Shengyu Chen

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RESEARCH INTERESTS

Knowledge-guided Machine Learning, Spatial-temporal Data Mining, AI for Science, Generative Modeling, LLMs

EDUCATION

University of Pittsburgh, Pittsburgh PA
Ph.D. in Computer Science — Expected May. 2025

- **Advisor:** Xiaowei Jia, Pitt Data Mining Lab.

Indiana University Bloomington, Bloomington IN
M.S. in Computer Science — Dec. 2018

- **Advisor:** Feng Qian.

Indiana University Bloomington, Bloomington IN
B.S. in Computer Science, **Minor:** Mathematics — Dec. 2017

AWARDS

SDM Best Doctoral Forum Poster Award 2023
SDM Best Paper Award 2023
SDM Travel Grant 2023, 2024
Indiana University Graduate Student Fellowship 2017

PUBLICATIONS (* denotes equal contribution)

1. **Shengyu Chen***, Shihang Feng*, Yao Huang, Zhou Lei, Xiaowei Jia, Youzuo Lin, Estaben Rougier, "HOSSnet: an Efficient Physics-Guided Neural Network for Simulating Crack Propagation.", Computational Materials Science, 2024.

2. **Shengyu Chen**, Shihang Feng, Yi Luo, Xiaowei Jia, Youzuo Lin, "BrainPuzzle: A New Data-Driven Method for Ultrasound Brain Imaging.", SPIE. Medical Imaging, 2024.

3. **Shengyu Chen**, Tianshu Bao, Peyman Givi, Can Zheng, Xiaowei Jia, "Reconstruction of Turbulent Flows Using Physics-Guided Spatio-Temporal Dynamics.", ACM Transactions on Intelligent Systems and Technology (TIST), 2023.

4. **Shengyu Chen**, Nasrin Kalanat, Simon Topp, Jeffery Sadler, Yiqun Xie, Zhe Jiang, Xiaowei Jia, "Meta-Transfer-Learning for Time Series Data with Extreme Events: An Application to Water Temperature Prediction.", Conference on Information and Knowledge Management (CIKM), 2023.

5. **Shengyu Chen**, Nasrin Kalanat, Yiqun Xie, Sheng Li, Jacob Zwart, Jeffrey Sadler, Alison Appling, Samantha Oliver, Jordan Read, Xiaowei Jia, "Physics-Guided Machine Learning from Simulated Data with Different Physical Parameters.", Knowledge and Information Systems (KIS), 2023.

6. (**Best Paper Award**) **Shengyu Chen**, Yiqun Xie, Xiang Li, Xu Liang, Xiaowei Jia, "Physics-Guided Meta-Learning Method in Baseflow Prediction over Large Regions.", In Proceedings of the 2023 SIAM International Conference on Data Mining (SDM), 2023.

7. Xiaowei Jia, **Shengyu Chen**, Can Zheng, Yiqun Xie, Zhe Jiang, Nasrin Kalanat, "Physics-guided Graph Diffusion Network for Combining Heterogeneous Simulated Data: An Application in Predicting Stream Water Temperature.", In Proceedings of the 2023 SIAM International Conference on Data Mining (SDM), 2023.

8. **Shengyu Chen**, Jacob A. Zwart, and Xiaowei Jia, "Physics-Guided Graph Meta Learning for Predicting Water Temperature and Streamflow in Stream Networks.", In Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), 2022.

9. Bao, Tianshu*, **Shengyu Chen***, Taylor T. Johnson, Peyman Givi, Shervin Sammak, and Xiaowei Jia, "Physics Guided Neural Networks for Spatio-temporal Super-resolution of Turbulent Flows.", In The 38th Conference on Uncertainty in Artificial Intelligence (UAI). 2022.

10. Jia, Xiaowei, **Shengyu Chen**, Yiqun Xie, Haoyu Yang, Alison Appling, Samantha Oliver, and Zhe Jiang, "Modeling Reservoir Release Using Pseudo-Prospective Learning and Physical Simulations to Predict Water Temperature.", In Proceedings of the 2022 SIAM International Conference on Data Mining (SDM), 2022.

