# 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

## Scores for Key Courses

| Course Name | Credit | Score | Course Name | Credit | Score |
|---|---|---|---|---|---|
| Introduction to Computation (A) | 3 | 98.5 | Design Principles of Programming Languages | 3 | 90 |
| Computer Networks (*Honor Track*) | 3 | 100 | Computer Networks Practicum | 2 | 98 |
| Operating System (*Honor Track*) | 4 | 93 | Embedded Linux Operating System | 2 | 93 |

## Academic Experiences

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

Undergraduate Research — *Dec. 2017 - Current*

- Build heterogeneous RISC-V SoCs that foster state-of-the-art accelerator designs
- Develop system and application software for embedded platforms targeting machine learning applications
- Explore the fringes of performance and efficiency of emerging platforms with Hardware-Software Co-design

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

Research Intern — *Jul. 2020 - Current*

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

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

Team Leader — *Nov. 2017 - Sept. 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 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

## 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

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, and logistics
- 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* (Gentoo Linux's package manager)
- Brought full *GNU/Linux* support to Android systems
- 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

**RISC-V experiment platform on Zynq UltraScale+ MPSoC** *Jan. 2020*

- Renowned Rocket Chip from UCB implemented on FPGA, tailored for computer architecture research
- Flexible framework for baremetal or Linux-based software projects
- High-speed debugging based on coherent memories and GPIO JTAG

**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 |
| **Multimedia** | GStreamer, FFmpeg (LibAV), OpenCV |
| **Foreign (Natural) Languages** | English (Proficient: TOEFL 113, GRE 331/4.0), Japanese (Proficient: JLPT N1) |