Abstract Title	A novel approach for forecasting non-stationary time series: Utilization of a variational autoencoder reflecting seasonal patterns
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Abstract	This study proposes a novel approach based on a variational autoencoder to enhance the forecasting performance of non-stationary time series, particularly those with pronounced seasonality. Specifically, the proposed method integrates a seasonal prior based on Fourier terms into a traditional variational autoencoder to generate replicated time series that reflect the seasonality of the original time series. Individual forecasting models are then applied to each replicated time series, and the final forecast is obtained through aggregation. Unlike a traditional variational autoencoder, the proposed method effectively learns seasonal variations through the seasonal prior, ensuring that the replicated time series reflect the seasonal characteristics of the original time series. To validate the applicability and effectiveness of the proposed approach, this study conducts a case study using electric vehicle charging demand data from Korea and compares various deep learning-based forecasting models. The proposed approach can be extended beyond simple time series forecasting and can be applied to a wide range of domains. In particular, it holds significant potential for real-world problems where seasonal patterns play a crucial role, such as economic and financial data analysis, energy consumption forecasting, weather data modeling, and public infrastructure demand prediction. Keywords: deep learning, Fourier terms, time series analysis, variational autoencoder

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