

ZHENGMENG ZHAI

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Summary

Zheng-Meng Zhai is a 4th-year Ph.D. student in Electrical Engineering at Arizona State University under the supervision of Prof. Ying-Cheng Lai. His background is in physics and he is interested in nonlinear dynamics and chaos, machine learning and neural networks, reservoir computing, and time series analysis. He has actively pursued these interests through his doctoral studies, where he had the opportunity to delve into cutting-edge research and contribute to the advancement of knowledge in these fields.

Education

Southwest Jiaotong University

Bachelor of Electronic Information Science and Technology

Sep. 2015 – May 2019

Chengdu, Sichuan, China

East China Normal University

Master of Theoretical Physics

Sep. 2019 – June 2022

Shanghai, China

Arizona State University

Ph.D. of Electrical, Computer and Energy Engineering

Sep. 2021 – Now

Arizona, USA

Publications

- [10] **Zheng-Meng Zhai**, Mohammadamin Moradi, Shirin Panah, Zhi-Hua Wang, and Ying-Cheng Lai. “Machine-learning nowcasting of the Atlantic Meridional Overturning Circulation,” *APL Machine Learning*, **2**, 036103, (2024).
- [9] Mohammadamin Moradi, Shirin Panah, **Zheng-Meng Zhai**, Yang Weng, John Dirkman, and Ying-Cheng Lai. “Heterogeneous reinforcement learning for defending power grids against attacks,” *APL Machine Learning*, **2**, 026121, (2024).
- [8] Mohammadamin Moradi, **Zheng-Meng Zhai**, Aaron Nielsen, and Ying-Cheng Lai. “Random forests for detecting weak signals and extracting physical information: A case study of magnetic navigation,” *APL Machine Learning*, **2**, 016118, (2024).
- [7] **Zheng-Meng Zhai**, Mohammadamin Moradi, Bryan Glaz, Mulugeta Haile, and Ying-Cheng Lai. “Machine-learning parameter tracking with partial state observation,” *Physical Review Research*, **6**, 013196, 1-19 (2024).
- [6] **Zheng-Meng Zhai**, Mohammadamin Moradi, Ling-Wei Kong, Bryan Glaz, Mulugeta Haile, and Ying-Cheng Lai. “Model-free tracking control of complex dynamical trajectories with machine learning,” *Nature Communications*, **14**, 5968, 1-11 (2023). Highlighted as a Featured Article
- [5] **Zheng-Meng Zhai**, Ling-Wei Kong, and Ying-Cheng Lai. “Emergence of a resonance in machine learning,” *Physical Review Research*, **5**, 033127, 1-12 (2023).
- [4] **Zheng-Meng Zhai**, Mohammadamin Moradi, Ling-Wei Kong, and Ying-Cheng Lai. “Detecting Weak Physical Signal from Noise: A Machine-Learning Approach with Applications to Magnetic-Anomaly-Guided Navigation,” *Physical Review Applied*, **19**, 034030, 1-18 (2023).
- [3] Yong-Shang Long, **Zheng-Meng Zhai**, Ming Tang, Ying Liu, and Ying-Cheng Lai. “Structural position vectors and symmetries in complex networks,” *Chaos*, **32**, 093132, 1-24 (2022). Featured in Scilight
- [2] Yong-Shang Long, **Zheng-Meng Zhai**, Ming Tang, and Ying-Cheng Lai. “Metamorphoses and explosively remote synchronization in dynamical networks,” *Chaos*, **32**, 043110, 1-10 (2022).

[1] **Zheng-Meng Zhai**, Yong-Shang Long, Ming Tang, Zonghua Liu, and Ying-Cheng Lai. “Optimal inference of the start of COVID-19,” *Physical Review Research*, **3**, 013155, 1-12 (2021).

Technical Skills

Languages: Python, Matlab, Java, C, R, Mathematica

Developer Tools: VS Code, Eclipse

Technologies/Frameworks: Linux, GitHub, Tensorflow, Keras, Pytorch

Research Interests: Machine learning (e.g., Transformer, RNN, VAE), Time series forecasting, Nonlinear dynamics and chaos, Reservoir computing, Nonlinear control, Complex networks

Service

Journal Reviewer: Physical Review X, Physical Review X Energy, Physical Review Applied, IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Artificial Intelligence, Neurocomputing, Information Fusion, Information Sciences, IEEE Access, Plos One.

Talks

APS March Meeting 2023

March 2023

Model-free tracking control of regular and chaotic trajectories with machine learning

Las Vegas, Nevada

APS March Meeting 2024

March 2024

Tracking parameter variations in nonlinear dynamical systems using machine learning

Minneapolis, Minnesota

News and Media Coverage

- Helping robots follow a new path, *Nanowerk* (Oct. 2023)
- Helping robots follow a new path, *ASU News* (Oct. 2023)
- Machine learning research enables Robots to traverse flexible, complex trajectories, *Wisdom of Science* (Oct. 2023)
- Nat. Commun. Express: Model-free tracking control of complex dynamic trajectories based on machine learning, *Swarma Club* (Oct. 2023)
- Nat. Commun. Express: Model-free tracking control of complex dynamic trajectories based on machine learning, *The Paper* (Oct. 2023)
- Nature Communications: Model-free tracking control of complex dynamic trajectories based on machine learning, *AI Energy* (Sept. 2023)
- ‘Time Zero’ tool adds dimension to COVID-19 arrival, spread and mutations, *ASU News* (Feb. 2021)

References

- Prof. Ying-Cheng Lai, Arizona State University, Advisor.