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APPLICATION OF MACHINE LEARNING AND CYBER SECURITY IN SMART GRID

Soham Dutta Dr.

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Soham Dutta

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Born 25th May 1992

SUMMARY

- Possess strong commitment to team environment dynamics with the ability to contribute expertise and absorb new ideas.
- Strong presentation and demonstrating skills to a diverse audience; Confident, articulate and professional speaking abilities.
- Continually improving to deliver the goals and better meet the needs of the job.

RESEARCH INTERESTS

Power System Protection, Signal Processing, Machine Learning, Micro Phasor Measurement Unit, Advanced Meters

EDUCATION

- August 2016 – November 2021 **Ph.D | Dept. of Electrical Engineering | Indian Institute of Technology, Dhanbad, India**
Thesis Topic | Micro Phasor Measurement Unit based Islanding Detection Approach in Microgrid
- July 2014 – June 2016 **M.Tech | Dept. of Electrical and Electronics Engineering | Birla Institute of Technology, India**
Thesis Topic | Simulation and Hardware Modeling of Prepaid Energy Meter
- August 2010 – May 2014 **B.Tech | Dept. of Electrical Engineering | Techno India Saltlake, India**
Thesis Topic | Fault analysis in Transmission lines, An approach using soft-computing techniques

RESEARCH EXPERIENCE

- July 2021 – Present **Assistant Professor | Manipal Institute of Technology, India**
- Communicated three journal papers.
- November 2021 – June 2022 **Assistant Professor | Aditya Engineering College, India**
- Performed fault analysis considering hosting capacity in Typhoon HIL software.
 - Got acquainted with Python Programming.
 - Communicated three journal papers, one book chapter.
- August 2016 – November 2021 **Ph.D Research Scholar | Indian Institute of Technology, Dhanbad, India**
- Simulated various island and fault scenarios in a modified IEEE 13 node and IEEE 33 node test feeder in MATLAB/SIMULINK.
 - Developed low cost, high accuracy and negligible non detection zone methods for island/fault detection with micro phasor measurement unit.
 - Worked on application of different machine learning methods on classifier learner app of MATLAB.
 - Gained experience in data visualization and machine learning with Rattle (R) software.
 - Worked on application of various signal processing techniques to detect fault/island scenario.
 - Worked on software reliability allocation method using analytical hierarchical process and software fault-tree analysis for island/fault detection technique.
 - Published five journal papers, four conference papers and two book chapters.
- May 2015 – June 2016 **M.Tech Scholar | Birla Institute of Technology, India**
- Simulated bidirectional prepaid net energy meter in MATLAB/SIMULINK.
 - Develop hardware model for an Arduino based single phase prepaid net energy meter.
 - Gained experience in LABVIEW for simulating basic control loops.
 - Published two conference papers.
- May 2013 – May 2014 **B.Tech Scholar | Techno India Saltlake, India**
- Developed models for fault analysis in ring main type transmission lines using EMTP and ANN.
 - Performed electrical transmission/distribution systems analysis, load flow analysis, dynamic studies, reactive deficiency study, transient stability analysis, short circuit, and voltage analysis.

PUBLICATIONS

Journals

Soham Dutta, Pradip Kumar Sadhu, Maddikara Jaya Bharata Reddy and Dusmanta Kumar Mohanta. "Smart inadvertent islanding detection employing p-type μ PMU for an active distribution network." *IET Generation, Transmission & Distribution*, vol. 12, no. 20 (2018): pp. 4615-4625.

Soham Dutta, Pradip Kumar Sadhu, Maddikara Jaya Bharata Reddy and Dusmanta Kumar Mohanta. "Shifting of research trends in islanding detection method-a comprehensive survey." *Protection and Control of Modern Power Systems*, vol. 3, no. 1 (2018).

Soham Dutta, Maddikara Jaya Bharata Reddy, Dusmanta Kumar Mohanta, Makrand Sing Kushwah and Pradip Kumar Sadhu. " μ PMU based intelligent island detection—the first crucial step toward enhancing grid resilience with MG." *IET Smart Grid*, vol. 3, no. 2, (2019): pp. 162-173.

Apoorva Shukla, **Soham Dutta**, and Pradip Kumar Sadhu. "An island detection approach by μ -PMU with reduced chances of cyber attack." *International Journal of Electrical Power and Energy Systems*, vol. 126, no. A, (2021): pp. 106599.

Soham Dutta, Sachin Olla, and Pradip Kumar Sadhu. "A secured, reliable and accurate unplanned island detection method in a renewable energy based microgrid." *Engineering Science and Technology, an International Journal*, vol. 24, no. 5, (2021): pp. 1102-1115.

Conferences Sikander Singh, **Soham Dutta**, Saurav Sahu, and Pradip Kumar Sadhu. "Spectral Kurtosis Based Island Detection Technique" In *Emerging Trends for Smart Grid Automation and Industry 4.0 (ICETSGAI4.0)*, International Conference on, Springer, 2019.

Soham Dutta, Shailesh Verma, Pradip Kumar Sadhu, Maddikara Jayabharata Reddy, and Dusmanta Kumar Mohanta. "Islanding detection in a distribution system: A pattern assessment based approach using Concordia analysis" In *20th International Conference on Intelligent System Application to Power Systems (ISAP)*, International Conference on, pp. 1-5. IEEE, 2019.

