Tutorial Proposal: Time Series Analytics: Challenges, Foundation Models, and Benchmarking

Abstract

Time series data is widely applied in various fields such as transportation, healthcare, and energy. This report focuses on the time series foundation models for forecasting, anomaly detection, and classification tasks, systematically introducing several key elements of their construction, such as the selection and construction of pre-training data, the design of generalizable model architectures and training strategies, and presents the current mainstream methods and models from these aspects. Through this report, the audience will gain a comprehensive understanding of the technical system and development trends of time series foundation models, providing references for subsequent research and practical applications. As a result, research on time series methods has become crucial. To advance progress in this area, we propose OpenTS, an automated benchmarking framework for time series forecasting and anomaly detection methods. OpenTS addresses current research challenges, including insufficient coverage of data domains, bias toward traditional methods, and inconsistent and inflexible processes. We improve data domain coverage by incorporating datasets from 10 different fields and provide time series characterization to ensure the comprehensiveness of these datasets. Additionally, OpenTS supports the integration of various methods, including statistical learning, machine learning, and deep learning approaches, and offers multiple evaluation strategies and metrics to ensure comprehensive assessment of different methods. Moreover, with the recent rising of time series foundation models, OpenTS also includes the recently proposed methods in different forecasting strategies, including zero-shot, few-shot, and full-shot, thereby facilitating more thorough evaluations.

Duration

Total Time: 1.5 hours (90 minutes)

Outline

Time	Session	Content
0:00 – 0:10 (10 min)	Part I – Challenges of Time Series Data	Time Series data overview
0:10 – 0:50 (40 min)	Part II – Time Series Foundation Models	Foundation models in time series data.
0:50 – 1:25 (35 min)	Part III – Time Series	Benchmarking on time series methods in

	Benchmarking	forecasting and anomaly detection
1:25 – 1:30 (5 min)	Discussion & Q&A	Audience interaction and closing summary.

Organiser Biographies

Prof. Jilin Hu
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Dr. Hu Jilin is a professor at East China Normal University, selected for the National Youth Talent Program in 2022. He has held positions as a tenured associate professor and tenure-track assistant professor in the Department of Computer Science at Aalborg University and has been a visiting scholar at the University of California, Berkeley. His research focuses on spatiotemporal data management and analysis, transportation analysis and prediction, and graph neural networks. He has published over 50 papers in CCF-recommended top-tier international journals and conferences and has received the Best Paper Award at ICDE 2022 and a Best Paper Nomination at PVLDB 2024.

Dr. Yang Shu
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Shu Yang is a lecturer and Chenhui Scholar at the School of Data Science and Engineering, East China Normal University. He received his Ph.D. from the School of Software, Tsinghua University. His main research interests lie in time series analysis and transfer learning. He has published over twenty papers in top conferences and journals such as ICML, NeurIPS, ICLR, TPAMI, and VLDB. He serves as an executive committee member of the CCF Technical Committee on Database and is a reviewer for top conferences and journals including ICML, NeurIPS, ICLR, TPAMI, AIJ, and IJCV.