# An Adaptive Scheme to Improve Prony's Method Performance to Estimate Signal Parameters of Power System Oscillations

**Publisher: IEEE**



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**Abstract:**

This work introduces a new methodology based on neural networks (NNs) and Prony's method to estimate the signal parameters during power oscillations related to transient phenomena caused by severe perturbations. Power system dynamic analysis becomes essential to establish reliability indices under critical conditions; these indices are commonly based on signal parameters estimated at different points throughout the power system. In this context, the proposed approach offers several advantages due to the adaptability of NNs. The proposed formulation is first analyzed with a signal model with different oscillating components. This technique is validated for a wide range of conditions, where the results show good accuracy to carry out the estimation of the signal parameters such as frequency and damping. In addition, the proposed method is validated using a multimachine power system with four synchronous generators considering different operating conditions that result in power oscillations; comparison results against the fast Fourier transform (FFT), conventional Prony's method, matrix pencil method, and Prony combined with Haar transform are included to prove the effectiveness of the proposed approach. Quantitative indexes, which exhibit the performance of the proposal, are presented to duly demonstrate the evolution of new adaptive scheme.