Emin Ucer, Ph.D.

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Professional Interests

Modeling and Simulation; Software Development; Control and Optimization; EV and Charging Technologies; Energy Management Systems; Power Electronics; Real-time HIL Simulation; Radar and Missile Systems; Aircraft Control Systems; Data Science and Machine Learning Applications; LLM Applications and AI Agents

Education

🏛 **The University of Alabama, USA**   📅 (2019 − 2022)

Ph.D. Electrical Engineering (GPA: 3.98)

Thesis Title: Data-Driven, Large-Scale, Distributed EV Charging Control Supported with Machine Learning (**Supervisor: John Kisacikoglu**)

🏛 **The University of Alabama, USA**   📅 (2017 − 2019)

MSc. Electrical Engineering (GPA: 3.98)

Thesis Title: Additive increase-multiplicative decrease control of charging rate to enable mass EV-grid integration (**Supervisor: John Kisacikoglu**)

🏛 **Hacettepe University, Turkey**   📅 (2010 − 2015)

BSc. Electrical & Electronics Engineering (GPA: 3.52 — ranked 2nd)

Professional Experience

💼 **National Renewable Energy Laboratory (NREL), Golden, CO, USA**   📅 (2022–present)

Role: Research Engineer

- Led and co-developed the EVI-EnSitePy software tool for EV charging site design, analysis, and optimization

- Led and co-developed the EVI-DiST software tool for analyzing the impact of EV charging on power distribution networks

- Developed the frontend and backend software stacks of a Site Energy Management System (SEMS) for EV charging site control and monitoring

- Devised and implemented advanced hybrid controller architectures such as model predictive control (MPC) and droop control to optimize charging site operations

- Developed real-time simulation models and executed them on hardware-in-the-loop (HIL) platforms such as OPAL-RT and SpeedGoat

- Developed high-fidelity, dynamic models for inverters, converters, charging stations, electric vehicles, energy storage systems, and PV panels

- Performed energy demand modeling and travel behavior analysis for EVs and electrified transportation fleets

- Developed real-time smart charging control systems for Level-2 AC chargers compatible with OCPP communication

- Constructed hardware testbed platforms and designed specialized panels for monitoring and data acquisition in AC charging system tests

- Led machine learning–based modeling efforts for temperature-dependent behavior of EV batteries

- Contributed to project proposal development, grant writing, and industry engagement efforts

- Mentored interns by providing technical guidance, code reviews, and support on research and development projects
- Regularly published research papers and technical reports, and participated in peer reviews for academic and technical journals

💼 **National Renewable Energy Laboratory (NREL), Golden, CO, USA** 📅 (Summer 2021)
Role: Research Intern

- Developed a smart charging algorithm using a rolling-horizon-based optimization approach for managing EV load at the NREL parking facility

💼 **The University of Alabama, Tuscaloosa, AL, USA** 📅 (2017 − 2022)
Role: Research Assistant

- Developed and implemented a data-driven, large-scale, distributed EV charging control algorithm supported with machine learning
- Designed and operated a Level 2 AC charging station and its control/power panel, featuring built-in load emulation and real-time simulator integration capabilities
- Developed a DC fast charging site design, analysis, and optimization tool in MATLAB for internal use at NREL
- Built detailed 416-node offline and real-time simulation models in Simulink, capturing power distribution system behavior down to the secondary network level
- Designed, implemented, and validated real-time HIL testbeds for bi-directional converter modules in V2V applications, developing associated controllers using dSPACE platforms
- Developed PID controllers for bi-directional converter applications
- Engineered a 0.5 mH (@ 10 kW, 20 kHz) inductor for bi-directional converters, performing comprehensive core design and precision winding and wiring
- Developed ML-based algorithms combining signal processing and classification to enable resilient operation of distributed grid-edge controllers
- Served as a teaching assistant, holding office hours for multiple courses and assisting with grading and student support activities
- Participated as a technical referee in educational robotics competitions for school-aged participants
- Presented at outreach events for school children on electric vehicles, their underlying technologies, and related university research efforts

💼 **Scientific and Technological Research Council of Turkey (TUBITAK), Turkey** 📅 (2015 − 2016)
Role: Research Engineer

- Developed software automation tools for testing, validating, and recording data from inertial measurement unit (IMU) sensors for long-range missiles
- Tested and calibrated IMU sensors and gyroscopes using multi-degree-of-freedom motion simulators
- Attended missile launch jettison tests and assisted with test coordination and execution
- Engaged in the development and production processes of fiber-optic gyroscope (FOG) systems

