Xiaohan Wang

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Google Scholar | GitHub

Education

- **Vanderbilt University, Ph.D. in Computer Science**
  Aug. 2023 - Expected May. 2028 *Nashville, U.S.*
- **Nanjing Normal University, B.Eng. in Software Engineering**
  Sep. 2019 - Jun. 2023 *Nanjing, PRC*

Experience

- **Vanderbilt University**
  Research Assistant, advised by Prof. Berger. *Aug. 2023 - Present*
  - Working on visual analysis for neural fields, focusing on adapting machine learning techniques to improve visual data exploration and how visualization can be used to help various aspects of machine learning.
- **The Hong Kong University of Science and Technology**
  Research Intern, advised by Prof. Wang, and co-advised by Prof. Zeng. *Oct. 2022 - Apr. 2023*
  - Contributed as a primary author to a research paper that was accepted and published in Visual Informatics.
- **Shandong Future Network Research Institute**
  Research Intern *Jul. 2022 - Dec. 2022*
  - Independently developed and implemented a backend algorithm module for a computer vision project, which successfully passed the testing phase.
- **Nanjing Normal University**
  Elite Talent Program *Nov. 2020 - Nov. 2022*
  - Selected as one of the Top 30 students across the university. Worked in a team of three under the guidance of Prof. Liu, where we completed research tasks and co-authored multiple papers. Our team was funded with $10,000 by the school.

Publications

[1] **Xiaohan Wang**, and Matthew Berger, "Topology Guidance: Controlling the Outputs of Generative Models via Vector Field Topology", arXiv preprint (currently on hold), 2025. PDF

[2] Bingyuan Wang, Qing Shi, **Xiaohan Wang**, You Zhou, Wei Zeng, and Zeyu Wang, "EmotionLens: Interactive visual exploration of the circumplex emotion space in literary works via affective word clouds" in Visual Informatics, 2025. (Journal, IF=3.8) PDF System Overview

[3] Yueke Zhang, Anda Liang, **Xiaohan Wang**, Pam Wisniewski, Fengwei Zhang, Kevin Leach, and Yu Huang, "Who's Pushing the Code? An Exploration of GitHub Impersonation" in the IEEE/ACM International Conference on Software Engineering (ICSE), 2025. (CCF A Conference).

[4] Richen Liu*, Min Gao, Lijun Wang, **Xiaohan Wang**, et al., "Interactive Extended Reality Techniques in Information Visualization" in *IEEE Transactions on Human-Machine Systems*, vol 52, no. 6, pp. 1338-1351, 2022. (CCF B Journal) DOI PDF

[5] Hansheng Wang, Xiaojian Chen, Zeyu Xia, Hailong Wang, **Xiaohan Wang**, and Richen Liu*, "iTDW: Immersive Tiled Display Wall with Clustering-Driven Layout" in *IEEE International Symposium on Mixed and Augmented Reality (ISMAR)*, pp. 1-6, Singapore, Oct. 2022. (CCF B Conference, workshop)

[6] **Xiaohan Wang**, Chuyu Zhang, Yu Zhu, Xueyi Chen, Liming Shen, Richen Liu*, and Rongtao Qian, "Hybrid Line-Based and Region-Based Interactive Set Data Visualization" in *ACM SIGCHI Conference on Human Factors in Computing Systems Extended Abstracts (ACM CHI'21 EA)*, no. 411, pp. 1-7, Yokohama, Japan, May 2021. (CCF A Conference, extended abstract). DOI | PDF

[7] Chuyu Zhang, Xiaojian Chen, Yu Zhu, **Xiaohan Wang**, Siru Chen, Xiaodong Wen, and Richen Liu*., "Multi-user Collaborative Volume Data Illustration and Visualization" in *IEEE Visualization 2020 (IEEE VIS)*, no. 411, pp. 1-7, Salt Lake City, USA, October, 2020. (CCF A Conference, poster) PDF

Projects

- **Feature-driven parameter space exploration of simulation ensembles**
  Machine Learning, Data Visualization *Apr. 2024 - Present*
  - **Inverse Mapping via Latent-Space Learning:** Developed a bidirectional latent space bridging simulation parameters and outputs, enabling real-time inverse design from user-specified features while maintaining low dimensionality proportional to parameter count.
  - **Flexible Feature Extraction with Implicit Neural Representations** Leveraged INRs to achieve: (a) highly compressed yet accurate field representations, (b) multi-scale feature support (point-to-region), and (c) derivative-based feature computation - all critical for interactive inverse analysis.

