

SUNIL SUBEDI

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SUMMARY STATEMENT

A Ph.D. candidate in electric power engineering with three and half years research experience at South Dakota State University and National Renewable Energy Laboratory working on analysis, design, and control of power electronic converters, and dynamic modeling and simulation of converter-dominated power systems. Demonstrated experience using various programming language and exposure to the power systems modeling and simulation tools.

SKILLS & KNOWLEDGE

Programming/scripting language: Python, MATLAB, R, C++

Library/API: Numpy, Scipy, Pandas, Matplotlib, Seaborn, CasADi, OpenMP, MPI, CUDA

Software/Tools: Simulink, OPAL-RT, HELICS, PSS/E, Git, LaTeX, MATPOWER, GridLAB-D, OpenDSS, RT-LAB, PSIM, LTSPICE, PowerWorld

EXPERIENCE

- **Graduate III-Electrical Engineer Intern, NREL, CO, USA** (May 2022 - Dec. 2022)
 - ★ Assessed the technical potential and analyzed the cost-benefit of the installation of grid-supportive loads for fast frequency response [C1]
 - ★ Worked on a PSS/E model of the reduced 240-bus WECC test system and high IBR penetration scenarios
- **Graduate Research Assistant, SDSU, USA** (Aug. 2019 - present)
 - ★ Designed a data-driven partitioned modeling approach and developed a comprehensive simulation framework to reduce computational complexity and simulation time for converter-dominated power systems [J2,C4]
 - ★ Developed and examined low-level probing signals using a real-time digital simulator driven power amplifier to perturb power electronic converters for model parameter estimation [C5]
 - ★ Formulated a system identification algorithm using the least square method in both Python and MATLAB to model the dynamics of a power electronic converter with advanced grid support functionality
 - ★ Reviewed methods to accelerate electromagnetic transient simulation of power systems [J1]
 - ★ Compared the impact of different PLLs on data-driven modeling of grid-connected single-phase inverters [C2]
- **Microgrid Laboratory, SDSU, USA** (Aug. 2019 -present)
 - ★ Applied data-driven modeling of grid-connected SMA inverters using a Puissance Plus power amplifier unit and Opal-RT real-time simulator system [C3]
 - ★ Evaluated grid support functions in Fronius Symo inverter using a hardware-in-the-loop testbed [C6]
- **Intern Electrical Engineer, Nepal Electricity Authority (NEA), Nepal** (Oct. 2018 - Apr. 2019)
 - ★ Assisted distribution system fault analysis for residential and industrial regions

EDUCATION

- **Ph.D. in Electrical Engineering (GPA: 4/4), SDSU, USA** (Expected Graduation: Summer, 2023)
 - ★ **Advisor:** Dr. Timothy M. Hansen, Associate Professor, SDSU
 - ★ **Dissertation Topic:** Computationally efficient statistical modeling of inverter with grid support functions to access the dynamic response of converter dominated power system
 - ★ **Relevant Coursework:** Advanced Power Electronics, Advanced Power Systems, High-Performance Computing, Applied Bayesian Statistics, Modern Applied Statistics II, Compute Data Analysis in Power Systems
 - ★ **Course Projects:**
 - ★ Analyzed data-driven modeling of a grid-connected PV system *MATLAB/Simulink, Python*
 - ★ Parallelized high-performance linear algebra *C, OpenMP, MPI, CUDA*
 - ★ Formulated supervised and unsupervised learning algorithms *R, Python*
 - ★ HELICS co-simulation for fast frequency support in isolated microgrid system *Python*
 - ★ Grid efficient building energy co-simulation modeling and control *HELICS, Python, OpenModelica*

- **BE in Electrical Engineering, Tribhuvan University, Nepal** (2014 - 2018)
 - ★ **Relevant Coursework:** Power System Analysis, Control Systems and Theory, Transmission and Distribution Design, Power Electronics, Switchgear and Protection, FACT devices, High Voltage Engineering
 - ★ **Thesis Title:** Hardware Fabrication of Smart Energy Meter for Demand Side Management
 - ★ **Undergraduate Research Project:**
Designed a smart energy billing meter system for residential building *C, C++, Arduino UNO*