💼 **Military Electronic Industries (ASELSAN), Turkey** 📅 (Summer 2014)
Role: Student Intern

- Developed and implemented angle of arrival (AoA) estimation algorithms to detect and track enemy aircrafts with rotating radar platforms

💼 **Hacettepe University, Turkey** 📅 (2014 − 2015)
Role: Senior Student

- Designed, led, and coordinated the development of a smart EV charging station with smart grid communication capabilities as a senior year project

Relevant Skills

- Highly proficient in MATLAB/Simulink and Python for developing simulation models, data analysis, visualization, implementing digital controller systems, and developing optimization algorithms for physical system models
- Experienced with Python libraries including NumPy, Pandas, PyTorch, scikit-learn, Matplotlib, Plotly, Panel, and PuLP
- Skilled in computer networking, including MQTT protocol and Node-RED-based system design
- Proficient in frontend (JavaScript, React, Svelte) and backend (Flask, FastAPI) web application development
- Hands-on experience with real-time simulators and controllers such as OPAL-RT, Speedgoat, dSPACE, and Typhoon HIL
- Proficient in LaTeX for technical writing and documentation
- Working knowledge of R for statistical analysis and data visualization
- Intermediate skills in C and C++ for systems and embedded programming
- Familiar with EVSE technologies and the OCPP communication protocol
- Skilled in circuit simulation using LTspice
- Experienced in Linux systems, virtual machines, and Bash scripting for development and automation
- Familiar with cloud computing environments and deployment workflows
- Proficient with GitHub for version control, code review, issue tracking, and collaborative development
- Experienced in industry-academic collaborative projects, including proposal development and grant writing
- Strong background in advanced data analysis and exploration techniques for engineering applications

Academic Services

Reviewed for

- IEEE Transactions on Vehicular Technology
- IEEE Systems Journal
- IEEE Transactions on Industry Applications
- IEEE Transactions on Transportation Electrification
- IEEE Applied Power Electronics Conference (APEC)
- IEEE Energy Conversion Congress and Expo (ECCE)

Awards and Honors

2021-2022	UA Cyber Initiative Award (\$ 27,235)
2020-2021	Graduate Council Fellowship, *The University of Alabama*
2019	Best of the Best Paper Prize Award at IEEE PES GM (Link)
2018-2022	NSF Funding Award under CRII: CPS Program (\$ 175,000)
2017	NREL Grant For EV Charging Station Design and Analysis Tool (\$ 35,201)
2017	Graduate Teaching Assistantship, *The University of Alabama*
2017	Graduate Research Assistantship, *The University of Alabama*
2015	2nd Best Place Among Graduates, *Hacettepe University*
2015	2nd Best Project Award, Senior Design Project Exhibition, *Hacettepe University*
2015	Invited Poster Presentation at The Chamber of Electrical Engineers (EMO) Senior Design Project
2015	Interviewed by Daily Haberturk Newspaper for the Smart EV Charging Station Project
2014	TUBITAK Senior Project Award (\$ 2,000)
2010-2011	Honor List in the EEE Department, *Hacettepe University*
2010	Ranked in the top 0.5% nationally in a competitive university entrance exam

Professional Affiliations

- Institute of Electrical and Electronics Engineers   📅 (2017 − present)
- National Renewable Energy Laboratory   📅 (2022 − present)
- The University of Alabama   📅 (2017 − 2022)
- Scientific and Technological Research Council of Turkey (TUBITAK)   📅 (2015 − 2016)
- Military Electronic Industries (ASELSAN)   📅 (Summer 2014)
- Hacettepe University   📅 (2010 − 2015)

Referees

Dr. John Kisacikoglu
Doctoral thesis supervisor

✉ john.kisacikoglu@nrel.gov

📞 –

🏢 Chief Engineer, EV Charging Group, NREL

Alex Schroeder
Group Manager

✉ alex.schroder@nrel.gov

📞 –

🏢 Group Manager, EV Charging Group, NREL

Dr. Ali Gurbuz
Research supervisor

✉ aligurbuz@ncsu.edu

📞 –

🏢 Associate Professor, Electrical & Computer Engineering Dept., North Carolina State University

Citation Indices as of June 2025 (Google Scholar)

