

ABODH POUDYAL

Electrical Engineer | Ph.D. Student

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Power Systems Engineer with about 4 years of experience as a researcher at Washington State University and South Dakota State University. I am actively working on the spatiotemporal modeling of extreme weather-related events and its impact on power systems, with a focus on power distribution systems. Additionally, I am also interested in developing risk-driven power distribution planning framework to develop resilience against extreme stochastic events in power distribution systems. I am a quick learner and an enthusiastic and persistent researcher. I have grown my research expertise in several domains such as power distribution modeling and optimization, power system analysis, operations research, machine learning, and high-performance computing.

PROFESSIONAL EXPERIENCE

Present Aug 2020	Graduate Research Assistant, WASHINGTON STATE UNIVERSITY, Pullman, WA <ul style="list-style-type: none">> Developing a risk-averse long-term planning model in power distribution systems for resilience against extreme events via stochastic optimization framework.> Developing an impact assessment framework for combined T&D network using HELICS as a co-simulation platform.> Mentored two high school interns to develop a framework for analyzing the spatiotemporal impact of extreme events on a power grid.> Working as a support consultant from WSU for WSU-Restoration application developed in GridAPPS-D, an Advanced Distribution Management System (ADMS) platform developed by Pacific Northwest National Laboratory (PNNL). <p>Python Julia MATLAB MATPOWER OpenDSS HELICS GridAPPS-D</p>
Aug 2020 May 2020	Graduate Research Intern, ENERGY SYSTEM INNOVATION CENTER, Pullman, WA <ul style="list-style-type: none">> Familiarized with ADMS via GridAPPS-D platform and distribution system application development using GridAPPS-D on docker containers.> Implemented linearized power flow algorithms on standard distribution system test cases using conventional graph theory and search algorithms.> Got acquainted with distribution system modeling, analysis, and power flow using Open Distribution System Simulator (OpenDSS). <p>Python OpenDSS GridAPPS-D Docker SparQL Blazegraph</p>
May 2020 May 2019	Graduate Research Assistant, SOUTH DAKOTA STATE UNIVERSITY, Brookings, SD <ul style="list-style-type: none">> Developed a decentralized data-driven power system inertia estimation framework using Federated Learning (FL).> Developed a data-driven single-area power system inertia estimation tool using Convolutional Neural Network (CNN).> Analyzed the behavior of power system inertia when integrated with model predictive controller-based virtual inertia unit.> Developed an adversarial game theory framework for power system attack and defense strategies using Deep Q-Learning (DQN). <p>Python MATLAB MATLAB Simulink PowerWorld</p>
May 2019 Aug 2018	Graduate Teaching Assistant, SOUTH DAKOTA STATE UNIVERSITY, Brookings, SD <ul style="list-style-type: none">> Mentored two undergraduate TAs to conduct effective lab sessions and tutorials.> Conducted labs and took classes in basic electric circuit theory and electronics.> Designed electronic circuits (amplifier and oscillator circuits) and lab manual for experiments. <p>PSPICE MATLAB</p>
Jul 2018 May 2017	Electrical Engineer, UPENDRA BADAL INTERNATIONAL, Kathmandu, Nepal <ul style="list-style-type: none">> Designed low-voltage distribution systems for residential and industrial areas.> Performed energy auditing and prepared reports on the analysis. <p>AutoCAD Dialux Microsoft Office</p>

EDUCATION

Present Aug 2020	Ph.D. in Electrical Engineering , WASHINGTON STATE UNIVERSITY, Pullman, WA <ul style="list-style-type: none">> Research : Risk-Averse Long-term Power Distribution Systems Planning for Resilience to Extreme Weather Events> Major : Power and Energy Systems (Minor : Computer Science)> Relevant Coursework : Analysis of Power Systems, Data Science, Graph Theory, Convex and Non-linear Optimization> GPA : 4.0 out of 4.0 (as of Fall 2021)> Advisor : Dr. Anamika Dubey (WSU)
Aug 2020 Aug 2018	M.S. in Electrical Engineering, SOUTH DAKOTA STATE UNIVERSITY, Brookings, SD <ul style="list-style-type: none">> Research : Distributed Machine Learning Approach to Fast Frequency Response-based Inertia Estimation in Low Inertia Grids> Major : Power and Energy Systems> Relevant Coursework : Advanced Power Systems, Fundamentals of High-Performance Computing, Statistical Methods, Operations Research, Computational Intelligence> GPA : 4.0 out of 4.0> Advisor : Dr. Timothy M. Hansen (SDSU)
Oct 2016 Nov 2012	B.E. in Electrical Engineering, TRIBHUVAN UNIVERSITY, Lalitpur, Nepal <ul style="list-style-type: none">> Title : Design and Fabrication of a Shunt Active Power Filter for a 3 Phase 4 Wire System Using PQ Theory> Major : Power and Energy Systems> Relevant Coursework : Power Systems Analysis, Power Electronics, Transmission and Distribution System Design, Electrical Machines, Switchgear and Protection, C, C++, Signal Analysis> GPA : 3.75 out of 4.0> Advisor : Dr. Netra Prasad Gyawali (TU)

PROJECTS

RISK-AVERSE LONG-TERM PLANNING IN POWER DISTRIBUTION SYSTEMS

2021 - PRESENT

This work is currently in development phase. Here, we are working on developing a framework that includes risk-driven decisions within the optimization framework long-term planning in power distribution systems. The main aim here is to improve the long term resilience of power distribution system against extreme events.

