Francesca Giardine

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Education

University of California, Berkeley — Berkeley, CA
Doctor of Philosophy in Electrical Engineering and Computer Sciences — *Aug. 2020 – May 2026*
Advised by Professor Robert Pilawa-Podgurski

Smith College — Northampton, MA
Bachelor of Science in Engineering Science & Mathematics and Statistics — *Aug. 2016 – May 2020*
Summa Cum Laude

Honors and Awards

Fellowships

National Science Foundation Graduate Research Fellowship — *Sept. 2022 - Sept. 2025*
- Tuition and stipend for 3 years of graduate study in STEM.

Hearts to Humanity Eternal Graduate Research Grant — *Sept. 2023 - Sept. 2024*
- $10,000 grant for independent research.

Berkeley EECS Department Fellowship — *Aug. 2020*
- Semester-long fellowship for select incoming students.

Recognitions

Rising Stars in EECS — *October 2025*
- Selective 2-day program organized by MIT and Boston University to provide preparation for junior faculty positions.

WiscProf Future Faculty Program Participant — *May 2025*
- Selective 4-day program sponsored by the University of Wisconsin, Madison providing training for faculty positions in academia.

Best Paper Award, ECCE Europe 2024 — *September 2024*
- Awarded to 10 of 300 papers presented at ECCE Europe for paper [C4].

NextProf Nexus Future Faculty Program Participant — *August 2024*
- Selective program sponsored by the University of Michigan, UC Berkeley, and Georgia Tech giving participants the opportunity to explore and prepare for a faculty position in academia.

Adeline Devor Penberthy, Class of 1945, Memorial Prize — *May 2020*
- Awarded to an undergraduate engineering major for academic excellence in engineering and outstanding contributions toward building a community of learners within the Smith College Picker Engineering Program.

Honor Societies

Phi Beta Kappa Honor Society — *May 2020*
Tau Beta Kappa Engineering Honor Society — *October 2018*
Mu Sigma Rho Statistics Honor Society — *May 2020*
Sigma Xi Research Honor Society — *May 2020*

Research Experience

Pilawa Research Group *Aug. 2020 - Present*
University of California, Berkeley *Berkeley, CA*

- Developed and validated model of electromagnetic interference in multilevel power converters.
- Formulated control technique to improve efficiency and electromagnetic interference of flying capacitor multilevel inverters.
- Simulated and designed advanced hybrid switched-capacitor converters for use in DC-AC grid-connected systems.

Power Electronic Device Characterization Internship *June 2023 - Aug. 2023*
National Renewable Energy Laboratory *Golden, CO*

- Designed a test setup for switch characterization for power electronics.
- Performed simulation, printed circuit board layout, and investigated advanced sensing techniques to achieve high-bandwidth performance.

Researcher in the Renewable and Appropriate Energy Lab *July 2020 - Aug. 2020*
University of California, Berkeley *Berkeley, CA*

- Extended research beginning in the SUPERB REU under Professor Daniel Kammen in the Energy Resources Group.
- Performed statistical and spatial analyses in Python and GIS to isolate candidate communities for microgrid development

SUPERB Research Experience for Undergraduates *June 2019 - Aug. 2019*
University of California, Berkeley *Berkeley, CA*

- Analyzed geospatial data in RStudio and GIS to classify community types in California with emphasis on environmental predictors.
- Selected as the sole student from the SUPERB REU to present research at NSF REU Research Symposium in Alexandria, VA, in October 2019.

Capstone to Work Research Team *Sept. 2018 - May 2020*
Smith College *Northampton, MA*

- Reviewed qualitative and quantitative data from a large pool of first year engineering employees to analyze the impacts of the engineering capstone experiences on employment after college.

Publications

Refereed Conference Papers

[**C11**] Y. Zhao*, J. Armstrong*, **F. Giardine**, and R. C. N. Pilawa-Podgurski, "A High-Performance 6-Level Flying Capacitor Multilevel Totem-Pole Bidirectional DC-AC Converter for Single-Phase Systems," in *2026 IEEE Applied Power Electronics Conference and Exposition (APEC)*, [To Appear], 2026.

[**C10**] S. Krishnan, **F. Giardine**, T. Mahbub, L. Horowitz, and R. C. N. Pilawa-Podgurski, "High-Performance Flying Capacitor Multilevel Dual Active Bridge DC-DC Converter for Isolated Automotive Systems," in *2026 IEEE Applied Power Electronics Conference and Exposition (APEC)*, [To Appear], 2026.

[**C9**] **F. Giardine**, S. Krishnan, M. Nerenberg*, and R. C. N. Pilawa-Podgurski, "An Analytical Model for Common-Mode EMI in Flying Capacitor Multilevel Converters," in *2025 IEEE 26th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2025, pp. 1–7. DOI: 10.1109/COMPEL57166.2025.11121281.

[**C8**] E. Krause, N. Biesterfeld, **F. Giardine**, and R. C. N. Pilawa-Podgurski, "Analysis of Steady-State Balancing in the Flying Capacitor Multilevel Converter Considering Capacitor Voltage Ripple," in *2025 IEEE 26th Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2025, pp. 1–8. DOI: 10.1109/COMPEL57166.2025.11121246.

[**C7**] S. Krishnan, **F. Giardine**, J. Zou, R. A. Abramson, and R. C. N. Pilawa-Podgurski, "Design and Implementation of a GaN-Based, Cascaded Isolated DC-DC Converter for Satellite Applications," in *2025 IEEE/AIAA Transportation Electrification Conference and Electric Aircraft Technologies Symposium (ITEC+EATS)*, 2025, pp. 1–6. DOI: 10.1109/ITEC63604.2025.11097988.

