

Enhancing short-term forecasting in power systems with generative models and diffusion models

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The power system is a critical backbone for economic stability, which makes precise short-term forecasting indispensable in the field. Recent advancements in diffusion models have set new benchmarks in deep learning, particularly for time-series and spatio-temporal analysis. This study explores the application of Structured State Space Diffusion (SSSD) models to load data obtained from the New York Independent System Operator (NYISO). By incorporating structured state-space models into the neural network architecture of conditional diffusion models, SSSD effectively captures time dependencies and can be applied to spatio-temporal data. This approach demonstrates a promising avenue for improving the accuracy of day-ahead forecasts in power systems. Moreover, this study also considers uncertainty quantification by applying conformal prediction to adjust the prediction interval.