Power System Stability Assessment Method based on GAN and GRU-Attention using Incomplete Voltage Data

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Abstract

The social economy is growing rapidly, and the power grid load demand is increasing. To maintain the stability of the power grid, it is crucial to achieve accurate and rapid power system stability assessment. In the actual operation of the power network, data loss is an unavoidable situation. However, most of the data-driven models currently used assume that the input data is complete, which has obvious limitations in real-world applications. This paper suggests an IVS-GAN model to assess power system stability using incomplete PMU measurement data with random loss. The proposed method combines the super-resolution perception technology based on Generative Adversarial Network (GAN) with a time-series signal classification model. The generator adopts a one-dimensional U-Net network and uses convolutional layers to complete and recover missing data. The discriminator adopts a new GRU-Attention architecture proposed in this paper to better extract voltage temporal variation features on key buses. The result of this paper is that the stability evaluation method outperforms other algorithms in high voltage data loss rates on the New England 10-machine 39-bus system.

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