Pooja Algikar

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Education

- **Virginia Polytechnic Institute and State University** — Washington D.C.
  Doctor of Philosophy in Electrical Engineering — Jan. 2021 – Present
- **Virginia Polytechnic Institute and State University** — Washington D.C.
  Master of Engineering in Electrical Engineering — Aug. 2019 – Dec. 2020
- **College of Engineering, Pune** — Pune, India
  Bachelor of Engineering in Electrical Engineering — Aug. 2013 – July. 2017

Programming Skills

- **Languages:** Matlab, Python, C, C++, Arduino
- **Applications:** Matlab Simulink, OpenDSS, Eagle, LTspice, Multisim, Proteus

Experience

Virginia Tech — Washington DC

- Graduate Researcher
  Advisor: Lamine Mili — Dec 2019 - Present
  - Research interests: Robust state estimation, uncertainty quantification, Bayesian inference, power systems with high integration of renewable energy resources"
  - Masters research focused on **"Development of Gaussian process emulator for stochastic power flow"**
- **Ford Motor Company** — Dearborn, Michigan
  Summer Intern, Product Development Research and Advanced Engineering — May 2021 - Aug. 2021
  - Developing a cost function comprising of the benefit and risk quantification to participate in the electricity market
  - Setting up a mathematical model for optimization of the total credit associated with the household aggregation strategy
- **Renault Nissan Technology and Business Center Inc.** — Chennai, India
  EV Algorithm Engineer — Aug. 2017-July. 2019
  - Analyzing functionality of BMS (Battery Modelling Systems) Simulator Modules
  - Performing Model-In-Loop testing of Power-train module

Research Projects

- **A Measurement-Based Robust Non-Gaussian Process Emulator Applied to Data-Driven Stochastic Power Flow** — Oct. 2022
  A robust non-Gaussian process emulator based on the Schweppe-type generalized maximum likelihood estimator is trained on metered time series of voltage phasors and power injections to perform stochastic power flow. Power system data are often corrupted with outliers caused by fault conditions, power outages, and extreme weather, to name a few. The proposed emulator bounds the influence of the outliers using weights calculated based on projection statistics. Specifically, the developed estimator is robust to vertical outliers and bad leverage points while retaining good leverage points in the measurements of the training dataset. The proposed method is demonstrated on an unbalanced radial IEEE 33-Bus system heavily integrated with renewable energy sources. [Link]
- **A Robust Data-driven Process Modeling Applied to Time-series Stochastic Power Flow** — Jan. 2023
  A robust non-Gaussian process emulator is trained on real-world data: output power injections and voltage phasors. The time-series stochastic power flow requires a large amount of Monte Carlo simulations for a large-scale power system. A robust surrogate is proposed in the Gaussian process framework to enable computationally efficient uncertainty quantification of power flow results. Since the proposed model is trained on real data, outliers are downweighted based on projection statistics, which are a robust version of Mahalanobis distances. The proposed model is applied to the IEEE 240-Bus system heavily integrated with renewable energy sources.[Link]
- **Robust Gaussian Process Regression with Huber Likelihood** — Feb. 2023
  We propose a robust process regression model in the Gaussian process framework with the likelihood of observed data expressed as the Huber probability distribution. The parameters of the proposed model are estimated with full Bayesian treatment. High statistical efficiencies at the Gaussian and thick-tailed noise distributions such as Students t, Laplace, and Cauchy distribution with a good amount of outlying data are demonstrated with a numerical example. Finally, the proposed method is applied to estimate the planet-to-star radius ratio of the HD-189733 planetary system. The work is submitted to the Annals of Applied Statistics Journal. [Link]

- **Identification of Power System Oscillation Modes using Blind Source Separation based on Copula Statistic** Mar. 2023
  We propose a high-order blind source identification algorithm based on the copula statistic to address the non- linear dynamics in modal analysis. The method combined with Hilbert transform (HOBI-HT) and iteration procedure (HOBMI) can identify all the oscillation modes as well as the model order from the observation signals obtained from the number of channels as low as one. We assess the performance of the proposed method on numerical simulation signals and recorded data from a simulation of time domain analysis on the classical 11-Bus 4-Machine test system. Our simulation results outperform the state-of-the-art method in accuracy and effectiveness. The proposed work is accepted for the PES General Meeting 2023 conference.

Publications

- Algikar, P., Xu, Y., Yarahmadi, S., & Mili, L. (2023). A Robust Data-driven Process Modeling Applied to Time-series Stochastic Power Flow. IEEE Transactions on Power Systems.
- Algikar, P., Xu, Y., & Mili, L. (2022, July). A Measurement-Based Robust Non-Gaussian Process Emulator Applied to Data-Driven Stochastic Power Flow. In 2022 IEEE Power Energy Society General Meeting (PESGM) (pp. 01-05). IEEE.

Extracurricular Activities and Achievements

- **Inducted IEEE-Eta Kappa Nu (2022)**
- **Contestant of NASA RASC-AL 2021; Theme: Minimum Mars Ascent Vehicle:** As the head of a power subsystem, my contribution was to design a power supply for in-situ resource utilization and ascent vehicle.
- **Innovation Campus Fellow:** Assisting in developing Virginia Tech's new campus: Innovation Campus in Alexandria with many other fellows and university professors. As a fellow, I am engaged with the Innovation Campus Delivery Team (a cross-functional team supporting the project), attend industry-related events, special host seminars, engage with the community, and participate in other activities to support the planning and design of the new campus

Coursework

Power Systems Dynamics and Control, Power Systems Operations and Control, Deep Learning, Advanced Machine Learning, Power Systems Protection, Introduction to Plasma Science, Smart Grid, HVDC and FACTS, Wind and Solar Power, Control Systems, Signal Processing, Electromagnetic Fields, Robust Estimation and Filtering, Stochastic Signals and Systems, Introduction to Inquiry Thinking and Research