

Debjyoti Chatterjee

Ph.D. student, UT Austin

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Summary

Power electronics and systems researcher with a focus on modeling and control of grid-forming inverters for renewable energy integration. Passionate about clean energy transition, grid modernization, and decarbonization.

Education

Ph.D. in Electrical and Computer Engineering

Expected Dec. 2025

The University of Texas at Austin, TX

🔗 Power Electronics and Systems Group

Advisor: Dr. Brian Johnson, GPA: 3.87/4.0

M.S. in Electrical and Computer Engineering

Dec. 2022

The University of Texas at Austin, TX

🔗 From grid-following to grid-forming: Modeling, control, and applications to inverter-based resources

Advisor: Dr. Surya Santoso, GPA: 3.92/4.0

B. Tech. (Hons.) in Electrical and Electronics Engineering

May 2020

National Institute of Technology, Tiruchirappalli, India

First Class with Distinction, GPA: 4.0/4.0

🔗 Protection Scheme for Microgrid: Relay Coordination Using Convex Optimization

Areas of Interest

- Modeling and control of grid-forming converters
- Micro-grid design, operation, and protection
- Fault ride-through of grid-forming converters
- Stability and control of low inertia power system
- Cascaded multilevel converters
- Interoperability of multiple inverters

Skills

- Software and Tools: MATLAB/Simulink, PLECS, LTspice, Altium, PSCAD, PSSE, OpenDSS, EMTP
- Programming Languages: Python, C, Embedded C
- Microcontrollers: TI C2000 Family (Piccolo and Delfino series) with Code Composer Studio (CCS)

Graduate Research Experience

Graduate Research Assistant, UT Austin

Jan 2021-Present

Project 1: Fault Ride Through of Grid-forming (GFM) Inverters

- Performed simulations in grid-connected and islanded microgrids, evaluating the steady-state and transient response of GFM inverters against synchronous generators under balanced and unbalanced faults 🔗
- Integrated direct, indirect, and hybrid current limiters into GFM inverters with single- and multi-loop controls

Project 2: Interoperability of GFM inverters with Different Primary Controllers

- Built a test system with multiple 5 kW, 208 V three-phase GFM inverters in parallel, equipped with droop, dispatchable virtual oscillator, and virtual synchronous machine-based ac-side power-sharing controllers
- Successfully demonstrated interoperability and effective power sharing among parallel-connected converters

Project 3: Voltage Balancing of GFM Inverters in Unbalanced Microgrid

- Estimated required sequence currents for supporting balanced load voltage in an unbalanced grid [🔗](#)
- Demonstrated that a 3-wire GFM inverter with decoupled positive- and negative-sequence controllers and a grounding transformer can replicate the voltage balancing capabilities of an ideal voltage source

Project 4: Bi-directional Control of Converters in a Hybrid AC-DC Grid

- Proposed modified droop controller for the bidirectional converter that links the independent AC and DC sub-grids, facilitating effective power-sharing under contingency and contributing to grid reliability [🔗](#)
- Developed an optimization-driven control to ensure precise power sharing and loss minimization

Research Internship Projects

Undergraduate Research Intern, NIT Tiruchirappalli, India

Jan-July 2020

Project: Protection Scheme for Renewable-dominated Converter-interfaced Weak Power Grid

- Developed an optimal protection scheme for a 9-bus microgrid with different fault types and operating modes
- Proposed a streamlined relay coordination approach, using convexified linear programming [🔗](#)

Visiting Research Scholar, The University of Waterloo, Canada

May-Aug 2019

Project: Modeling and Performance Analysis of Synchro-Converter-Based Hybrid AC-DC Microgrid

- Implemented a synchro-converter controller for improved dynamic performance in hybrid microgrids [🔗](#)
- Verified transient performance enhancements in response to disturbances compared to voltage source converters

Summer Research Fellow, IIT Bombay, India

May-Aug 2018

Project: Modeling and Control of DFIG-based Variable Speed Wind Turbine Using Vector Control Method

- Explored four types of wind turbine operation and modeled type III (DFIG) wind turbine in Simulink [🔗](#)
- Designed controller for the bi-directional converter, enabling decoupled active and reactive power control

Professional Experience

Technical Power Consulting Intern (Transmission)

May-Aug 2022

Hitachi Energy, Raleigh, NC

- Conducted generation interconnection studies: power flow, fault study, and contingency analysis using PSS/E
- Synthesized high-resolution (1-second) PV irradiance data to improve microgrid frequency stability study
- Performed transmission routing study in QGIS and introduced a metric to rank the possible transmission routes

Publications

[🔗](#) **D. Chatterjee, N. Barry, and S. Santoso.** *Power Flow Control Through a Bidirectional Converter Under Contingency in a Hybrid Grid*, under review for 2024 IEEE PESGM, Seattle, WA, 2024.