11. Guo, Chen, Yaojin Lin, **Shengyu Chen**, Zhichun Zeng, Mingwen Shao, and Shaozi Li, "From the whole to detail: Progressively sampling discriminative parts for fine-grained recognition.", Knowledge-Based Systems (KBS), 2022.

12. **Shengyu Chen**, Shervin Sammak, Peyman Givi, Joseph P. Yurko, and Xiaowei Jia, "Reconstructing High-resolution Turbulent Flows Using Physics-Guided Neural Networks.", In 2021 IEEE International Conference on Big Data (Big Data), 2021.

13. **Shengyu Chen**, Alison Appling, Samantha Oliver, Hayley Corson-Dosch, Jordan Read, Jeffrey Sadler, Jacob Zwart, and Xiaowei Jia, "Heterogeneous stream-reservoir graph networks with data assimilation.", In 2021 IEEE International Conference on Data Mining (ICDM), 2021.

14. Jia, Xiaowei, Yiqun Xie, Sheng Li, **Shengyu Chen**, Jacob Zwart, Jeffrey Sadler, Alison Appling, Samantha Oliver, and Jordan Read, "Physics-Guided Machine Learning from Simulation Data: An Application in Modeling Lake and River Systems.", In 2021 IEEE International Conference on Data Mining (ICDM), 2021.

15. Lin, Guoping, Fengling Liu, **Shengyu Chen**, and Xiaolong Yu, "Updating knowledge in multigranulation decision-theoretic rough set model based on decision support degree.", The Journal of Engineering, 2020.

16. Liu, Bin*, **Shengyu Chen***, Ke Yan, and Fan Weng, "iRO-PsekGCC: identify DNA replication origins based on pseudo k-tuple GC composition.", Frontiers in Genetics, 2019.

17. Liu, Yumeng, **Shengyu Chen**, Xiaolong Wang, and Bin Liu, "Identification of intrinsically disordered proteins and regions by length-dependent predictors based on conditional random fields.", Molecular Therapy-Nucleic Acids (MTNA), 2019.

PAPERS UNDER REVIEW

1. **Shengyu Chen**, Peyman Givi, Can Zheng, Xiaowei Jia, "Modeling of Continuous Spatial-Temporal Dynamics of Turbulent Flow with a Test-Time Refinement.", In 2024 IEEE International Conference on Data Mining (ICDM), 2024.

2. Jin Cao, Renxiong Liu, **Shengyu Chen**, "Score-based Solution Path Algorithm for Root Cause Analysis.", Neural Information Processing Systems (NeurIPS), 2024.

3. **Shengyu Chen**, Peyman Givi, Can Zheng, Xiaowei Jia, "Physics-enhanced Neural Operator: An Application in Simulating Turbulent Transport.", In Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), 2024.

4. Shiyuan Luo, Juntong Ni, **Shengyu Chen**, Runlong Yu, Yiqun Xie, Licheng Liu, Zhenong Jin, Huaxiu Yao, Xiaowei Jia, "FREE: The Foundational Semantic Recognition for Modeling Environmental Ecosystems.", In Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), 2024.

5. Xiaowei Jia, **Shengyu Chen**, Can Zheng, Yiqun Xie, Zhe Jiang, Nasrin Kalanat, "Learning from Heterogeneous Simulated Data: An Application in Predicting Stream Water Temperature.", ACM Transactions on Spatial Algorithms and Systems (TSAS), 2023.

WORKSHOP TALKS

1. **Shengyu Chen**, Peyman Givi, Can Zheng, and Xiaowei Jia, "Physics-Aware Spatio-Temporal Dynamics and Test-Time Refinement for Turbulent Flow Reconstruction.", Bulletin of the American Physical Society (APS), 2023.