- **Total citations:** 417
- **h-index:** 11
- **i10-index:** 11
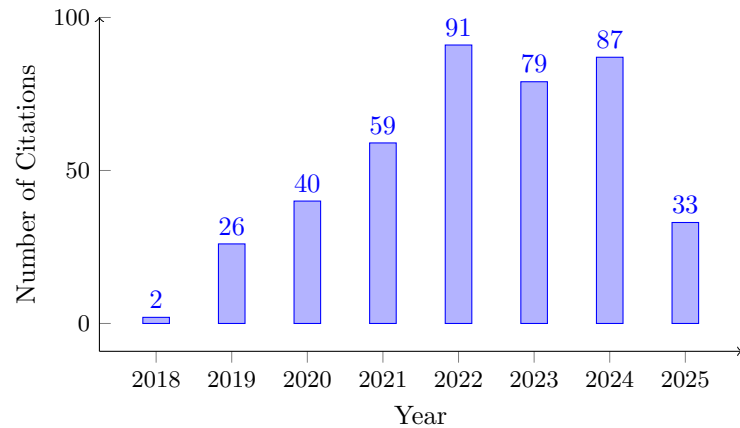
Journal Publications

Refereed Journal Publications

2025   **1.** Khan, M. S. U., Thurlbeck, A., Watt, E., Kisacikoglu, M. J., **Ucer, E.**, Meintz, A., Mahmud, R., "Development and experimental validation of a high-power dc distribution testbed for advanced charging infrastructure and energy management," *IEEE Transactions on Industry Applications*, 2025.

2024   **2. Ucer, E.**, Kisacikoglu, M. J., "Development of a hardware-in-the-loop testbed for a decentralized, data-driven electric vehicle charging control algorithm," *IEEE Transactions on Industry Applications*, 2024.

2021   **3. Ucer, E.**, Buckreus, R., Haque, M. E., Kisacikoglu, M., Sozer, Y., Harasis, S., Guven, M., Giubbolini, L., "Analysis, design, and comparison of v2v chargers for flexible grid integration," *IEEE Transactions on Industry Applications*, vol. 57, no. 4, pp. 4143–4154, 2021.

2020	**4. Ucer, E.**, Kisacikoglu, M. C., Yuksel, M., "Decentralized additive increase and multiplicative decrease-based electric vehicle charging," *IEEE Systems Journal*, vol. 15, no. 3, pp. 4272–4280, 2020.
2019	**5. Ucer, E.**, Kisacikoglu, M. C., Yuksel, M., Gurbuz, A. C., "An internet-inspired proportional fair ev charging control method," *IEEE Systems Journal*, vol. 13, no. 4, pp. 4292–4302, 2019.
	6. Ucer, E., Koyuncu, I., Kisacikoglu, M. C., Yavuz, M., Meintz, A., Rames, C., "Modeling and analysis of a fast charging station and evaluation of service quality for electric vehicles," *IEEE Transactions on Transportation Electrification*, vol. 5, no. 1, pp. 215–225, 2019.

Conference Publications

Refereed Conference Proceedings

2024	**7.** Jackson, D., **Ucer, E.**, Kisacikoglu, M. J., Thurlbeck, A., "A comparison of ac and dc distribution architectures for electric vehicle high power charging facilities," in *2024 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2024, pp. 2013–2019.
	8. Ucer, E., Pawaskar, V., Jackson, D., Thurlbeck, A., Watt, E., Kisacikoglu, M. J., "Hybrid energy management with real-time control of a high-power ev charging site," in *2024 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2024, pp. 1105–1111.
2023	**9.** Khan, M. S. U., Watt, E., Thurlbeck, A., **Ucer, E.**, Mahmud, R., Kisacikoglu, M. J., Meintz, A., "Development of a dc distribution testbed for high-power ev charging," in *2023 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2023, pp. 1589–1596.
	10. Ucer, E., Thurlbeck, A., Watt, E., Khan, M. S. U., Kisacikoglu, M. J., Meintz, A., "Controller hardware-in-the-loop modeling and operation of a high-power dc charging hub," in *2023 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2023, pp. 1961–1967.
2022	**11.** Flack, C., **Ucer, E.**, Smith, C. P., Kisacikoglu, M., "Controller hardware-in-the-loop (c-hil) testing of decentralized ev-grid integration," in *2022 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2022, pp. 01–05.
	12. Ucer, E., Kisacikoglu, M., "Data-driven distributed control to scale ev integration into power grid," in *2022 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2022, pp. 1–5.
	13. Ucer, E., Kisacikoglu, M. J., "Design and implementation of a hardware test-bed for real-time ev-grid integration analysis," in *2022 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2022, pp. 1–8.
	14. Ucer, E., Kurtoglu, E., Kisacikoglu, M., Gurbuz, A. C., Gurbuz, S. Z., "Local detection of oltc operation to support decentralized control of active end-nodes," in *2022 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2022, pp. 1–5.
2021	**15.** Rahman, S., **Ucer, E.**, Kisacikoglu, M., "Impact of high-level controller actions on local active end-nodes in a distribution grid," in *2021 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT)*, IEEE, 2021, pp. 1–5.
2020	**16. Ucer, E.**, Kisacikoglu, M., Gurbuz, A., Rahman, S., Yuksel, M., "A machine learning approach for understanding power distribution system congestion," in *2020 IEEE Energy Conversion Congress and Exposition (ECCE)*, IEEE, 2020, pp. 1977–1983.
2019	**17. Ucer, E.**, Buckreus, R., Kisacikoglu, M. C., Bulut, E., Guven, M., Sozer, Y., Giubbolini, L., "A flexible v2v charger as a new layer of vehicle-grid integration framework," in *2019 IEEE Transportation Electrification Conference and Expo (ITEC)*, IEEE, 2019, pp. 1–7.