[**C6**] **F. Giardine**, S. Krishnan, L. Horowitz, and R. C. N. Pilawa-Podgurski, "A Variable Frequency Technique for EMI and Efficiency Improvements in High-Level Count Flying Capacitor Multilevel Converters," in *2025 IEEE Applied Power Electronics Conference and Exposition (APEC)*, 2025, pp. 151–156. DOI: 10.1109/APEC48143.2025.10977102.

[**C5**] **F. Giardine**, Y. Wu, and R. C. N. Pilawa-Podgurski, "A Variable Switching Frequency Control Technique for DC-AC Flying Capacitor Multilevel Converters to Improve Efficiency and Inductor Utilization," in *2024 IEEE Energy Conversion Congress and Exposition (ECCE)*, 2024, pp. 3473–3478. DOI: 10.1109/ECCE55643.2024.10861273.

[**C4**] **F. Giardine**, K. Fernandez, and R. C. N. Pilawa-Podgurski, "A Two-Stage Non-Isolated Hybrid Switched-Capacitor Microinverter Utilizing a Fixed-Ratio Resonant DC-DC Stage with Startup Functionality and Flying Capacitor Multilevel DC-AC Stage," in *2024 Energy Conversion Congress & Expo Europe (ECCE Europe)*, [Best Paper Award], 2024, pp. 1–7. DOI: 10.1109/ECCEEurope62508.2024.10752033.

[**C3**] **F. Giardine**, N. C. Brooks, K. Fernandez, and R. C. Pilawa-Podgurski, "Utilizing Harmonic Injection to Reduce Energy Storage and Required Capacitance in an Active Series-Stacked Energy Buffer for Single-Phase Systems," in *2022 IEEE 23rd Workshop on Control and Modeling for Power Electronics (COMPEL)*, 2022, pp. 1–7. DOI: 10.1109/COMPEL53829.2022.9829980.

[**C2**] C. Gerwitz, **F. Giardine**, R. Ott, and A. Kary, "Women's Unique Challenges in the Transitions to Engineering Work," in *2020 ASEE Annual Conference & Exposition*, 2020.

[**C1**] S. Howe, M. Paretti, R. Ott, J. Deters, C. Gerwitz, **F. Giardine**, C. Hernandez, and A. Kary, "Women's Experiences in the Transition from Capstone Design Courses to Engineering Workplaces," in *2019 ASEE Annual Conference & Exposition*, 2019. DOI: 20.500.12592/23pjcnp.

Journal Papers

[**J4**] **F. Giardine**, S. Krishnan, Y. Wu, L. Horowitz, and R. C. N. Pilawa-Podgurski, "A Variable Frequency Technique for EMI and Efficiency Improvements in High-Level Count Flying Capacitor Multilevel Converters," *IEEE Open Journal of Power Electronics*, [Accepted].

[**J3**] N. C. Brooks, **F. Giardine**, and R. C. N. Pilawa-Podgurski, "DC-Link Capacitors for Twice-Line Frequency Power Decoupling: Design-Oriented Figures-of-Merit With Empirical Application," *IEEE Transactions on Power Electronics*, vol. 39, no. 6, pp. 6569–6573, 2024. DOI: 10.1109/TPEL.2023.3305153.

[**J2**] **F. Giardine**, S. Krishnan, M. Nerenberg*, and R. C. N. Pilawa-Podgurski, "An Analytical Model for Common-Mode EMI in Flying Capacitor Multilevel Converters," [In Preparation].

[**J1**] J. Ford, M. Paretti, D. Kotys-Schwartz, S. Howe, C. Gerwitz, J. Deters, T. Mahmud, R. Ott, N. Alvarez, D. Knight, C. Hernandez, L. Rosenbauer, A. Kary, and **F. Giardine**, "Transitioning from Capstone Design Courses to Workplaces: A Study of New Engineers' First Three Months," *International Journal of Engineering Education*, 2019.

*denotes undergraduate student

Teaching

University of California, Berkeley EECS

EE 108: Introduction to Electric Power and Renewable Energy — *Spring 2024, Spring 2025*

Certificate in Teaching and Learning in Higher Education — *Expected, Fall 2025*

Smith College

Engineering Master Tutor — *Spring 2019 - Spring 2020*

General Quantitative Tutor — *Fall 2018*

Mentoring

Research Mentor — *Fall 2024 - Present*

University of California, Berkeley — *Berkeley, CA*

- Mentored four undergraduate students on research projects. Guided project scoping, and met on a weekly basis with each student.
- Students have worked on a bidirectional dc-ac converter [**C11**], a resonant flying capacitor multilevel inverter, and on building safety enclosures for HV testing.

Service and Leadership

University of California, Berkeley

Berkeley EECS Graduate Admissions Student Reader — *2023, 2024*

IEEE Power and Energy Society — *Jan. 2022 - Present*

- 2023 Chair
- 2022 Vice Chair

EECS Graduate Student Association Committee Member — *Sept. 2021 - Sept. 2022*

Smith College

Tau Beta Kappa Engineering Honor Society (Co-President) — *Sept. 2019 - May 2020*

Writing and Public Discourse Committee Student Liaison — *Sept. 2018 - May 2020*

Outdoor Orientation Leader — *Fall 2019*