National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: Identification of Oscillatory Modes from Degraded PMU Measurements Using an ML-Based GCN-GIN Scheme
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Venue	: UG Seminar Room
Date and Time	: 13 May 2025 (5:00PM)
Abstract	: In a modern power system, Phasor Measurement Units (PMU) are a key component for real-time monitoring and stability assessment. However, network congestion, communication failures, cyber-attacks and equipment malfunctions can introduce missing values and outliers, leading to anomalies that are captured at Phasor Data Concentrators (PDCs). Such anomalies can potentially degrade the performance of an estimator and consequently lead to power system stability issues. To address this issue, a newly introduced method integrating Graph Convolutional Networks (GCN) and Graph Imputation Networks (GIN) with TLS-ESPRIT has been developed. The reliability of this integrated approach is confirmed through Monte Carlo simulations performed on signals with different oscillation modes and noise levels. These simulations highlight that combining GCN for outlier detection, GIN for data imputation, and TLS-ESPRIT for mode estimation surpasses conventional methods, particularly in the presence of significant data anomalies. The combination of GCN and GIN, along with the TLS-ESPRIT algorithm, presents a robust approach to overcoming the challenges associated with nonlinear data in PMU measurements. This technique ensures accurate mode estimation, thereby improving system stability and sustainability. This approach has also been tested on two areas of data, real-time data collected from the Western Electricity Coordinating Council (WECC) and IEEE 39-bus system data simulated in a Real-Time Digital Simulator (RTDS).