IEEE Task Force on Big Data Analytics for Synchro-Waveform Measurements

Presentation at NASPI on 4/17/2024

Officers:

- Hamed Mohsenian-Rad, University of California, Riverside (Chair)
- Jhi-Young Joo, Lawrence Livermore National Laboratory (Chair)
- Alireza Shahsavari, San Diego Gas and Electric (Secretary)
- Chris Mullins, Power Monitors (Liaison to IEEE PES Power Quality Subcommittee)

Task Force Overview

- PES Committee: AMPS PES Sub-Committee: BDA
- Focus: Data analytics methods and applications of high-resolution waveform and synchro-waveform measurements in power systems, facilitate industry acceptance, identify challenges and opportunities, and encourage collaborations.
- Chairs:
  - Hamed Mohsenian-Rad, University of California, Riverside (hamed@ece.ucr.edu)
  - Jhi-Young Joo, Lawrence Livermore National Laboratory (joo3@llnl.gov)
- Website: https://ieee-synchrowaveform.engr.ucr.edu/
- Established: April 2023
- Meetings: Quarterly (Next Zoom Meeting: April/May 2024)
  (Next In-Person Meeting: IEEE PESGM 2024)

Synchro-Waveforms

- Terminology:
  - Synchro-waveforms (*comparable to synchro-phasors*)
  - [Synchronized] Waveform Measurements
  - [Synchronized] [Continuous] Point-on-Wave Measurement

→ Multi-location time-synchronized waveform measurements

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- Technology:
  - Power Quality Sensors
  - Digital Fault Recorders
  - PMUs with Waveform Capture
  - New Dedicated Devices
  - …

→ Waveform Measurement Unit (WMU)


SEL

PMI


Schneider


Candura


NuGrid


GridSweep

Technical Needs

- High*er*-resolution data
  - High-speed, for real-time ingestion and analytics
  - Big data analytics (BDA) is even more crucial than synchro-phasors

- High*er*-volume data
  - Data storage, data compression might be necessary beyond what is needed for existing data types
  - Analytics and interface to translate the data into actionable information and use cases

Developing new methods, tools, and techniques to ingest, store, and analyze waveform and synchro-waveform data in various power system applications is critical.

Scope of the Task Force

- Identify and promote new data analytics methods for synchro-waveform data
- Identify and promote new applications for data analytics for synchro-waveform data
- Identify and promote opportunities for collaboration among academia and industry
- Provide a platform for industry practitioners to share experience and lessons learned
- Facilitate access to real-world waveform and synchro-waveform data to promote research
- Close the gap between synchro-waveform BDA and other BDA domains, such as synchro-phasor BDA to promote a more comprehensive view to BDA in power systems.

