# 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** — *Beijing, China*

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

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

## Academic Experiences

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

Undergraduate Research — *Dec. 2017 - Current*

- 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

**Parallel Systems Architecture Lab (PARSA) @ EPFL** — *Lausanne, Switzerland (remote from Beijing)*

Research Intern — *Jul. 2020 - Current*

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

**XG Lab @ Alibaba DAMO Academy** — *Beijing, China*

Academic Collaboration — *Sept. 2020 - Current*

- 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

**PKU Student Supercomputing Competition Team (PKUSC)** — *Beijing, China*

Team Leader — *Nov. 2017 - Nov. 2020*

- 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*

## Work Experiences

**SenseTime** — *Beijing, China*

Research Intern — *Jun. 2019 - Dec. 2019*

- 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

## Teaching Experiences

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

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

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

# Publications

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) — *to appear*

- *: these authors contributed equally to this work.
- Invited publication for the submitted report of reproducibility challenge at the SC19 Student Cluster Challenge

**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*

- Introduced a flow for convenient, efficient automatic code generation for Rocket Chip RoCC accelerators
- Verified proposed flow for the Gemmini matrix multiplication accelerator with TVM

# 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-perforamance 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

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|---|---|
| **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 |
| **Multimedia** | GStreamer, FFmpeg (LibAV), OpenCV |
| **Foreign (Natural) Languages** | English (Proficient: TOEFL 112, GRE 331/4.0), Japanese (Proficient: JLPT N1) |