Dr. Jiajian Xiao

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Intro

I am currently working as a Senior Scientist II at Agency for Science, Technology and Research (A*STAR) Singapore. My research interests span high-performance computing, focusing on deploying applications on heterogeneous hardware, agent-based simulation, and intelligent transportation. I am one of the core architects and developers of a microscopic agent-based mobility simulator – CityMoS. I have been involved in and led a number of research projects, collaborating with research entities and industrial partners in Singapore, Germany, Austria, and China.

Experience

Scientist (Mar 2023 – Jun 2023) $\rightarrow$ Senior Scientist II (Jul 2023 – present) Mar 2023 – present
A*STAR, Institute of High Performance Computing *Singapore*

- Working with government agencies and industrial partners on various scientific challenges, utilizing machine learning and simulation approaches.

Research Fellow Sep 2020 – Mar 2023
TUMCREATE (A research center founded by National Research Foundation Singapore) *Singapore*

- Co-led the simulation efforts on the TUMCREATE side for the Singapore Integrated Transport Energy Model (SITEM) project, collaborating with A*STAR. The project's goal was to build a simulation-based digital twin solution for the decision-makers to conduct comprehensive analyses of the future electric vehicle adoption in Singapore.
- Key R&D member of the joint simulation laboratory with HUAWEI Research Centre Munich – Mobility in Virtual Environments at Scale (MoVES) Lab.

Research Associate Apr 2016 – Aug 2020
TUMCREATE *Singapore*

- Daily tasks involved both engineering and research work. Engineering work included software development (in C++) of the CityMoS simulator. Research work focused on accelerating agent-based simulations using emerging hardware.
- Built a general compiler framework to **automate the acceleration of agent-based simulations on heterogeneous hardware** (a mixed hardware setting with CPUs, GPUs, FPGAs, etc.)

Software Developer Mar 2014 – Mar 2016
TUMCREATE *Singapore*

- One of the main C++ backend and frontend developers of a microscopic agent-based traffic simulator – CityMoS.

Education

Technical University of Munich (Supervisor: Prof. Alois Knoll) Munich, Germany/Singapore
Doctor (Co-supervised by Prof. Wentong Cai from Nanyang Technological University) *Apr 2016 – Oct 2022*

Technical University of Munich Munich, Germany
Master of Science in Computer Science *Oct 2011 – Dec 2013*

Shanghai Jiao Tong University Shanghai, China
Bachelor of Engineering in Computer Science *Sep 2007 – Jul 2011*

Technical Skills

Languages	:	C/C++, Objective-C, CUDA, OpenCL, ARM/Intel Assembly, Java, JavaScript, HTML, CSS
Frameworks	:	Express, Node.js, Redis, ZeroMQ, MPI, OpenMP, LLVM/Clang
Databases	:	Oracle SQL, MongoDB, PostgreSQL
Tools & OSs	:	Docker, Adobe Photoshop/Premiere, Windows, Linux, macOS

Honors

FireFly Silver Borderless Award Singapore
Ministry of Trade and Industry Singapore *Jun 2022*

Best Paper Award Spain
IEEE/ACM DS-RT 2018 *Oct 2018*

Selected High-impact Publications

Full list on Google Scholar

- A survey on agent-based simulation using hardware accelerators. Xiao, J., Andelfinger, P., Eckhoff, D., Cai, W. and Knoll, A., 2019. ACM Computing Surveys (CSUR), 51(6) **(IF: 14.324, top computer science journal)**

- Exploring execution schemes for agent-based traffic simulation on heterogeneous hardware. Xiao, J., Andelfinger, P., Eckhoff, D., Cai, W., & Knoll, A.; In 2018 IEEE/ACM International Symposium on Distributed Simulation and Real-Time Applications **(Best Paper Award)**

- A Partition-Based Match Making Algorithm for Dynamic Ridesharing. Pelzer, D., Xiao, J., Zehe, D., Lees, M.H., Knoll, A.C., Aydt, H.; 2015. IEEE Transactions on Intelligent Transportation Systems **(IF 9.551, top transportation journal)**

- Pedal to the Bare Metal: Road Traffic Simulation on FPGAs Using High-Level Synthesis. Xiao, J., Kilinç, G., Andelfinger, P., Eckhoff, D., Cai, W., & Knoll, A. In Proceedings of the 2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation **(1st known effort for agent-based traffic simulations using HLS)**

- OpenABLext: An automatic code generation framework for agent-based simulations on CPU-GPU-FPGA heterogeneous platforms. Xiao, J., Andelfinger, P., Cai, W., Richmond, P., Knoll, A., & Eckhoff, D. 2020. Concurrency and Computation: Practice and Experience, e5807

- OptCL: A Middleware to Optimise Performance for High-Performance Domain-Specific Languages on Heterogeneous Platforms. Xiao, J., Andelfinger, P., Cai, W., Eckhoff, D., & Knoll, A. In 2021 International Conference on Algorithms and Architectures for Parallel Processing **(A middleware accelerates not only agent-based simulation but also general arithmetic e.g., machine learning algorithms)**