

# A Low-Rank Matrix Approach for the Analysis of Large Amounts of Power System Synchrophasor Data

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**Abstract—** With the installation of many new multi-channel phasor measurement units (PMUs), utilities and power grid operators are collecting an unprecedented amount of high-sampling rate bus frequency, bus voltage phasor, and line current phasor data with accurate time stamps. The data owners are interested in efficient algorithms to process and extract as much information as possible from such data for real-time and off-line analysis. Traditional data analysis typically analyze one channel of PMU data at a time, and then combine the results from the individual analysis to arrive at some conclusions. In this paper, a spatial-temporal framework for efficient processing of blocks of PMU data is proposed. A key property of these PMU data matrices is that they are low rank. Using this property, various data management issues such as data compression, missing data recovery, data substitution detection, and disturbance triggering and location can be processing using singular-value based algorithms and convex programming. These functions are illustrated using some historical data from the Central New York power system.

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