18. Ucer, E., Erdogan, N., Rahman, S., Kisacikoglu, M. C., "Real-time simulation of ev grid integration with internet-inspired charging control," 2019.

19. Ucer, E., Kisacikoglu, M. C., Yuksel, M., "Analysis of aimd algorithm for ev charging," in *Proceedings of the Tenth ACM International Conference on Future Energy Systems*, 2019, pp. 436–438.

20. Ucer, E., Rahman, S., McDonald, A., Kisacikoglu, M. C., "Residential active/reactive power consumption, voltage, and frequency data for a house in alabama," 2019.

21. Wang, J., **Ucer, E. Y.**, Paudyal, S., Kisacikoglu, M. C., Khan, M. A., "Distribution grid voltage support with four quadrant control of electric vehicle chargers," in *2019 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2019, pp. 1–5.

2018   **22. Ucer, E.**, Kisacikoglu, M., Yuksel, M., "Analysis of an internet-inspired ev charging network in a distribution grid," in *2018 IEEE/PES Transmission and Distribution Conference and Exposition (T&D)*, IEEE, 2018, pp. 1–5.

23. Ucer, E., Kisacikoglu, M. C., Gurbuz, A. C., "Learning ev integration impact on a low voltage distribution grid," in *2018 IEEE Power & Energy Society General Meeting (PESGM)*, IEEE, 2018, pp. 1–5.

24. Ucer, E. Y., Kisacikoglu, M. C., Erden, F., Meintz, A., Rames, C., "Development of a dc fast charging station model for use with ev infrastructure projection tool," in *2018 IEEE Transportation Electrification Conference and Expo (ITEC)*, IEEE, 2018, pp. 904–909.

Other Publications and Presentations

2024   **25.** Kisacikoglu, M. J., Harper, J. D., Kandula, R. P., Thurlbeck, A. P., Ali, A. S., **Ucer, E.**, Watt, E., Khan, M. S. U., Mahmud, R., "High-power electric vehicle charging hub integration platform (echip): Design guidelines and specifications for dc distribution-based charging hub," National Renewable Energy Laboratory (NREL), Golden, CO (United States), Tech. Rep., 2024.

26. Meintz, A., Kisacikoglu, J., Kogalur, N., Carlson, B., **Ucer, E.**, Thurlbeck, A., "Nov. 2024 EVs@ Scale High-Power Charging Deep Dive Technical Meeting," National Renewable Energy Laboratory (NREL), Golden, CO (United States), Tech. Rep., 2024.

2023   **27.** Meintz, A., Slezak, L., Thurston, S., Carlson, B., Thurlbeck, A., Kisacikoglu, J., Kandula, P., Rowden, B., Chinthavali, M., Wojda, R., "Electric vehicles at scale (evs@ scale) laboratory consortium deep-dive technical meetings: High power charging (hpc) summary report," National Renewable Energy Laboratory (NREL), Golden, CO (United States), Tech. Rep., 2023.

2022   **28. Ucer, E.**, "Data-driven, large-scale, distributed ev charging control supported with machine learning," Ph.D. dissertation, The University of Alabama, 2022.

2019   **29. Ucer, E. Y.**, "Additive increase-multiplicative decrease control of charging rate to enable mass ev-grid integration," M.S. thesis, The University of Alabama, 2019.