for Reconfigurable Robust Microgrids," in *IEEE Energy Conversion Congress and Exposition (ECCE)*. 2020.

2

Krishan Kant, **Matthew Overlin**, Lukasz Huchel, Mohammad Qasim, James L. Kirtley Jr.. "Self Synchronizing Controller for a Multifunctional Single Phase AC-DC-AC Converter," in *Applied Power Electronics Conference (APEC)*. 2020.

3

Matthew Overlin, Christopher Smith, Marija Ilic, James L. Kirtley Jr. "A Workflow for Non-linear Load Parameter Estimation using a Power-Hardware-in-the-Loop Experimental Testbed," in *Applied Power Electronics Conference (APEC)*. 2020.

4

Matthew Overlin, Marc Barbar, Krishnan Kant, Christopher Smith, James Kirtley Jr., "An Enhanced Time-Domain Simulator of Transient Stability in Power Systems," *IEEE PowerAfrica Conference*. 2019.

5

Matthew Overlin, Colm O'Rourke, Po-Hsu Huang, James Kirtley Jr., "A Timing Comparison of Different FPGA-Accelerated Load Flow Solvers," *IEEE Innovative Smart Grid Technologies (ISGT) Brazil*. 2019.

6

Matthew Overlin, Christopher Smith. "High Performance Computing Techniques with Power Systems Simulations," in *IEEE High Performance and Extreme Computing (HPEC)*. 2018.

Skills

Programming Languages	Matlab, Python, Julia, C/C++, Verilog (Basic), L ^A T _E X
Laboratory Skills	Soldering, Oscilloscopes, electronic test equipment, power tools
Misc.	Academic research, teaching, hiking, backpacking.

Miscellaneous Experience

Memberships

2019 Institute of Electrical and Electronics Engineers (IEEE).

References

Prof. James L. Kirtley Jr.

Professor of Electrical Engineering (Post-Tenure)
Dept. of Electrical Engineering and Computer Science (EECS)
Massachusetts Institute of Technology (MIT)
 77 Massachusetts Ave.
Cambridge, MA 02139
 kirtley@mit.edu
 +1-617-253-2357

Prof. Akintunde Akinwande

Thomas and Gerd Perkins Professor of EECS
Dept. of Electrical Engineering and Computer Science (EECS)
Massachusetts Institute of Technology (MIT)
 77 Massachusetts Ave.
Cambridge, MA 02139
 akinwand@mtl.mit.edu
 +1-617-258-7974

Joseph Kozak

Director of Engineering (Retired)
Oracle Corporation
 35 Network Drive
Burlington, MA 01803
 sdlt01@aol.com
 +1-413-210-1569

Biren Patel

Power and Energy Engineer
Power and Energy Division
Martin Defense Group
 1441 Main Street, Suite 1400
Columbia, SC 29201
 birenspatel@aol.com
 +1-309-255-9256

Prof. George K. Criner

Professor of Resource Economics and Policy
College of Natural Sciences, Forestry, and Agriculture
University of Maine
 5782 Winslow Hall, Rm 207A
Orono, ME 04469
 criner@maine.edu
 +1-207-581-3203