**XI HAN**

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**EDUCATION**

**Department of Computer Science, Stony Brook University, New York, United States** Aug 2019 – Present

Ph.D. in Computer Science (In progress, expected by Spring 2026) | GPA: 3.9/4.0

**Department of Computer Science and Technology, Tsinghua University, Beijing, China** Aug 2015 – Jul 2019

B.E. in Computer Science and Technology | GPA: 3.25/4.0

**SKILLS**

* **TL;DR.** C/C++/CUDA/Python; GPU Algorithms; Mamba; PDEs; Computer Graphics; Machine Learning.
* Expert in GPU algorithms for AI/HPC: Customized AI operators, AI model training/inference efficiency optimization. Involved techniques: PyTorch C++/CUDA extensions, GPU kernel profiling, fine-tuning, operator fusing, cache optimization, etc.
* Expert in Computer Graphics and Numerical Analysis: Neural PDE solvers, customized CUDA operators.
* Expert in languages: C/C++ (OOP, STL, Metaprogramming and Concurrency), CMake, CUDA (including PTX) and Python.
* Expert in tools: PyTorch Profiler, CUDA-GDB, Nsight Compute and NVIDIA Compute Sanitizer.
* Expert in frameworks: PyTorch and OpenGL.
* Familiar with: Linux systems and the Qt framework.
* Knows: Bash, Assembly, MATLAB, Java, Objective C/C++ and Swift.

**PUBLICATIONS**

* Song-Hai Zhang, Ruilong Li, Xin Dong, Paul Rosin, Zixi Cai, **Xi Han**, Dingcheng Yang, Hao-Zhi Huang and Shi-Min Hu, “Pose2Seg: Detection Free Human Instance Segmentation”, In *2019 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2019.
* **Xi Han**, Fei Hou and Hong Qin, “UGrid: An Efficient-And-Rigorous Neural Multigrid Solver for Linear PDEs”, In *Proceedings of the 41st International Conference on Machine Learning (ICML)*, 2024.
* Jingwei Zhang\*, Anh Tien Nguyen\*, **Xi Han**\*, Vincent Quoc-Huy Trinh, Hong Qin, Dimitris Samaras, and Mahdi S. Hosseini, “2DMamba: Efficient State Space Model for Image Representation with Applications on Giga-Pixel Whole Slide Image Classification”, In *2025 IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025. (**\*: Equal Contribution.**)
* **Xi Han\***, Jingwei Zhang\*, Dimitris Samaras, Fei Hou, and Hong Qin, “GeoMaNO: Geometric Mamba Neural Operator for Partial Differential Equations”, *arXiv preprint arXiv:2505.12020*, 2025. (**\*: Equal Contribution.**) (**Under Review.**)
* Jingwei Zhang\*, **Xi Han\***, Hong Qin, Mahdi S. Hosseini, and Dimitris Samaras, “LBMamba: Locally Bi-directional Mamba”, Submitted to *Transactions on Machine Learning Research (JMLR)*, 2025. (**\*: Equal Contribution.**) (**Under Review.**)

**WORK EXPERIENCE**

**Research Assistant & Teaching Assistant** Aug 2019 – Present

Stony Brook University, New York, United States

* Conducted research projects on GPU algorithms, neural PDE solvers, PDE-driven foundation models (e.g., Mamba), and Computer Graphics. Research work is published in top-venue conferences, including ICML and CVPR.
* Extensive project experience on AI training/inference efficiency optimization. Involved techniques: CUDA kernel fusing, performance profiling, and PyTorch CUDA extensions.
* Hosted lectures on OpenGL programming with C++/Python, the implementation details of computer graphics applications and algorithms, and the state-of-the-art research topics on graphics and physics-based modeling.

**Research Assistant**  Jan 2017 – Jul 2019

Tsinghua University, Beijing, China

* Deployed a MobileNet module on IOS platform with Apple’s CoreML framework, and delivered an IOS app for a human segmentation (in Swift and Objective C++).
* Optimized the model used in the app (increased accuracy and added key point recognition) and achieved 10x speedup in FPS.

**SELECTED PROJECTS**

**2DMamba: A Hardware-Aware 2D Selective State-Space Model with Applications in Image Processing**

* **TL;DR**. 2DMamba employs a geometric-rigorous and hardware-aware 2D SSM formulation, which extends 1D Mamba into 2D while maintaining its modeling capabilities, high parallelism, and memory efficiency.
* Implements a warp-scan based 2D parallel scan routine which supports scanning prefix callbacks for global tiling. Extends 1D Mamba scanning operation into 2D while maintaining its training/inference efficiency. Compared to a naïve implementation, achieves a throughput of 10x, while the GPU memory consumption is only 10%.
* Involved techniques: Warp shuffle and parallel scans, 2D tiling and caching, HBM access optimization, CUDA kernel and AI model profiling, and PyTorch CUDA extension encapsulation.
* Code available at <https://github.com/AtlasAnalyticsLab/2DMamba>.

**UGrid: An Efficient-And-Rigorous Neural Multigrid Solver for Linear PDEs**

* **TL;DR.** UGrid is a neural solver for Partial Differential Equations (PDEs) with convergence guarantee.
* Built upon the combination of the U-Net architecture and the legacy MultiGrid PDE solver, provides users with high speed (up to 20x speedup against legacy solvers), high precision (relative residual as low as 1e-5), high robustness (against irregular and noisy input), high generalization power (to irregular boundary geometries and topology), and high scalability (without need for retraining).
* Involved techniques: Numerical analysis on convergence, customized AI operators (Python and CUDA based). Implements a customized CUDA convolution module to save computation for specific-shaped convolution kernels used in PDE solvers.
* Code available at <https://github.com/AXIHIXA/UGrid>.

**CUDA Baseline Experiments: Performance Profiling and Optimization**

* **TL;DR.** Implements and fine-tunes multiple CUDA baseline algorithms.
* Implemented baselines and their optimizations:
* Parallel reduction (with loop unrolling and warp shuffle primitives).
* Histogram and Copy-If (with atomic primitives).
* Parallel scan (WarpScan and Raking variants).
* Fused Biased-Mask-Scale-Add (fp32 and fp16, for fp16, with half precision primitives like \_\_hadd2).
* SGEMM an GEMV (loop unrolling, SMEM padding, warp tiling and double buffer optimizations, reaching 90% throughput of cuBLAS).
* Dropout (with cuRAND APIs).
* Fused SoftMax/LayerNorm/RMSNorm, Im2Col, Matrix transpose, etc.
* Code available at <https://github.com/AXIHIXA/CudaDemo>.

**MISC**

* Language Proficiencies:
* Chinese (Mandarin): Native speaker.
* English: Fluent, near-native proficiency. TOEFL: 106/120; GRE: 324/340 + Writing 3.5.
* Japanese: Sufficient for basic working scenarios. JLPT: N1 173/180, N2 169/180.