Lin **Yan**

Postdoctoral Fellowship · Environmental Science & Mathematics and Computer Science · Argonne National Laboratory

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Education

University of Utah — *Utah, U.S.A*

Ph.D. in Computing — *Aug. 2017 - May. 2022*

- Advisor: Bei Wang Phillips
- Research Area: Topological Data Analysis, Data Visualization, Machine Learning, and Data Mining
- Dissertation: Merge Trees and Their Variants for Scientific Visualization

Shanghai Jiao Tong University (SJTU) — *Shanghai, China*

M.S. in Control Science and Engineering — *Sep. 2010 - Mar. 2013*

- Advisor: Xingqun Zhan
- Research Area: GNSS Signal Acquisition and Processing, Real - Time Kinematic (RTK) Technology

Shanghai Jiao Tong University — *Shanghai, China*

B.S. in Automation — *Sep. 2006 - June. 2010*

- Core Courses: C++, Digital Electronics Technology, Analog Electronic Technology, Discrete Control System, Digital Signal Processing

Research Interests

- Topological Data Analysis
- Data Visualization
- Uncertainty Visualization
- Machine Learning
- Data Mining

Skills

Programming Languages Python, Node.JS, C/C++, JavaScript, Matlab, LaTeX

English, Chinese

Publications

- **Lin Yan**, Hanqi Guo, Tom Peterka, Bei Wang, Jiali Wang. TROPHY: A Topologically Robust Physics-Informed Tracking Framework for Tropical Cyclones. IEEE Transactions on Visualization and Computer Graphics (TVCG, Proceedings of IEEE Visualization Conference), 2023 (accepted).
- **Lin Yan**, Xin Liang, Hanqi Guo, Bei Wang. TopoSZ: Preserving Topology in Error-Bounded Lossy Compression. IEEE Transactions on Visualization and Computer Graphics (TVCG, Proceedings of IEEE Visualization Conference), 2023 (accepted).
- **Lin Yan**, Luke van Roekel, Paul Ullrich, Bei Wang, Hanqi Guo. Multi-Level Robustness for 2D Vector Field Feature Tracking, Selection, and Comparison. Computer Graphics Forum, 2023.
- **Lin Yan**, Talha Bin Masood, Farhan Rasheed, Ingrid Hotz, Bei Wang. Geometry Aware Merge Tree Comparisons for Time-Varying Data. IEEE Transactions on Visualization and Computer Graphics, 2022.
- **Lin Yan**, Talha Bin Masood, Raghavendra Sridharamurthy, Farhan Rasheed, Vijay Natarajan, Ingrid Hotz, Bei Wang. Scalar Field Comparison with Topological Descriptors: Properties and Applications for Scientific Visualization. Eurographics Conference on Visualization (EuroVis), 2021. Computer Graphics Forum, 40(3), pages 599-633, 2021.
- Tushar Athawale, Dan Maljovec, **Lin Yan**, Chris R. Johnson, Valerio Pascucci, Bei Wang. Uncertainty Visualization of 2D Morse Complex Ensembles Using Statistical Summary Maps. IEEE Transactions on Visualization and Computer Graphics, 2020.
- Roxana Bujack, **Lin Yan**, Ingrid Hotz, Christoph Garth, Bei Wang. State of the Art in Time-Dependent Flow Topology: Interpreting Physical Meaningfulness Through Mathematical Properties. Eurographics Conference on Visualization (EuroVis), 2020.
- **Lin Yan**, Yusu Wang, Elizabeth Munch, Ellen Gasparovic, Bei Wang. A Structural Average of Labeled Merge Trees for Uncertainty Visualization. IEEE Transactions on Visualization and Computer Graphics (TVCG, Proceedings of SciVis), 2019.
- **Lin Yan**, Yaodong Zhao, Paul Rosen, Carlos Scheidegger, Bei Wang. Homology-Preserving Dimensionality Reduction via Manifold Landmarking and Tearing. Visualization in Data Science (VDS) at IEEE Visualization Conference, 2018.
- Hua Wang, **Lin Yan**, Heng Huang, and Chris Ding. From Protein Sequence to Protein Function via Multi-Label Linear Discriminant Analysis. IEEE/ACM Transactions on Computational Biology and Bioinformatics, 2016.

- Hongchang Gao, **Lin Yan**, Weidong Cai, Heng Huang. Anatomical Annotations for Drosophila Gene Expression Patterns via Multi-Dimensional Visual Descriptors Integration: Multi-Dimensional Feature Learning. Proceedings of the 21th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining. ACM, 2015.
- Hongchang Gao, Chengtao Cai, Jingwen Yan, **Lin Yan**, Joaquin Goni Cortes, Yang Wang, Feiping Nie, John West, Andrew Saykin, Li Shen, Heng Huang. Identifying connectome module patterns via new balanced multi-graph normalized cut. International Conference on Medical Image Computing and Computer-Assisted Intervention. Springer, Cham, 2015.
- **Lin Yan**, Xingqun Zhan. Advantage analysis and verification of the GPS/BeiDou integrated satellite navigation system. Journal of Shanghai Jiao Tong University, 47(8): 1169-1172, 2013.

