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RENSSELAER

US DOE Digitizing Utilities Prize: Track 2 – Data Analysis Automation
Toward the Development of a Real-Time Monitoring System for a Transmission Operator based on High-Sampling-Rate Data
Team: Red Hawks; Members: Christoph Lackner (GPA) Denis Osipov (RPI), Joe Chow (RPI)

Team Expertise: 30+ combined years of experience with synchrophasor data. Accomplishments include:

- Cross power spectral density method for locating and characterizing power oscillation sources (first place in 2021 IEEE-NASPI Oscillation Source Location Contest)
- Power control equipment performance analysis from disturbance and ambient PMU data
- PMU missing data recovery using matrix and tensor completion methods
- Automated analysis of power system equipment via tracking real-time performance characteristics
- Development of production-grade tools, SciSync, for online and offline analysis of synchrophasor data

Solution and Approach: Further develop our methods for analyzing synchrophasor data to provide transmission system operators diagnostic and dynamic performance evaluation tools, with the following tasks:

1. Oscillation detection, location, and characterization for internal or external oscillation sources due to synchronous generators or inverter-based resources
2. Control equipment performance analysis for voltage and frequency regulation by generators and inverter-based resources using disturbance and ambient PMU data
3. System frequency response analysis to capture aggregate frequency response parameters of the control region
4. Exploratory data analysis and diagnostics of PMU and point-on-wave data to track nonstationary higher frequency oscillations

Implementation Plan:

- Utilize a Jupyter hub to develop the algorithms and perform data analysis
- Analyze disturbance (internal and external events) and ambient PMU data for oscillation and performance evaluation
- Focus on data-driven analytical tools for calculating response capabilities of inverter-based resources