2. **Shengyu Chen**, Peyman Givi, and Xiaowei Jia, "Physics Guided Neural Networks for Spatio-temporal Super-resolution of Turbulent Flows.", Bulletin of the American Physical Society (APS), 2022.

3. **Shengyu Chen**, Yiqun Xie, Xiang Li, Xu Liang, Xiaowei Jia, "Physics-Guided Meta-Learning Method in Baseflow Prediction over Large Regions.", HydroML 2022.

4. **Shengyu Chen**, Shervin Sammak, Peyman Givi, Joseph P Yurko, Xiaowei Jia, "Physics-Guided Neural Networks for Reconstructing High-resolution Turbulent Flows. ", Bulletin of the American Physical Society (APS), 2021.

5. **Shengyu Chen**, Alison Appling, Samantha Oliver, Hayley Corson-Dosch, Jordan Read, Jeffrey Sadler, Jacob Zwart, and Xiaowei Jia, "Heterogeneous stream-reservoir graph networks with data assimilation.", DSOS 2021.

PROFESSIONAL SERVICE

ACML Conference Peer Review	2024
KDD Conference Peer Review	2024
IJCAI Conference Peer Review	2024
PAKDD Conference Peer Review	2024
AAAI Conference Peer Review	2024
SDM Conference Peer Review	2023, 2024
UAI Conference Peer Review	2023, 2024
Reviewer of IEEE Transactions on Big Data	2023
ECML PKDD Workshop Peer Review	2023
Session Chair of SDM Conference	2023, 2024

ACADEMIC EXPERIENCE

Graduate Student Researcher at University of Pittsburgh Sep. 2020 - Present

- Join Professor Xiaowei Jia's lab, with a focus on designing and integrating novel machine learning methods with scientific knowledge to various scientific problems in climate science, hydrology, healthcare, and computational fluid dynamics.

Teaching Assistant at University of Pittsburgh Jan. 2022 - May. 2022

- Assist professors in two courses: Discrete Mathematics and Bioinformatics, focusing on conducting recitation sessions and holding office hours.

Research Associate at Minnan Normal University Feb. 2019 - Jul. 2020

- Join the team of professors of Yaojin Lin and Guoping Lin, with a focus on the research direction of multi-label learning.

Teaching Assistant at Indiana University Bloomington Aug. 2017 - Dec. 2018

- Assist Professor Mitja in teaching courses including object-oriented programming, data structures, Python programming, and computer graphics, for over 200 IU students.

Research Assistant at Indiana University Bloomington May. 2018 - Jul. 2018

- Assist Professor Feng Qian in research on mobile computing and networking for accelerating the download speed of mobile phones and enhancing the safety of downloading process.

INTERNSHIPS & WORK EXPERIENCES

Research Scientist Intern at NEC Laboratory America May. 2024 - Present

- Design and apply a new multi-agent framework (incorporating users' personalities) to address the challenge of user coordination in the supply chain.

Research Scientist Intern at Nokia Bell Laboratory Jan. 2024 - April. 2024

- Design and apply new machine learning techniques to address the challenges for causal discovery and root cause analysis.

Ph.D Student Researcher at Los Alamos National Laboratory May. 2022 - Dec. 2023

- Design and apply new machine learning models augmented with physics knowledge to address material science challenges, such as microcrack propagation, as well as medical imaging problems, including brain imaging.

ACTIVITIES

Vice President of Career Development Dept, IUCSSA Jan. 2021 - Dec. 2016
Vice President of Planning Department, DCIU Volunteer Organization Sep. 2015 - Dec. 2016
Vice President of Professional Department, Indiana University CS Club Jan. 2016 - May. 2016
Piano Performer, IUB Jacobs School Music Recitation Feb. 2016

ADDITIONAL INFORMATION

Computer: Pytorch, Tensorflow, Python, Matlab, R, JS, React, Git, C, Java.
Skills: Amateur Level Ten in Piano (Top Level), Music Composition, Drawing, Basketball, Tennis, Billiard, Bowling, and Golf.