Work Experience

Argonne National Laboratory - Postdoctoral Fellowship
Illinois, U.S.A

Environmental Science & Mathematics and Computer Science Division — *June 2022 - present*

- Developed topological techniques which can be applied to earth science and address critical questions such as feature tracking, uncertainty quantification, and critical structure retrieval.

Argonne National Laboratory - Summer Internship
Illinois, U.S.A

Mathematics and Computer Science Division — *May 2021 - August 2021*

- Developed analysis and visualization methods for understanding uncertainties in ensemble ocean climate models.
- Proposed a topology-preserving scalar field compression technique.

Los Alamos National Laboratory - Summer Internship
New Mexico, U.S.A

Data Science at Scale School — *May 2019 - August 2019*

- Feature detection through classical vector field topology.
- Extended the definitions of source, sink, and saddle in classic steady vector field to finite-time vector field

Shanghai Jiao Tong University - Engineer
Shanghai, China

Department of Electronic Engineering — *May 2013 - July. 2016*

- Designed and maintained interactive websites for ee.sjtu.edu.cn
- Participated in international cooperation projects in a joint research lab between SJTU and the University of Texas at Arlington

Research Experience

Environmental Science & Mathematics and Computer Science Divisions, Argonne National Laboratory
Utah, U.S.A

Postdoctoral Fellowship — *June 2022 - PRESENT*

- Combined topological, geometric, statistical, data mining, and machine learning techniques with visualization to study large and complex data for understanding uncertainties and physics insight in earth system models.
- Developed an interactive visualization framework to detect and track tropical cyclones.
- Implemented machine learning and topological data analysis in the study of the climate teleconnection problem and freezing rain prediction.
- Developed an error-bounded lossy compression method that preserves the topological features in 2D and 3D scalar fields.

School of Computing, University of Utah
Utah, U.S.A

Assistant Researcher — *Aug. 2017 - May 2022*

- Worked on high-dimensional data analysis with topological interpretation and participated in several projects related to data mining, bioinformatics and social networks.
- Designed an algorithm to compute structural averages of a set of labeled merge trees and utilizing such averages in uncertainty visualization. Provided an interactive visualization system to demonstrate this proposed algorithm.
- Studied the scalar field comparison methodologies based on topological descriptors, including their proprieties and the application for scientific visualization.
- Topological data analysis and visualization of vector and tensor field, including feature extraction, tracking, selection, and comparison.
- Designed a dimensionality reduction technique that achieves the criterion of homology preservation, a generalized version of topology preservation using topology-inspired manifold landmarking and manifold tearing and evaluated the effectiveness of this technique.

Data Science Lab Joint Research Between SJTU and University of Texas at Arlington
Texas, U.S.A

Researcher & Software Engineer — *May 2014 - Mar. 2016*

- Conducted data mining and bioinformatics research under Dr. Heng Huang. Published three research papers in KDD, MICCAI, TCBB with other PhD students on the team.
- Participated in the structured-sparse-learning-based data integration algorithm design and implementation, and conducted the experiments on Drosophila gene expression pattern recognition.
- Implemented the multi-label linear discriminant analysis algorithm with application to protein function prediction.
- Implemented the balanced normalized cut method and applied this method for multi-graph pattern finding in connectome research.

National GNSS Research Center, Korea & Institute of Aerospace Science, China

Daejeon, S.Korea

Software & Hardware Engineer & Researcher

May 2011 - Dec. 2012

- Participated in the entire project cycle, including documentation, application, implementation and evaluation for the BeiDou (BeiDou Navigation Satellite System, BDS) demonstration system in Korea. Wrote the draft of the implementation plan and finished work in Korea as the only engineer from China.
- Installed the required software and hardware for the BeiDou demonstration project in Korea and tested its operation and process data for Prof. Sang Jeong Lee's report in ICG-7 (A conference for Reference Frames, Timing and Applications was held at Beijing International Convention Center (BICC) on 7th November 2012 by the International Committee on Global Navigation Satellite Systems).

Department of Aerospace Information and Control, SJTU

Shanghai, China

Assistant Researcher

Mar. 2012 - Mar. 2013

- Participated in designing an integrated control system for an autonomous underwater vehicle.
- Constructed the hardware and software for a four-mode reference station, which collects and processes GNSS signals.
- Created the ionosphere model products based on a four-mode reference station using a BDS/GPS dual system assisted by GPS in order to improve its accuracy.