

# Short-Term Wind Speed Forecasting using Temporal Fusion Transformers

By

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**Abstracts:** Wind power generation is unpredictable and volatile due to its dependence on wind availability. As a result, reliable wind speed forecasting is vital for maximizing renewable energy generation and ensuring grid stability. In this work, a novel architecture known as the Temporal Fusion Transformer (TFT) is employed for short-term wind speed forecasting. An improved TFT (ITFT) model is developed by replacing the Long Short-Term Memory (LSTM) encoder with a Causal Dilated Convolutional Network (CDCN). This enhances computational efficiency, enabling the model to capture relevant temporal patterns in long historical wind-speed sequences. The effectiveness of the proposed ITFT model is evaluated using three datasets from distinct geographical locations, spanning four forecasting horizons: 30 minutes, 1 hour, 6 hours, and 24 hours. A new metric called the mean arctangent absolute percentage error (MAAPE) is employed to assess the accuracy of the forecasting model. The empirical results demonstrate that the proposed model outperforms the TFT, resulting in improvements of 21.3% in mean absolute error, 21.4% in root mean square error, and 14.7% in MAAPE across all datasets.



**Biography of the Presenter:** Prof. Jai Govind Singh received his Ph.D. (2008) and M.Tech. (2003) and B.E. (2001) degrees from IIT Kanpur, IIT Roorkee, and MNNIT Allahabad, respectively, all in Electrical Power Engineering. Prof. Singh joined the Asian Institute of Technology (AIT) in December 2009 and currently serves as an Associate Professor and Head of the Department of Energy and Climate Change at SERD, AIT, Thailand. Before joining AIT Bangkok, he worked as a Postdoctoral research associate (2008-2009) at the Royal Institute of Technology (KTH), Stockholm, Sweden.

He held a postdoctoral research fellowship at the University of Queensland in Brisbane, Australia, in 2009. His teaching and research interests include power system planning, operation, and control; Smart Grid and Microgrid; Electric vehicles and battery storage; deregulation; solar and wind integration; and power distribution system planning.

**Prof. Singh** has supervised 11 doctoral students (another 5 currently in progress) and 81 master's graduates. He has published more than 169 articles in different international journals (69), books (3), book chapters (7) in international conference proceedings (84), including IEEE, Elsevier, IET, John Wiley & Sons Ltd, and Taylor & Francis, etc. He has been involved in research/development projects (26) sponsored by international donors/agencies with a total value of US\$3,024,896. Furthermore, he has successfully organized six training programs, including two recent WePOWER SAR100 and SAR100-2.0 programs, which trained 211 mid-career women in the energy industry from seven South Asian countries. Additionally, he

organized the international conference ICUE 2018 and served as a member of the technical committee for several other conferences. He has been regularly invited and has participated in numerous international conferences and training programs as a keynote speaker (25) and expert (50+). He is also a senior member of the IEEE Power and Energy Systems and a Fellow of the Institution of Engineers (India). For more details, his profile is available at <https://ait.ac.th/people/dr-jai-govind-singh/>.