

Jinwei Yao

COMPUTER SCIENCE · SYSTEM

École Polytechnique Fédérale de Lausanne (EPFL), Route Cantonale, 1015 Lausanne, SWITZERLAND

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“Write the code, change the world.”

Education

École Polytechnique Fédérale de Lausanne (EPFL)

Lausanne, Switzerland

PH.D. IN COMPUTER SCIENCE

2022 - 2027(expected)

- Got the **Ph.D. fellowship** from CS Dept of EPFL.

Zhejiang University

Hangzhou, China

B.ENG. IN ELECTRONIC SCIENCE AND TECHNOLOGY

2018 - 2022

- **Overall GPA:** 3.89/4.00 (87/100).
- **Honors Minor(40/6800+):** Advanced Class of Engineering Education(ACEE), **Chu Kochen Honors College**.
- **Graduated with Outstanding Thesis Award.**

Research Interest

Distributed systems for **X**. **X** could be: machine learning, blockchains, databases, etc.

Experience

A Starvation-free Consensus for Decentralized Cross-shard Transaction Commit

EPFL, Switzerland

RESEARCH INTERN AT DECENTRALIZED AND DISTRIBUTED SYSTEMS LAB(DEDIS).

Oct. 2022 - Feb. 2023

- **Mentor:** Prof. Bryan Ford
- **Motivation:** Most commit protocols for cross-shard transactions in decentralized systems have starvation problems and are also expensive in communication.
- **Insight:** Starvation is mainly caused by the contentions for the exclusive locks. Transaction atomic commit and consensus have many similarities.
- **Challenge:** 1. How to resolve contention without introducing a global or even an intra-shard leader for ordering. 2. How to reduce communication costs.
- **Solution:** Fair contention resolution to enable starvation-free. Unifying consensus and atomic commit to reducing communication costs.

Accelerating Graph Neural Network Sampling by Customizing FPGA Subsystem

Zhejiang University, China

UNDERGRADUATE RESEARCH INTERN AT RC4ML LAB, ZHEJIANG UNIVERSITY

Nov. 2021 - May. 2022

- **Mentor:** Prof. Zeke Wang
- **Motivation:** Graph sampling, as the first step for GNN training, is a time-consuming irregular computation on modern CPU.
- **Goal:** Customize an FPGA-based memory subsystem with High Bandwidth Memory (HBM) for graph sampling acceleration.
- **Hardware level:** High-bandwidth memory(HBM) can be applied to accelerate the sampling.
- **Software level:** 1) Pipelines and loop unrolling can increase parallelism. 2) The optimization of read and write strategies for graph information can squeeze the performance of HBM.
- **Win Outstanding Thesis Award for undergraduates(rank 1/200+).**

Power-based Side-channel Disassembly Attacks on Shared FPGA

EPFL, Switzerland

SUMMER@EPFL PROGRAM RESEARCH INTERN AT PARALLEL SYSTEMS ARCHITECTURE LABORATORY, EPFL

Jul. 2021 - Nov. 2021

- **Mentor:** Dr. Mirjana Stojilovic
- **Supported by Summer@EPFL fellowship** (acceptance rate in 2021 was **1.5%**)
- **Motivation:** The voltage fluctuation generated by the softcore CPU deployed on the FPGA may leak side channel information when the instruction is running.
- **Goal:** Based on the voltage information, disassemble CPU instructions.
- **Insight:** The voltage fluctuations can be regarded as time-series signals.
- **Challenges:** 1) How to generate a robust dataset (noise between adjacent instructions needs to be considered)? 2) The critical paths of the same type of instructions (such as Add and Sub) are almost the same. What's worse, the sensor sampling rate on the FPGA is very low, and it is difficult for traditional ML methods to obtain enough information for classification.
- **Solution:** 1) Generating random but balanced training set by designing noise tolerated templates for different instructions; 2) Use lightweight LSTM+CNN model to do the classification. LSTM is suitable for processing sequence data, and CNN can help LSTM learn more meaningful feature representations.
- **A paper was submitted to Cryptographic Hardware and Embedded Systems (CHES).**

Publications

1.[CHES'23]: O. Glamocanin, J. Yao, N. Ardo, M. Stojilovic. "Title omitted for double-blind review". CHES 2023(in submission). **Key Words: Power side-channel attack, Disassembly, FPGA, Softcore processor.**

Honors & Awards

INTERNATIONAL

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| 2022 | Ph.D. fellowship , EPFL | Switzerland |
| 2021 | Summer@EPFL 21 research fellowship(1.5% applications were awarded) , EPFL | Switzerland |

DOMESTIC

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| 2022 | Outstanding Thesis Award(rank 1/200+, Graduation project for bachelor, Zhejiang University | China |
| 2022 | Dean's Outstanding Honor , Outstanding Graduate of Zhejiang University | China |
| 2021 | Winner's Prize , National College Student Information Security Contest | China |
| 2021,2019 | Academic Fellowship and Academic Excellence Award , Zhejiang University | China |
| 2020 | Third Prize , Zhejiang Province Physics Competition for College Students | China |
| 2019 | Outstanding Student , Zhejiang University | China |
| 2019 | Artistic and Athletic Achievement Award , Zhejiang University | China |

Extracurricular Skills

Language

ENGLISH: IELTS 7.0

- Listening 6.5/Reading 8.5/ Writing 6/ Speaking 6

Programming

PYTHON, GO, SCALA, VHDL, C, JAVA, MATLAB

- Framework: Tensorflow, PyTorch, Keras