Shengzhong Mao

CONTACT INFORMATION

Department of Computer Science
The University of Manchester
Manchester, M13 9PL, UK

Email: shengzhong.mao@manchester.ac.uk
Web: Google Scholar, Homepage
Tel: (+44)0753-613-6657

RESEARCH INTEREST

My research interests cover machine learning and data mining, particularly in learning graph representations for time series data. I aim to explore temporal patterns within multivariate sequences, leveraging this insight to advance predictive strategies in practical applications.

EDUCATION

Ph.D. in Computer Science — Sept. 2020 - Mar. 2024
University of Manchester — Manchester, UK
Supervisor: Prof. Xiaojun Zeng
Thesis: Visibility Graph Networks for Time Series Forecasting

B.Eng. in Network Engineering — Sept. 2016 - Jun. 2020
Yuan Longping Class (Honors College)[1] — Chongqing, CN
Southwest University (GPA: 4.0/4.0)

Exchage Student — Sept. 2017 - Jan. 2018
National Chung Hsing University (GPA: 4.0/4.0) — Taichung

PUBLICATIONS

[1] **S. Mao**, X. Zeng. Learning Visibility Attention Graph Representation for Time Series Forecasting. *Proceedings of the 32nd ACM International Conference on Information and Knowledge Management* (CIKM 2023).

[2] **S. Mao**, X. Zeng. SimVGNets: Similarity-Based Visibility Graph Networks for Carbon Price Forecasting. *Expert Systems With Applications* 230 (2023) 120647.

[3] **S. Mao**, X. Zeng. Multiplex Convolutional Visibility Graph Networks for Multivariate Carbon Price Forecasting. *IEEE Transactions on Knowledge and Data Engineering.* (Under Review)

[4] **S. Mao**, X. Zeng. AVGNets: Angular Visibility Graph Networks with Probability Attention for Time Series Forecasting. *IJCAI 2023 Workshop on Artificial Intelligence for Time Series Analysis (AI4TS).*

[5] **S. Mao**, X. Zeng. DVGNets: Differential Visibility Graph Networks for Time Series Forecasting. *Knowledge-Based Systems.* (Under review)

[6] **S. Mao**, C. Tseng, J. Shang, Y. Wu, X. Zeng. Construction Cost Index Prediction: A Visibility Graph Network Method. *2021 International Joint Conference on Neural Networks* (IJCNN 2021).

[7] **S. Mao**, Y. Deng, D. Pelusi. Alternatives selection for produced water management: A network-based methodology. *Engineering Applications of Artificial Intelligence* 91 (2020) 103556.

[8] **S. Mao**, Y. Han, Y. Deng, D. Pelusi. A hybrid DEMATEL-FRACTAL method of handling dependent evidences. *Engineering Applications of Artificial Intelligence* 91 (2020) 103543.

[9] **S. Mao**, F. Xiao. Time series forecasting based on complex network analysis. *IEEE Access* 7 (2019) 40220-40229.

[10] **S. Mao**, F. Xiao. A novel method for forecasting Construction Cost Index based on complex network. *Physica A: Statistical Mechanics and its Applications* 527 (2019) 121306.

[11] **S. Mao**, F. Xiao, Z. Cao, D. Pelusi. An adaptive visibility graph power averaging aggregation (AVGPA) operator and its application in financial time series. *Soft Computing.* (Under review)

[12] Y. Wu, C. Tseng, J. Shang, **S. Mao**, N. Goran, X. Zeng. EDU-level Extractive Summarization with Varying Summary Lengths. *Findings of the 17th Conference of the European Chapter of the Association for Computational Linguistics* (EACL 2023).

[1] The honors program for top-talent students, selecting no more than 1% (40 of over 9,000) students annually.

[13] C. Tseng, S. Lee, J. Feng, **S. Mao**, Y. Wu, J. Shang, X. Zeng. UPANets: Learning from the Universal Pixel Attention Neworks. *Entropy* 24 (2022) 1243.

[14] J. Shang, X. Zeng, Y. Wu, **S. Mao** and C. Tseng. A machine learning approach for functional data classification based on unified basis functions. *Information Sciences.* (Under Review)

Research Experience

Graph Representation Learning for Time Series Forecasting Sept. 2020 - Mar. 2024
Research Assistant at Machine Learning and Robotics Group Manchester, UK

- Proposed weighting scheme for time series encoding by mapping binary relations into weighted networks, which overcomes information loss of graph mapping.
- Extended the concept of single-layer graph to multiplex networks, and introduced intra-layer and inter-layer similarities to extracts past and recent sequential knowledge.
- Introduced ProbAttention mechanism to evaluate probabilistic attention distribution for multivariate long-term sequence modeling and forecasting.

Related works: [1] [2] [3] [4]

Decision Making Under Uncertainty in Complex Systems Jun. 2019 - Sept. 2019
Research Intern at Center for Mathematics and Systems Science Chengdu, CN

- Addressed inner and outer dependence in evidence theory under uncertainty, and achieved higher sensitivity and accuracy in transportation project selection.
- Developed a decision-making framework applicable to complex systems, applying to products and process strategies selection for produced water management.

Related works: [7] [8]

Time Series Fusion and Prediction by Complex Networks Mar. 2018 - Jun. 2020
Research Assistant at Information Fusion and Intelligent System Lab Chongqing, CN

- Investigate time series data via complex networks analysis, exploring potential links in temporal networks by link prediction based on random walk.
- Proposed network-based models for time series aggregation and improved predictive accuracy on real-world datasets, offering a novel promising avenue of network forecasting.

Related works: [9] [10] [11]

Honors and Awards

- President's Doctoral Scholarship Award, University of Manchester (Top 1%) 2020-2023
- President's Doctoral Scholarship Development Fund (£500) 2023
- National Scholarship, China Ministry of Education (Top 1%) 2019-2020
- Innovation Funding Program, Southwest University (¥2,000) 2019-2020
- Top-Talent Students Cultivation Program, Southwest University (Top 1%) 2016-2020
- Honorable Mention, International Mathematical Contest in Modeling 2019
- First Provincial Prize, National Mathematical Contest in Modeling 2019

Conferences &Talks

- The 32nd International Joint Conference on Artificial Intelligence@AI4TS (IJCAI'23) 2023
- ACM International Conference on Information and Knowledge Management (CIKM'23) 2023
- 2021 International Joint Conference on Neural Networks (IJCNN'21) 2021
- The 16th China Network Science Forum (CNETSCI'20) 2020

Professional Services

- Reviewer: Information Sciences, Information Fusion, IEEE TFS, IEEE TKDE, EAAI, etc.
- Committee Member: Computation Tools 2024
- Session Chair: CIKM 2023

Teaching Experience

Teaching Assistant Oct. 2020 - Present
Department of Computer Science, University of Manchester Manchester, UK

- COMP11120 Mathematical Techniques for Computer Science
- COMP11212 Fundamentals of Computation
- COMP24112 Machine Learning
- COMP26020 Programming Languages
- COMP66090 Masters Project

Computer Skills

- Programming Languages & Tools: Python, MATLAB, C/C++, LaTeX, PyTorch, TensorFlow.