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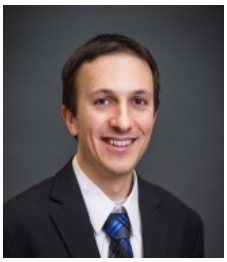
WEBINAR SERIES

FOA 1861 Awardees report out on Machine Learning and AI

Phillip Hart (GE Research), David Daigle (SEL), Lei Yang (University of Nevada), and Bruno Leao (Siemens Technology)

Learn more about the U.S. Department of Energy FOA 1861 projects and fact sheet.



Philip Hart is a Lead Electric Power Systems Engineer at GE Research in Niskayuna, NY, where he has been researching event detection and classification techniques for wide area monitoring systems. Prior to joining GE Research in 2018, he received the M.Sc. and Ph.D. degrees in Electrical Engineering as a Morgridge Fellow and research assistant at the University of Wisconsin-Madison. He has co-authored over 15 journal and conference publications and multiple patent applications in the power systems discipline, and in 2017 was the recipient of a Grainger Power Engineering Award. He has served as a reviewer for multiple IEEE Transactions journals and is an active member of local IEEE chapters and conference organizing committees.

Application of a powerful, industry-validated signature identification strategy to a large PMU dataset will be described. The event signatures generated using the semi-supervised strategy are derived from an over-abundance of features calculated in a transparent manner and can be efficiently applied to either historical or streaming PMU data. The signatures can be used to quantify the relative severity, location, and duration of each event, and show promise for integration into tools that provide enhanced power systems reliability, operational efficiency and resiliency. Lessons learned and opportunities for additional research will be discussed.

David Daigle is a Lead Research Engineer with over five years' experience working at SEL. Mr. Daigle earned his BS in Electrical Engineering from University of Idaho and is currently pursuing his MS in Electrical Engineering from Washington State University. His relevant areas of expertise include transient modeling of power systems, data analytics, and high-performance computing. He has produced a variety of publications for government customers regarding the synthesis of transient power system analysis and machine learning techniques. David currently leading multiple research efforts at SEL that address the confluence of modern data science technologies and electrical power systems.

Schweitzer Engineering Laboratories (SEL), in partnership with Oregon State University (OSU), has developed novel data handling, data anomaly mitigation, and event classification techniques using the FOA 1861 dataset. By using new technologies inspired by SEL's recent release of the Synchrowave Operations platform, SEL and OSU have applied these techniques with special emphasis on robustness against perturbed or spoofed data and explainability. The result of this joint research effort is an array of techniques that are applicable to every stage of the machine learning pipeline, from preprocessing to event detection. This research contributes directly to the goal of providing situational awareness using real phasor measurement unit data in an online environment such as Synchrowave Operations.

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Lei Yang is currently an associate professor in the Department of Computer Science and Engineering at the University of Nevada, Reno. Prior to joining the University of Nevada, Reno, he was an assistant research professor with the School of Electrical Computer and Energy Engineering at Arizona State University. Before that, he was a postdoctoral scholar at Princeton University and Arizona State University. He received the Best Paper Award Runner-up of IEEE INFOCOM 2014. His research interests include big data analytics, AI/ML for cyber-physical systems, edge computing and its applications in IoT and 5G.

In this webinar, Lei Yang will present the FOA 1861 project findings at University of Nevada, Reno. This project aims to develop a robust event diagnostics platform by integrating state-of-the-art tensor analytics and machine learning into real-time grid monitoring. This presentation will outline the tools developed in this project, experimental results using the large PMU datasets, lessons learned and next steps.

Dr. Bruno P. Leao is a Senior Researcher with Siemens Technology in Princeton, NJ. He has 15 years of experience in R&D of data analytics methods and their application to various industrial domains including electrical power, oil & gas, smart cities and aeronautics. Before joining Siemens, Dr. Leao has been a Senior Researcher with GE Global Research, Head of Data Intelligence at O&G startup Ouro Negro and Researcher at aircraft manufacturer Embraer. His topics of interest include equipment/system performance, health and security analytics, and the application of machine learning and signal processing methods to the solution of industrial problems in general. Dr. Leao has over 30 publications and 5 US patents on these topics and he has developed solutions which are employed for continuously monitoring of worldwide fleets of industrial equipment. He is currently the PI of DOE OE funded MindSynchro project and key contributor to other DOE funded projects where he develops and leads the R&D of data analytics applications to power grid use cases.

The presentation describes innovative solutions associated to the application of ML methods to real world PMU Big Data resulting from FOA 1861 MindSynchro project. Flagship innovation comprises semi-supervised learning approaches for detection of relevant grid events which can be applied to a broad variety of use cases. Other innovations and challenges are also discussed, especially concerning the relevance of adequately labeling PMU data for proper extraction of its value and novel approaches developed for overcoming existing limitations in available labels. Discussion includes adequacy of developed solutions to real world application, benefits for power systems operation and next steps towards application by utilities.

To attend this free webinar, please register at https://www.naspi.org/node/910.

Please email naspi@pnnl.gov if you would like to be on our email list or sign up for yourself at https://www.naspi.org/informed. Our next NASPI Work Group meeting will be October 5-7, 2021, more details will be posted here: https://www.naspi.org/work-group-meetings.

Wednesday, July 28, 2021
10:00 a.m. Pacific / 1:00 p.m. Eastern (1.5 hr.)
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