Jiajun (Dana) Dai

PhD Student, Scientific Computing & Imaging Institute (SCI)
Kahlert School of Computing, University of Utah

Salt Lake City, Utah, USA

u1420119@utah.edu; jiajundai1991@gmail.com
Website: https://dana-dai.github.io

Education

2025– Ph.D. in Computing, Kahlert School of Computing, University of Utah, Salt Lake City, UT, USA
Scientific Computing & Imaging Institute (SCI).
Advisor: Prof. Valerio Pascucci.

2022–2025 M.A. in Mathematics, University of California, Santa Barbara, CA, USA
Focus: algebraic geometry, algebraic topology, numerical analysis, and scientific computing.

2008-2012 B.Eng. in Polymer Science and Engineering, University of Science and Technology of China, Hefei, China

Research Interests

Data Visualization for large-scale scientific and biomedical datasets

Topological Data Analysis (TDA) and computational topology

Machine Learning for Digital Pathology (H&E histopathology, WSI analysis)

Deep learning for PDEs and scientific machine learning

Research Experience

2025– Graduate Research Assistant, Scientific Computing & Imaging Institute (SCI)
University of Utah, Salt Lake City, UT, USA
Advisor: Prof. Valerio Pascucci

- Developing computational pipelines for prostate cancer hematoxylin & eosin (H&E) whole-slide images (WSI) on HPC infrastructure.
- Working with large-scale, multi-gigapixel WSIs and multi-resolution tiling strategies for scalable model training and evaluation.

- Exploring structure-aware and topology-inspired representations (e.g., TDA-based features) to improve robustness and interpretability of deep learning models for digital pathology.
- Investigating visualization and interaction techniques to help researchers inspect model predictions, uncertainty, and failure modes on WSIs.

2022–2025 Graduate Researcher, Department of Mathematics
University of California, Santa Barbara, CA, USA

- Studied partial differential equations (PDEs), numerical methods, and applications in scientific computing.
- Explored the interface between mathematical analysis and computation, including finite difference and finite element methods.
- Built foundational expertise that now supports work on deep learning methods for PDEs and scientific machine learning.

Research Projects

Ongoing Prostate cancer whole-slide imaging (WSI) pipelines
Scientific Computing & Imaging Institute, University of Utah

- Designing end-to-end data pipelines for large collections of prostate cancer WSIs, including dataset curation, quality control, tiling, and efficient storage on HPC systems.
- Integrating clinical labels and region-of-interest annotations to support supervised and weakly supervised learning.
- Investigating multi-resolution and patch-based approaches that preserve diagnostically relevant context while remaining computationally tractable.

Ongoing Topological data analysis for interpretable ML in digital pathology
Scientific Computing & Imaging Institute, University of Utah

Exploring TDA-inspired representations (e.g., persistence-based features) to capture structural information in histopathology images.

Studying how topology-aware descriptors can be combined with multiple instance learning (MIL) and related architectures to improve robustness and interpretability.

Aiming to design visual analytics tools that link topological summaries, image patterns, and model behavior.

2024–2025 Deep learning methods for PDEs and scientific computing
Department of Mathematics, UC Santa Barbara

Surveyed deep neural network approaches for solving PDEs, including physics-informed neural networks (PINNs), neural operators, and related architectures.

Analyzed advantages and limitations of deep learning-based solvers compared to classical numerical schemes in terms of accuracy, stability, and scalability.

Prepared groundwork for future work that connects PDE-based modeling with data-driven approaches and visualization.

Publications

At this stage of my PhD, I do not yet have peer-reviewed publications. This section will be updated as manuscripts are submitted and published.

Talks & Presentations

(To be updated as research talks and conference presentations occur.)

Technical Skills

- **Programming & Scripting:** Python, C++, MATLAB
- **Machine Learning & Data:** PyTorch, NumPy, SciPy
- **Digital Pathology:** OpenSlide, WSI preprocessing, tiling pipelines
- **Scientific Computing:** Numerical methods for PDEs, basic HPC usage
- **High-Performance Computing:** Linux, shell scripting, job submission on clusters (e.g., SLURM-based systems)
- **Tools:** Git, LaTeX, Jupyter, VS Code

Languages

- Chinese (native)
- English (professional proficiency)

Professional Development & Interests

- Active interest in connecting rigorous mathematical methods with practical tools for large-scale data analysis and visualization.
- Interested in interdisciplinary collaboration across computing, mathematics, and biomedical applications.

Last updated: Dec 3, 2025