Aryan Ritwajeet Jha

Pursuing Doctor of Philosophy in Electrical and Computer Engineering

PERSONAL DETAILS

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EDUCATION AND INTERNSHIPS

Doctor of Philosophy
Electrical and Computing Engineering
Washington State University
Pullman, WA — Aug '22 -
Currently 3.94/4.00 GPA

Summer Internship
North American Electric Reliability Corporation (NERC)
Advanced System Analytics and Modelling — May '24 - Aug '24

Graduate Work
Electrical Engineering
Indian Institute of Technology Delhi — Sep '20 - Aug '22

Bachelor of Engineering.
Electrical and Electronics Engineering
with a Minor in Data Science
Birla Institute of Technology and Science Pilani
Hyderabad Campus — Aug '16 - May '20
Secured 8.47/10.00 CGPA

PROJECTS

Ongoing Doctoral Thesis — Aug '22 -

Scalable Multi-Period Optimal Power Flow in Active Distribution Systems
Supervisor : Dr. Anamika Dubey, Associate Professor, School of Electrical Engineering and Computer Sciences, Washington State University

My goal is to devise scalable Multi-time Period Optimal Powerflow strategies for Active Radial Power Distribution Systems. These strategies will allow for decomposing the computational burden of solving for a minimizer of an objective function (say, line losses) both spatially and temporally. This work is part of the "Connected Communities" project sponsored by the Department of Energy, and involves the partnership of Washington State University, Avista Utilities, Edo Energy and Pacific Northwest National Lab. Current status of the MATLAB simulations and their validation via OpenDSS may be viewed by clicking on

the GitHub logo icon next to the project title. A paper based on the work so far has been accepted in NAPS 2024.

Summer Internship Work at NERC 1 May '24 - Aug '24

Mapping Generator Data (GADS) and Transmission Data (TADS) for Extreme Weather Resiliency Studies

Supervisor : Svetlana Ekisheva, Principal Data Scientist, Advanced System Analytics and Modelling, NERC

NERC has an yearly updated database on Bulk Power System assets such as Generator Units and Transmission Lines, respectively known as Generator/Transmission Availability Database System (GADS/TADS). It is of NERC's interest to analyze how susceptible the assets are to extreme weather conditions, but the databases do not contain any geographical information. My task was to use a third party software, namely Hitachi Energy's Velocity Suite, which has an approximate geographical mapping of such assets, to indirectly 'map' the assets in GADS/TADS to their nearest weather station. A python codebase was developed which would input GADS/TADS as well as Velocity Suite databases, and parse them to finally output a table of transmission lines and generator units 'mapped' to their nearest weather station, for any user-input weather station.

Summer Internship Work at NERC 2 May '24 - Aug '24

System Strength Concept Development and EMT Simulation

Supervisor : Aung Thant, Senior Engineer, Engineering and Security Integration, NERC

Increasing penetration of IBRs, mostly Grid Following Inverters in the Bulk Power System are causing a 'weakening' of the grid, making it more susceptible to voltage collapse. Power System operators are actively researching ways to tackle this decrease in 'System Strength', including trying to quantify it. While existing quasi steady state metrics such as Short Circuit Ratios are somewhat useful for this, they do not give much information on fault dynamics, especially in grid conditions calling for 'ride-through' operation of IBRs. My task was to conduct a literature review on what progress has the industry or working groups (such as AEMO, CIGRE, EPRI, ERCOT, ESIG, PES) made on studying the concept of System Strength and present it to the engineering team. A PSCAD EMT simulation was developed with the aim of demonstrating to stakeholders from a wide variety of technical and non-technical backgrounds on how particular changes to the grid cause a 'decrease' or 'increase' in System Strength.

Research Project Sep '20 - Aug '22

Data Analysis for Predicting Instabilities in Power Systems

Supervisor : Dr. Nilanjan Senroy, Professor, Department of Electrical Engineering, IIT Delhi

An accumulation of stochastic disturbances in the power grid causes various steady state instabilities to develop, which can lead to blackout without any early warning indicators. My task was to statistically analyze the bus voltage magnitudes of the power grid for symptoms of *Critical Slowing Down*, detected via statistical parameters such as autocorrelation and variance in order to develop a reliable early warning service which may be used to avoid blackouts or at least mitigate its effects. Dynamic simulations were done in Siemens PSS®E 34.3 coupled with Python 2.7 being used for automation. Data Analysis was done in MATLAB.

PUBLICATIONS

Conference Paper

***Jha, A.**, Subho, P., & Dubey, A. 2024. Spatially distributed multi-period optimal power flow with battery energy storage systems . Accepted for Publication in North American Power Symposium (NAPS) 2024.*

NOTABLE COURSE PROJECTS

Course Project Aug '22 - Aug '23

Power System Analysis and Stability ,

Supervisors: Dr. Noel Schulz and Dr. Mani V. Venkatasubramanian, Professors at the School of Electrical and Engineering and Computer Sciences, Washington State University

As part of the two core graduate courses for Power Systems at WSU, a codebase was developed for performing various kinds of analysis on Power Transmission Systems, including Powerflow, Sparse Powerflow, Continuation Powerflow, State Estimation, Optimal Powerflow, Small Signal Stability and Transient Stability. The original codebase for course evaluation was developed in MATLAB. A Julia package based on the same projects is being developed, with a few already re-implemented.

Course Project Aug '23 -

Convex, Nonlinear, Nonsmooth Analysis and Optimization

Supervisor: Dr. Thomas Asaki, Professor at the Department of Mathematics, Washington State University

In order to solve various constrained/unconstrained/nonlinear/nonsmooth optimization problems using a variety of optimization algorithms, a solver in Julia has been developed and is still being updated.

COURSES

Courses in Power Systems

(Power Systems -) Analysis, Dynamics, Operation and Control

Courses in Scientific Computing

Applied Statistical Methods, Machine Learning, Convex and Nonlinear Optimization, Nonsmooth Analysis and Optimization

SKILLS

Programming Languages	Julia, MATLAB, Python, C/C++,
Typesetting and Drawing	LaTeX, Inkscape
Software	OpenDSS, MATLAB Simulink, Siemens PSS®E, PSCAD, Velocity Suite