[🔗](#) **D. Chatterjee, N. Barry, and S. Santoso.** *Improved Power Sharing and Loss Mitigation in a Hybrid AC-DC Residential Grid*, under review for 2024 IEEE PESGM, Seattle, WA, 2024.

[🔗](#) **D. Chatterjee, N. Barry, T. Kim, W. Kim, and S. Santoso.** *Voltage Balancing of Grid-Forming Inverters in Unbalanced, Islanded Microgrids* in 2023 IEEE PESGM, Orlando, FL, 2023.

[🔗](#) **P. Siratarnsophon, W. Kim, N. Barry, D. Chatterjee, and S. Santoso.** *Optimal Power Flow for Unbalanced Three-Phase Microgrids Using an Interior Point Optimizer*, *Energies* 2024, 17, 32.

[🔗](#) **B. Mallikarjuna, D. Chatterjee, M.J.B Reddy, and D.K. Mohanta.** *Real-Time Wide-Area Disturbance Monitoring and Protection Methodology for EHV Transmission lines*, INAE letters (Springer publication), Vol. 3, no. 2, pp 87-106, June 2018.

N. Baeckeland*, **D. Chatterjee***, **M. Lu**, **B. Johnson**, and **G-S. Seo**. *Overcurrent Limiting in Grid-Forming Inverters: A Holistic Review and Discussion*, in preparation for IEEE Transactions in Power Electronics.
[*: co-first authors]

Relevant Coursework

Fundamentals of Power Electronics, Power Electronics and Control, Power System Analysis with Renewable Energy Sources, Energy System Optimization, Power System Operation and Control, Power System Analysis, Power Quality, Introduction to Machine Learning, Linear Programming, Renewable Energy Technology

Teaching Experience

Power Quality and Harmonics (Graduate Level Course) **Aug-Dec 2022**
Power System Apparatus and Lab (Graduate Level Course) **Jan-May 2022**

Honors and Awards

MIT Media Lab's NextGen Fellow, MIT, Cambridge, MA **Oct 2023**
George J. Heuer, Jr. Ph.D. Endowed Graduate Fellowship, UT Austin **July 2023**
Professional Development Award, UT Austin **May 2023**
Wilson-Tayabali Family Fellowship and Jordan Baruch Fellowship, UT Austin **Jan 2023**
Charles M. Simmons Endowed Presidential Fellowship in Engineering, UT Austin **Jan 2021**
Energy Impact Scholarship, EIT InnoEnergy **Jan 2020**
Institute Day Academic Excellence Award, NIT Tiruchirappalli, India **Feb 2019**
MITACS Globalink Research Fellowship, Govt. of Canada **Jan 2019**
Rambhadran Narayan Alumni Award, NIT Tiruchirappalli, India **May 2018**
Summer Research Fellowship (SRF), Indian Academy of Sciences (IAS) **May 2018**
Mamraj Agarwal National Award, Office of the Governor, West Bengal, India **Aug 2016**
All State Rank-4 in West Bengal Higher Secondary Examination among 0.8 million candidates **June 2016**
Kishore Vigyanik Prosthana Yogona, Department of Science and Technology, Govt. of India **Jan 2015**
All State Rank-8 in National Talent Search Examination (NTSE) **Jan 2014**

Services and Leadership Roles

Reviewer, IEEE PESGM, ECCE, COMPEL, Springer Journal of Power Electronics **2023-2024**
TEX-E Energy Innovation Fellow, Martin Trust Center for MIT Entrepreneurship **2023-2024**
Student Advisory Council, The Kay Bailey Hutchison Energy Center, Austin **2023-2024**
President, Longhorn Energy Club (LEC), UT Austin **2023-2024**
Graduate Peer Mentor, ECE Partner Program, UT Austin **2022-2024**
Delegate, Harvard Project for Asian and International Relations (HAPAIR) **2020-2021**

References

Dr. Brian Johnson

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The University of Texas at Austin

Dr. Surya Santoso

Professor, Department of ECE
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