- **Interactive Interface for Simulation Ensemble Exploration:** Developed an interactive interface that supports multiple interactions with different large-scale simulation ensembles. Users can explore the simulation dataset and intuitively specify features of interest, and the interface will respond to potential parameter configurations in seconds.

- **TopologyGuidance: Controlling the Outputs of Generative Models via Vector Field Topology**
  Machine Learning, Data Visualization *Sep. 2023 - Mar. 2024*
  - **Topology Guidance for Denoising Diffusion Probabilistic Models (DDPM):** Innovated a method to control diffusion model outputs to align with specified topological features using a coordinate-based neural network.
  - **Enhanced the Controllability of DDPM:** Improved generative model precision by guiding the denoising process based on topological signals, ensuring accurate field generation.
  - **Validated on Fluid Dynamics Simulations:** Proved method effectiveness on 2D vector fields in fluid flows, accurately maintaining critical points and enabling enhanced ensemble analysis.

- **An Exploration of GitHub Impersonation**
  Software Engineering, Human-Computer Interaction *Nov. 2023 - Mar. 2024*
  - **First Empirical Study of GitHub Impersonation Risks:** Interviews with 17 OSS contributors revealed widespread underestimation of threats, while analysis of 12.5M commits exposed critical vulnerabilities in current systems.
  - **Exposed Fundamental Detection Gaps:** Found existing safeguards like commit signing are ineffective, with platform logs failing to distinguish impersonation from legitimate pull requests.

- **EmotionLens: Interactive Visual Exploration of the Circumplex Emotion Space in Literary Works via Affective Word Clouds**
  Machine Learning, Data Visualization *Nov. 2022 - Mar. 2023*
  - **Create a New Emotion Dataset:** Include literary works from different time periods, genres, and languages, with detailed valence and arousal labels to provide a solid foundation for emotion analysis in literature.
  - **Design an Interactive System:** Enable users to analyze literary emotions at different levels (e.g., individual, group, society) and from different perspectives (e.g., distribution, timeline, correlation) through EmotionLens. Support both exploratory and confirmatory analysis to fill a gap in visual emotion analysis in digital humanities.
  - **Introduce an Enhanced Affective Word Cloud:** Adjust word weight, position, and color to make emotional analysis of literary texts more intuitive and insightful.

- **BallonVis: Hybrid Line-Based and Region-Based Interactive Set Data Visualization Tool**
  Data Visualization, Human-Computer Interaction *Oct. 2020 – Feb. 2021*
  - Designed a Balloon Connection Method based on the item connection blob algorithm.
  - Combined control points to bypass obstacles while connecting the data items by lines.
  - Designed the energy optimization-based routing algorithm and the spring force algorithm to keep the connected lines natural and intuitive

- **Algorithm Design and Engineering Optimization of Quick Measuring Machine**
  Computer Vision *Aug. 2022 – Nov. 2022*
  - Combined random sample consensus (RANSAC) and least squares method during the process of fitting the edges to expunge the outlier, and the deviation is controlled to one micron (sub-pixel level).
  - Proposed coordinate transformation algorithm, employed affine transformation to traverse each pixel on oblique direction.

Fellowships, honors, and awards

2022 *Outstanding Student Scholarship - First Prize (5%)*
2021 *Outstanding Student Scholarship - First Prize (5%)*
Outstanding National in Computer Design Competition (Software Development) - First Prize
2020 *Outstanding Student Scholarship - First Prize (5%)*

Skills

- **Programming.**Proficient in Python (with experience in PyTorch), JavaScript (especially D3.js), C++, Bash, Git.
- **Human Study.** User research (interviews/surveys), qualitative analysis, IRB protocols.
- **Language.** English (TOEFL 108/120); Mandarin (Native).