Pengcheng **Xu**

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Aut inveniam viam aut faciam.
"I'll either find a way or make one."—Hannibal

Education

Systems Group, D-INFK, ETH Zürich
Zürich, Switzerland

Doctorate Computer Science — *Sept. 2021 - Jul. 2027*

- Part of the *Direct Doctorate in Computer Science* degree program
- Thesis supervisor: Prof. Dr. Timothy Roscoe

D-INFK, ETH Zürich
Zürich, Switzerland

Computer Science MSc — *Sept. 2021 - Sept. 2023*

- Part of the *Direct Doctorate in Computer Science* degree program
- Thesis supervisor: Prof. Dr. Torsten Hoefler

School of EECS, Peking University
Beijing, China

B.Sc. Computer Science and Technology — *Sept. 2017 - Jul. 2021*

- "*Summa cum laude*"; member of the *Turing Class* honors program
- Thesis supervisor: Prof. Yun Liang

Projects

NetOS, Systems Group @ ETH Zürich
Zürich, Switzerland

Doctorate (with Prof. Dr. Timothy Roscoe) — *Since Dec. 2023*

- Developing Lauberhorn, a cache-coherent RPC NIC that is part of the OS
- Developing TxnLang, a transaction-based intermediate language for HW formal verification
- Research focus: OS, networking, architecture, formal verification

Scalable Parallel Computing Lab (SPCL) @ ETH Zürich
Zürich, Switzerland

Master Thesis (with Prof. Dr. Torsten Hoefler) — *Mar. 2023 - Sept. 2023*

- Developed FPsPIN, an FPGA prototype of the sPIN in-network-compute paradigm
- Skills involved: Verilog, FPGA, systems programming in C

NetOS, Systems Group @ ETH Zürich
Zürich, Switzerland

Semester Project (with Prof. Dr. Timothy Roscoe) — *Oct. 2022 - Feb. 2023*

- Developed EFRI, an OS-firmware interface for the *Enzian* research computer
- Skills involved: systems programming in C, interface design

Center for Energy-efficient Computing and Applications (CECA) @ PKU
Beijing, China

Undergraduate Research (with Prof. Yun Liang) — *Dec. 2017 - Jul. 2021*

- Developed a prototype RISC-V-based accelerator platform on FPGAs
- Explored automatic compute intrinsic synthesis through MLIR and accelerator templates
- Skills involved: Chisel, systems programming in C, compiler design, C++, FPGA

Parallel Systems Architecture Lab (PARSA) @ EPFL
Lausanne, Switzerland (remote)

Research Intern (with Prof. Babak Falsafi) — *Jul. 2020 - Jan. 2021*

- Worked on a seL4 port for Midgard, a new virtual memory scheme for terabyte-scale memory servers
- Skills involved: seL4, systems programming in C

XG Lab @ Alibaba DAMO Academy
Beijing, China

Academic Collaboration (with Prof. Chenren Xu & Dr. Pengyu Zhang) — *Sept. 2020 - Jan. 2021*

- Developed the FPGA data capture and signal processing pipeline for a custom RFID localization system
- Skills involved: Verilog, FPGA, systems programming in C

PKU Student Supercomputing Competition Team (PKUSC)
Beijing, China

Team Leader — *Nov. 2017 - Nov. 2020*

- Built small clusters under tight power budget to solve super-computing challenges
- Skills involved: SysAdmin, C, C++, CUDA, Fortran

Work

SenseTime *Beijing, China*

Research Intern *Jun. 2019 - Dec. 2019*

- Built the prototype of an in-house tensor compiler for deep-learning applications
- Skills involved: compiler design, C++

Teaching

Advanced Operating Systems, ETH Zürich *Zürich, Switzerland*

Assistentz (head TA), Hilfsassistenz (HA) *2022 - 2025*

System Programming and Computer Architecture, ETH Zürich *Zürich, Switzerland*

Assistenz (head TA) *2024*

Computer Systems, ETH Zürich *Zürich, Switzerland*

Hilfsassistenz (HA) *2022*

Computer Networks (Honor Track), Peking University *Beijing, China*

Teaching Assistant (TA) *Sept. 2020 - Feb. 2021*

- Developed a lab assignment for students to implement their own NIC on FPGAs

Publications

Pengcheng Xu, Timothy Roscoe. "The NIC should be part of the OS." *Banff, Alberta, Canada*

