

Pengcheng Xu

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Aut inveniam viam aut faciam.
“I’ll either find a way or make one.”—Hannibal

Education

School of EECS, Peking University

B.SC. COMPUTER SCIENCE AND TECHNOLOGY (EXPECTED)

- Member of the *Turing Class* Honor Program
- Advisor: Professor Yun Liang at Peking University

Beijing, China

Sept. 2017 - Jul. 2021

Academic Experiences

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

UNDERGRADUATE RESEARCH

- With Prof. Yun Liang
- Build heterogeneous RISC-V SoCs that foster state-of-the-art accelerator designs
- Develop system and application software for embedded platforms
- Explore the fringes of performance and efficiency of emerging platforms with HW/SW Co-design

Beijing, China

Dec. 2017 - Current

Parallel Systems Architecture Lab (PARSA) @ EPFL

RESEARCH INTERN

- With Prof. Babak Falsafi
- Design next-generation memory subsystems targeting terabyte-scale situations
- Build RISC-V-based hardware and software solutions for validation

Lausanne, Switzerland

(remote from Beijing)

Jul. 2020 - Current

XG Lab @ Alibaba DAMO Academy

ACADEMIC COLLABORATION

- With Prof. Chenren Xu & Dr. Pengyu Zhang
- Build high-speed FPGA receiver for high-accuracy UHF RFID localization system
- Interface with RF frontends with RISC-V MCU and host over PCIe

Beijing, China

Sept. 2020 - Current

PKU Student Supercomputing Competition Team (PKUSC)

TEAM LEADER

- Optimize real-world HPC benchmarks and applications for performance and efficiency
- Gained profound experience in cluster building, management, and maintenance
- Participated in Student Cluster Competition @ SC19 & SC20 (2nd place, historic best) and ASC19
- Team invited to publish reports on *IEEE TPDS* and *Parallel Computing*

Beijing, China

Nov. 2017 - Nov. 2020

Work Experiences

SenseTime

RESEARCH INTERN

- Design and develop in-house deep learning compiler for GPU
- Foundation work for code generation of in-house deep learning framework
- Awarded *Outstanding Intern* title

Beijing, China

Jun. 2019 - Dec. 2019

Teaching Experiences

Computer Networks (Honor Track), Peking University

TEACHING ASSISTANT (TA)

- Volunteered to design hardware IP router lab assignment
- Delivered RISC-V research tutorial to all students

Beijing, China

Sept. 2020 - Feb. 2021

Publications

- 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 'Computing Planetary Interior Normal Modes with a Highly Parallel Polynomial Filtering Eigensolver' by SCC Team from Peking University" *Journal*
IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS (TPDS) Jan. 2021
- *: these authors contributed equally to this work.
- Pengcheng Xu**, Yun Liang. "Automatic Code Generation for Rocket Chip RoCC Accelerators" *Virtual Workshop*
FOURTH WORKSHOP ON COMPUTER ARCHITECTURE RESEARCH WITH RISC-V (CARRV 2020), CO-LOCATED WITH ISCA 2020 May 2020

Honors & Awards

INTERNATIONAL

- 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*
- Team of five from PKUSC, *first participation*
 - Worked as leader in charge of system install and administration, benchmarks, logistics, and the mystery task
 - Competition featured real-world HPC applications: global climate simulation, genome sequencing, lattice heat transport simulation, fluid dynamics, and deep learning super-resolution
- 2018 **Accepted & Passed**, Google Summer of Code 2018 with Gentoo Foundation *Global Event*
- Worked to develop solution to *modularize the Android system upgrade with Portage*
 - Enabled utilization of mature Unix technologies in mobile computing

DOMESTIC

- 2019 **SenseTime Scholarship 2019** *Beijing, China*
- Awarded to 31 students in Computer Science across Mainland China for academic excellence
 - Winners receive 20,000 CNY and a trip to SenseTime headquarters in Shanghai
- 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* (widely-used hashing algorithm) on Xilinx UltraScale+ FPGAs
 - Developed on the OpenCAPI FPGA-host platform for high-performance, cloud-oriented acceleration
- 2018 **Second Prize**, Peking University Collegiate Programming Contest *Beijing, China*

Selected Individual Projects

- KHEmu: User-space binary translation** *Jun. 2020*
- Designed for high-performance translation with emerging ISAs
 - Written in Rust for unmatched performance, flexibility, and safety
 - SIMD-capable IR and native floating point, LLVM JIT compilation, dynamic linking support, and more
- KHTcp: User-space network stack** *Oct. 2019*
- Ethernet, IP, TCP & UDP implemented from scratch with libpcap
 - Built for high-performance with event-driven asynchronous programming model
 - Client-server model for concurrent use from multiple userspace applications

Skills

Programming Language	C, Modern C++, Rust, Scala, Java, Bash, OCaml, Go, Scheme
High Performance Computing	Performance profiling & optimizations, MPI, OpenMP, OpenACC
System & Cluster Management	Linux & OpenBSD management, Conventional & RDMA networking, Distributed filesystems
Embedded & FPGA	Linux kernel development, Baremetal (MCU & SoC) development, Chisel, Verilog
Foreign (Natural) Languages	English (Proficient: TOEFL 112, GRE 331/4.0), Japanese (Proficient: JLPT N1)