Recent Activities

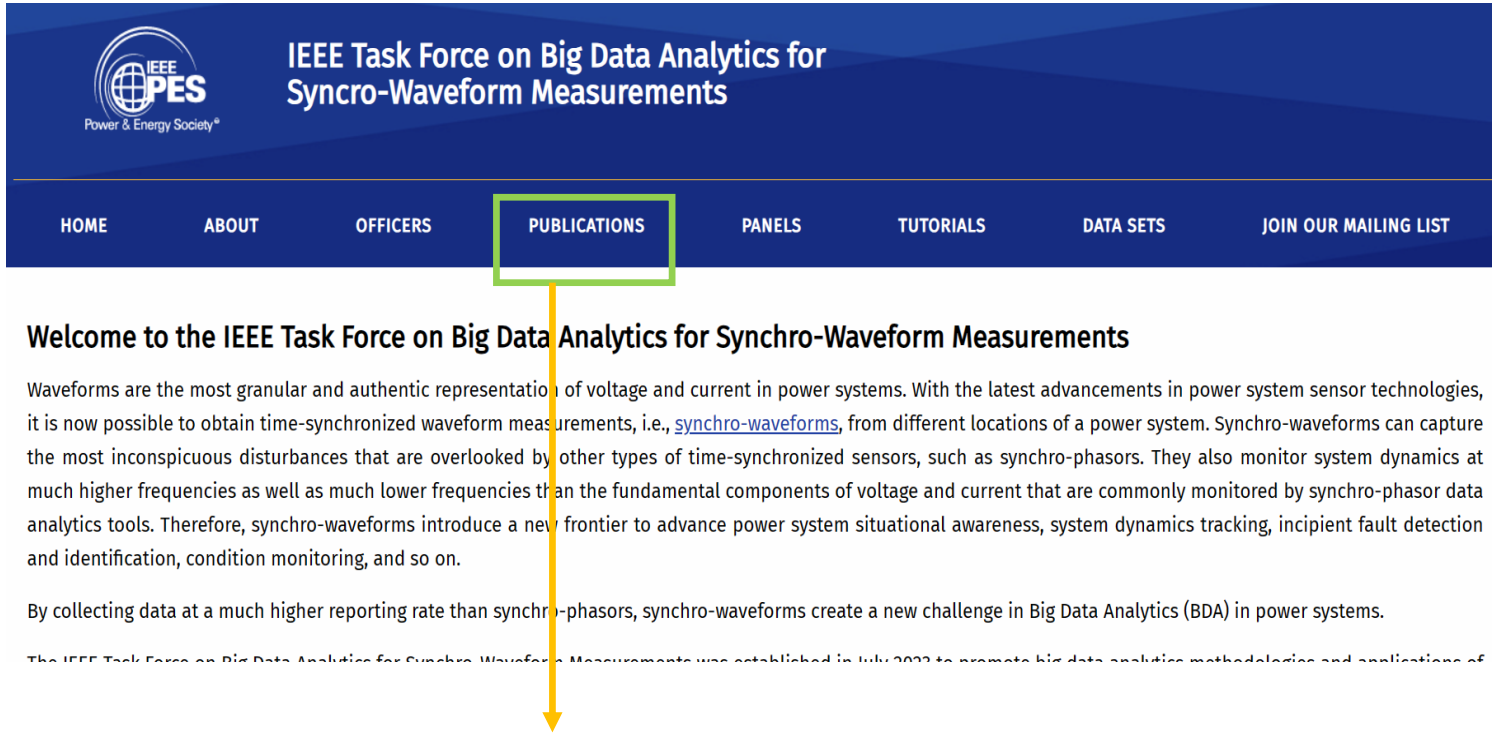
- **Task Force's Website**

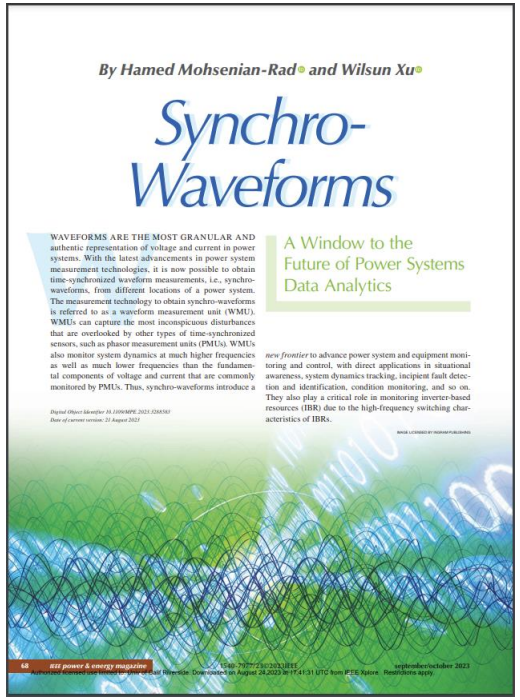
To Join the Task Force

https://ieee-synchrowaveform.engr.ucr.edu/

Recent Activities

- **Publications Library**





IEEE Power and Energy Magazine, September/October 2023

32 papers and industry reports have been indexed so far

You can suggest papers through the website or via email.

Recent Activities

- **Panels**

- Previous Panels

- IEEE PES General Meeting, Orlando, FL, USA, July 2023.
  - Hamed Mohsenian-Rad, University of California, Riverside, USA, Slides
  - Chester Li, Hydro One Inc., Canada, Slides
  - Jim Follum, Pacific Northwest National Laboratory, Slides
  - Wilsun Xu, University of Alberta, Canada, Slides
  - Farnoosh Rahmatian, NuGrid Power Corp, Canada, Slides

- IEEE SGSMA, Split, Croatia, May, 2022.
  - Hamed Mohsenian-Rad, University of California, Riverside, USA, Slides
  - Wilsun Xu, University of Alberta, Canada, Slides
  - Steven Blair, Synaptec Inc., Slides
  - Alvaro Furlani Bastos, Sandia National Laboratories, Slides

Recent Activities

- **Panels**

  - Upcoming Panels

- **IEEE PES General Meeting, Seattle, WA, July 2024**
  - Hamed Mohsenian-Rad, University of California, Riverside, USA
  - Jhi-Young Joo, Lawrence Livermore National Lab, USA
  - Lakshan Piyasinghe, Hubbell, USA
  - Yilu Liu, University of Tennessee, Knoxville, USA
  - Abder Elandaloussi, Southern California Edison, USA
  - Mario Paolone, EPFL, Switzerland
  - Mladen Kezunovic, Texas A&M University, USA

- **IEEE PES Grid Edge, San Diego, CA, January 2025**
  - Pending Approval

Recent Activities

- **Tutorials**

- Previous Tutorial

- **IEEE PES Subcommittee on Big Data Analytics (BDA) Webinar Series**
  - Hamed Mohsenian-Rad, University of California, Riverside, USA
  - **Video**: https://www.youtube.com/embed/mD1dsXZdxOw

- Upcoming Tutorial

- **IEEE PES SGSMA Conference, Washington, DC, May 2024**
  - Hamed Mohsenian-Rad, University of California, Riverside, USA
  - Chris Mullins, Power Monitors Inc. (PMI), USA
  - Alex McEachern, McEachern Laboratories, USA
  - Link: https://blogs.gwu.edu/seas-sgsma2024/

Technical Report (In Preparation)

Technical Report: IEEE Task Force on Big Data Analytics for Synchro-Waveform Measurements

Table of Content

High-level overview of the state of technology, current and future applications, data analytics architecture and tools, and standardization needs