The ACM SIGOPS Workshop on Hot Topics in Operating Systems (HotOS) *May 2025*

Anastasiia Ruzhanskaia, **Pengcheng Xu**, David Cock, Timothy Roscoe. "Rethinking Programmed I/O for Fast Devices, Cheap Cores, and Coherent Interconnects" *Online*

arXiv *Oct. 2024*

Timo Schneider, **Pengcheng Xu**, Torsten Hoefler. "FPsPIN: An FPGA-based Open-Hardware Research Platform for Processing in the Network" *Online*

arXiv *May. 2024*

Pengcheng Xu. "Full-System Evaluation of the sPIN In-Network-Compute Architecture" *ETH Zurich*

ETH Library *Sept. 2023*

Pengcheng Xu. "Enzian Firmware Resource Interface" *ETH Zurich*

ETH Library *Feb. 2023*

Zejia Fan, Yuchen Gu, Zhewen Hao, Yueyang Pan, **Pengcheng Xu**, Yuxuan Yan, Fangyuan Yang, Zhenxin Fu, Yun Liang. "Critique of 'MemXCT: Memory-Centric X-Ray CT Reconstruction With Massive Parallelization' by SCC Team From Peking University" *Journal*

IEEE Transactions on Parallel and Distributed Systems (TPDS) *Jan. 2022*

Qingcheng Xiao, Size Zheng, Bingzhe Wu, **Pengcheng Xu**, Xuehai Qian, Yun Liang. "HASCO: Towards Agile HArdware and Software CO-design for Tensor Computation" *Worldwide*

International Symposium on Computer Architecture (ISCA) *June 2021*

Yihua Cheng, Zejia Fan, Jing Mai, Yifan Wu, **Pengcheng Xu**, Yuxuan Yan, Zhenxin Fu, Yun Liang. "Critique of 'Planetary Normal Mode Computation: Parallel Algorithms, Performance, and Reproducibility' by SCC Team From Peking University" *Journal*

IEEE Transactions on Parallel and Distributed Systems (TPDS) *Jan. 2021*

Pengcheng Xu, Yun Liang. "Automatic Code Generation for Rocket Chip RoCC Accelerators" *Virtual Workshop*
Workshop on Computer Architecture Research with RISC-V (CARRV), co-located with ISCA *May 2020*

Posters

Pengcheng Xu, Jasmin Schult, Zikai Liu, Roman Meier, Timothy Roscoe. "Lauberhorn: a Smart NIC that is part of the OS" *Rotterdam, the Netherlands*
European Conference on Computer Systems (EuroSys) *Apr. 2025*

Pengcheng Xu, Jasmin Schult, Anastasiia Ruzhanskaia, David Cock, Timothy Roscoe. "Enzian fast RPC: merging OS and NIC on coherent interconnects" *Santa Clara, CA, USA*
USENIX Symposium on Operating Systems Design and Implementation (OSDI) *Aug. 2024*

Honors & Awards

2020 **Second Place**, Virtual Student Cluster Competition at SC'20 *Global Event*
- Worked as leader in charge of cloud cluster management and the mystery task
- Team ranked top on the CESM (Community Earth System Model) application

2019 **First Prize**, ASC Student Supercomputing Challenge 2019 *Dalian, China*
- Worked as leader in charge of system install and administration, benchmarks, logistics, and the mystery task

2019 **SenseTime Scholarship 2019** *Beijing, China*

2018 **Award for Scientific Research**, Peking University *Beijing, China*

2018 **Prize of Excellence**, IBM OpenPOWER/CAPI and OpenCAPI Heterogeneous Computing Design Contest *Beijing, China*
- Worked to build an FPGA accelerator for *BCrypt* on the OpenCAPI FPGA-host platform

2018 **Second Prize**, Peking University Collegiate Programming Contest *Beijing, China*

2018 **Accepted & Passed**, Google Summer of Code 2018 with Gentoo Foundation *Global Event*
- Worked to modularize Android system upgrades with Portage and LXC