Sauvik Biswas, Paresh Kumar Nayak, Ravi Shankar Prakash, and **Soham Dutta**. "The Effect of Kernels in SVM on the Fault Classification Accuracy of a Transmission Line Compensated with TCSC" In *Proceedings of the International Conference on Advances in Electronics, Electrical & Computational Intelligence (ICAEEC)*, Springer, 2019.

Shailesh Verma, **Soham Dutta**, Pradip Kumar Sadhu, Maddikara Jayabharata Reddy, and Dusmanta Kumar Mohanta. "Islanding detection using bi-directional energy meter in a DFIG based active distribution network" In *International Conference on Computer, Electrical & Communication Engineering (ICCECE)*, International Conference on, pp. 1-4. IEEE, 2019.

Soham Dutta, Debomita Ghosh, and Dusmanta Kumar Mohanta. "Optimum solar panel rating for net energy metering environment." In *Electrical, Electronics, and Optimization Techniques (ICEEOT)*, International Conference on, pp. 2900-2904. IEEE, 2016.

Soham Dutta, Debomita Ghosh, and Dusmanta Kumar Mohanta. "Location biased nature of net energy metering." In *Computation of Power, Energy Information and Communication (ICCPEIC)*, 2016 International Conference on, pp. 350-355. IEEE, 2016.

Book Chapters

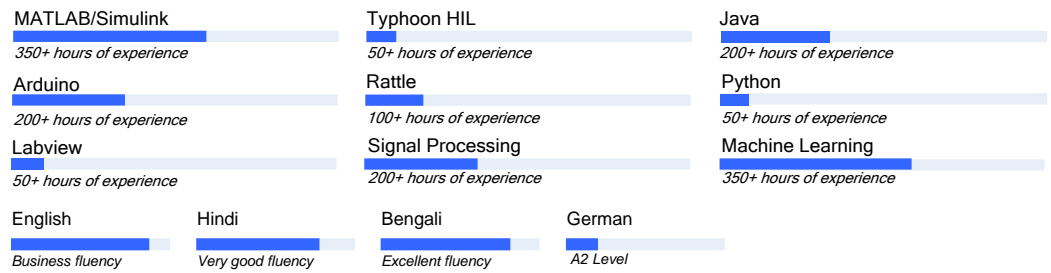
Soham Dutta, Pradip Kumar Sadhu, Maddikara Jaya Bharata Reddy, and Dusmanta Kumar Mohanta. "Role of micro phasor measurement unit (μ PMU) for decision making based on enhanced situational awareness of modern distribution system", in *Decision Making Applications in Modern Power Systems*, pp. 181-199, Academic Press (Elsevier), 2020.

Soham Dutta, Pradip Kumar Sadhu, Murthy Cherikuri, and Dusmanta Kumar Mohanta. "Application of Artificial Intelligence and Machine Learning Techniques in Island Detection in a Smart grid", in *Intelligent Renewable Energy Systems: Integrating AI Techniques and Optimization Algorithms*, Scrivener Publishing (Wiley), 2022.

Soham Dutta, Akash Kumar Pandey, Sourav Kumar Sahu, and Pradip Kumar Sadhu. "A Net Energy Meter based approach for Islanding Detection in Modern Distribution System", in *Internet of Energy - A Pragmatic Approach to Sustainable Development*, Apple Academic Press (Taylor & Francis), 2023, In Press

Sourav Kumar Sahu, Dilip Kumar Mishra, **Soham Dutta**, and Debomita Ghosh. "Design and testing capabilities of low-inertia energy system-based frequency control using Typhoon HIL Real-time Digital Simulator", in *Power System Frequency Control*, (Elsevier), In Press

SKILLS



SCIENTIFIC CONTRIBUTION

- Performed hardware implementation of load priority based net energy meter with Arduino.
- Formulated a method of leveraging a micro phasor measurement unit for island and fault detection.
- Developed fault and island detection methods using signal processing techniques such as Fortescue transform, Fractional discrete Fourier transform and Spectral Kurtosis.
- Applied machine learning techniques such as random forest, artificial neural network and support vector machine for obtaining a high accuracy island detection technique.
- Developed a cyber proof method of detecting island scenarios.
- Formulated a method of software reliability allocation method for island and fault detection techniques.
- Devised methods to get a very low island and fault detection time along with minimal chances of false tripping.

OTHERS

- Reviewed for journals like IEEE Transactions on Intelligent Transportation Systems, IEEE Access, IEEE Sensors Journal, IET Generation, Transmission & Distribution and several Elsevier and Springer Journals.
- Reviewed papers for several conferences such as Texas Power and Energy Conference (TPEC- 2021), IEEE Prague Czech Republic International Conference on Electrical, Computer, and Energy Technologies (ICECET'22) and several other conferences.
- Served as a technical committee member in IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (IEEE-iSSSC 2022), India.

REFERENCES

<i>Dr. Pradip Kumar Sadhu</i> PhD Supervisor	pradip@iitism.ac.in	+916299070058
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<i>Dr. Nabamita Pal</i> Bachelors Faculty	nabamitapal84@gmail.com	+13184973752

Place, Date: Karnataka, India, 28 October 2022