[Python](#) [MATLAB](#) [OpenDSS](#) [Pyomo](#) [Julia](#)

QUANTIFYING PLANNING-BASED RESILIENCE THROUGH MULTI-CRITERIA DECISIONS

2021 - PRESENT

This work is currently in development phase. For this project, we are quantifying power distribution resilience, from planning perspective, by combining multiple attributes that can contribute in improving the resilience of the system.

[Python](#) [MATLAB](#) [OpenDSS](#)

SPATIOTEMPORAL HURRICANE AND ITS IMPACT MODEL

2021 - PRESENT

github.com/abodh/SummerInternship2021WSU/tree/main/main_code_abodh

This work is collaborated with high school interns. Here, we simulate spatiotemporal hurricanes and quantify its impact on the power grid. As an extension, we are also working on integrating a distribution grid and analyze the impact of spatiotemporal extreme events through co-simulation.

[Python](#) [MATLAB](#) [MATPOWER](#) [OpenDSS](#) [HELICS](#) [CARTOPY](#) [Git](#)

MULTI-AREA INERTIA ESTIMATION USING CONVOLUTIONAL NEURAL NETWORKS AND FEDERATED LEARNING

2019-2020

github.com/abodh/Inertia-Estimation-using-Federated-Learning

github.com/abodh/Neural_Network_Inertia_Estimation

I worked in this project during my masters at SDSU. We developed a decentralized data-driven inertia estimation framework that is generator independent and depends only on the local frequency measurements. We applied Federated Learning for decentralized estimation that also ensures differential privacy in the power systems — facilitating provisions for cyber security.

[Python](#) [PyTorch](#) [MATLAB](#)

COMPARISON OF ELECTRICITY COST FORECASTING MODELS

2020

github.com/abodh/Electricity-cost-forecasting-using-machine-learning-and-deep-learning-models

This work is completed as a class project for the course CPT 575 Data Science. I worked on creating the cost forecasting dataset using auxiliary variables such as fuel cost, season, loads, and so forth. Furthermore, I also developed the artificial neural network (ANN) and convolutional neural network (CNN)-based forecasting models for this project.

Python PyTorch R Git

ITERATIVE POWER FLOW SOLVER

2020

github.com/abodh/Newton-Rhapson-Power-Flow

github.com/abodh/Power-Flow-with-Sparse-Matrix-Reordering

This work is completed as a class project for the course EE 521 Analysis of Power Systems. Power flow analysis is done using Newton-Rhapson method and fast decoupled method. Sparse matrix reordering methods are also implemented for faster computation of the Jacobian matrix.

MATLAB

PUBLICATIONS

JOURNALS

- [J1] **A. Poudyal**, U. Tamrakar, R. D. Trevizan, R. Fournay, R. Tonkoski, and T. M. Hansen, "Multi-Area Inertia Estimation using Convolutional Neural Networks and Federated Learning", *IEEE Systems Journal*, 2021 (in second round of review).
- [J2] **A. Poudyal**, S. Poudel, and A. Dubey, "Risk-Averse Long-term Power Distribution Systems Planning for Resilience to Extreme Weather Events", *IEEE Transactions on Sustainable Energy* (in preparation).
- [J3] S. Paul, **A. Poudyal**, S. Poudel, and A. Dubey, "Resilience Metrics and Planning in Power Distribution Systems : Past and Future Considerations", *Renewable and Sustainable Energy Reviews* (in preparation).

CONFERENCES

- [C1] **A. Poudyal**, U. Tamrakar, R. D. Trevizan, R. Fournay, R. Tonkoski, and T. M. Hansen, "Convolutional Neural Network-based Inertia Estimation using Local Frequency Measurements", in *2020 52nd North American Power Symposium (NAPS)*, Jun. 2021, pp. 1-6.
- [C2] **A. Poudyal** and S. Poudel, "Quantifying Planning-based Resilience in Power Distribution System using Multi-Criteria Decision Making Process", in *2022 IEEE PES General Meeting* (in preparation).
- [C3] **A. Poudyal**, V. Iyenger, D. G. Camaro, and A. Dubey, "Modeling Spatiotemporal Hurricane Events and its Impact on a Power Grid", in *2022 IEEE PES General Meeting* (in preparation).

PROGRAMMING SKILLS

Python	● ● ● ● ●
MATLAB	● ● ● ● ●
Julia	● ● ● ● ○
C	● ● ● ● ○
R	● ● ● ○ ○
C++	● ● ● ○ ○
CUDA	● ● ○ ○ ○

TOOLS & APPLICATION

- > OpenDSS
- > MATPOWER
- > HELICS
- > Pyomo
- > GridAPPS-D
- > PyTorch
- > PowerWorld

OFFICE SKILLS

- > L^AT_EX
- > MS Presentation
- > MS Excel
- > MS Word
- > MS OneNote
- > MS Visio
- > Visual Studio

PERSONAL AND PROFESSIONAL ACTIVITIES

- Present Serving as a reviewer for IEEE TNNLS, IEEE TSE, IEEE Systems Journal, and multiple IEEE conferences
- Present Serving as the Senator of Graduate and Professional Student Association (GPSA) at WSU
- 2015 Worked as a Team Leader for Communication and Information Management in AIESEC, Kathmandu
- 2014 Participated as a student delegate at 8th Asian Science Camp, Singapore

HONORS AND AWARDS

- 2020 - Present **Member**, Tau Beta Pi honors society
- 2012 - 2016 **Mahatma Gandhi Scholar**, achieved due to outstanding performance in high school
- 2012 - 2016 **Full scholarship**, Bachelor of Electrical Engineering, Tribhuvan University

REFERENCES

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