AFFILIATIONS

- Reviewer, IEEE Power & Energy Society (Dec. 2021 - current)
- Reviewer, IEEE Access (Mar. 2021 - current)
- Reviewer, IEEE Systems Journal (June 2021 - current)
- Reviewer, IEEE Transactions on Sustainable Energy (Feb. 2021 - current)
- Reviewer, Sustainable Computing: Informatics and Systems (SUSCOM) (Feb. 2021 - current)
- Graduate Student Member, IEEE/ IEEE PES (Sep. 2019 - current)

PROFESSIONAL DEVELOPMENT AND LEADERSHIP EXPERIENCE

- **Event Manager, Child Education Nepal (CEN) UK, Nepal** (May 2018)
 - ★ Coordinated an eight-person team to help underprivileged children in western Nepal, which included school upgrades and the establishment of an e-library that serviced 400 students in the community
- **Graduate Teaching Assistant, SDSU, SD, USA** (Aug. 2019 - May 2020)
 - ★ Supervised lab works on Basic Electrical Engineering and Electronics-II, graded lab reports and assignments
- **Discovery Center Science Communication Fellow, SD EPSCoR, SD, USA** (Apr. 2021)
 - ★ Developed a hands-on experiment on PV systems and demonstrated to a general audience at Discovery Center

PUBLICATIONS

Journal Paper

- J1. **S. Subedi**, M. Rauniyar, S. Ishaq, T. M. Hansen, R. Tonkoski, M. Shirazi, R. Wies, and P. Cicilio, "Review of Methods to Accelerate Electromagnetic Transient Simulation of Power Systems," *IEEE Access*, vol. 9, 17 pages, June 2021.
- J2. **S. Subedi**, B. Poudel, P. Aslami, R. Fournay, H. M. Rekabdarkolaee, R. Tonkoski, and T. M. Hansen, "Automated Data-Driven Model Extraction and Validation of Inverter Dynamics with Grid Support Functions," *ELSEVIER e-Prime - Special Issue*. (Submitted).

Conference Papers

- C1. **S. Subedi**, M. Blonsky, Y. Son, and B. Mather, "Benefit and Cost Analysis of Grid-Supportive Loads for Fast Frequency Response," in *IEEE PES Grid Edge Technologies Conference and Exposition 2023*, San Diego, CA, 5 pages, July 2022. (Accepted)
- C2. **S. Subedi**, R. Fournay, H. M. Rekabdarkolaee, R. Tonkoski, T. M. Hansen, J. D. Vasquez-Plaza, and F. Andrade, "Impact of PLL design on data-driven models for grid-connected single-phase inverters," in 2022 International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), 2022, pp. 930–935.
- C3. N. Guruwacharya, H. Bhandari, **S. Subedi**, J. D. Vasquez-Plaza, M. L. Stoel, U. Tamrakar, F. Wilches-Bernal, F. Andrade, T. M. Hansen, and R. Tonkoski, "Data-driven modeling of commercial photovoltaic inverter dynamics using power hardware-in-the-loop," in 2022 International Symposium on Power Electronics, Electrical Drives, Automation and Motion (SPEEDAM), 2022, pp. 924–929.
- C4. **S. Subedi**, N. Guruwacharya, R. Fournay, H. M. Rekabdarkolaee, R. Tonkoski, T. M. Hansen, U. Tamrakar, and P. Cicilio, "Computationally Efficient Partitioned Modeling of Inverter Dynamics with Grid Support Functions," in *47th Annual Conference of the IEEE Industrial Electronics Society (IECON'21)*, Toronto, ON, 6 pages, Nov. 2021.
- C5. M. Rauniyar, S. Berg, **S. Subedi**, T. M. Hansen, R. Fournay, R. Tonkoski, and U. Tamrakar, "Evaluation of Probing Signals for Implementing Moving Horizon Inertia Estimation in Microgrids," in *52nd North American Power Symposium (NAPS'20)*, Tempe, AZ, 6 pages, June 2021.
- C6. N. Guruwacharya, N. Bhujel, U. Tamrakar, M. Rauniyar, **S. Subedi**, S. Berg, T. M. Hansen, and R. Tonkoski, "Data-Driven Power Electronic Converter Modeling for Low Inertia Power System Dynamic Studies," in *IEEE Power Energy Society General Meeting (PESGM'20)*, Montreal, QC, 5 pages, Aug. 2020.