Fangzheng Lin

Personal Information

Pronouns: he / him / his

GitHub: @lin-toto

ORCID: 0000-0002-8645-7321

Google Scholar: mnxRwToAAAAJ

Emails: csl@lunlimited.net; lin.f.ab@m.titech.ac.jp; lin_toto@toki.waseda.jp

Education

Tokyo Institute of Technology, School of Engineering

MSc (Integrated PhD) candidate, Enrolled **2023/09**

Member of the **CARAS (Sasaki) Lab**

Research Keywords:

- **Computer Security**
- **Computer Architecture**
- **Distributed Systems**

Department of Information and Communications Engineering

Waseda University, School of Fundamental Science and Engineering

Bachelor Alumni, Enrolled **2019/09** – Graduation **2023/09**

Alumni Member of the **Katto Lab**

Research Keywords:

- **Learned Image Compression**
- **Parallel Processing**
- **High Performance Computing**

Major in Computer Science and Communications Engineering

GPA: **3.73 / 4.00**

Japanese Domestic Publications

[D1] **Fangzheng Lin**, Heming Sun, and Jiro Katto: "A high performance implementation of a factorized-prior image compression model," The 84th National Convention of IPSJ, Mar.2022.

[D2] **Fangzheng Lin**, Heming Sun, and Jiro Katto: "A parallel multistage spatial context model for Learned Image Compression," PCSJ/IMPS, Nov.2022.

International Publications

[1] **Fangzheng Lin**, Heming Sun, and Jiro Katto: "Streaming-Capable High-Performance Architecture of Learned Image Compression Codecs," IEEE International Conference on Image Processing (ICIP), Oct.2022.

[2] Heming Sun, Qingyang Yi, **Fangzheng Lin**, Lu Yu, Jiro Katto, and Masahiro Fujita: "F-LIC: FPGA-based learned image compression with a fine-grained pipeline," IEEE Asian Conference on Solid-State Circuits (ASSCC), Nov.2022.

[3] Heming Sun, Qingyang Yi, **Fangzheng Lin**, Lu Yu, Jiro Katto, and Masahiro Fujita: "Real-time Learned Image Codec on FPGA," IEEE International Conference on Visual Communications and Image Processing (VCIP) **Best Demo Paper**, Dec.2022.

[4] **Fangzheng Lin**, Heming Sun, Jinming Liu, and Jiro Katto: "Multistage Spatial Context Models for Learned Image Compression," IEEE International Conference on Acoustics, Speech, & Signal Processing (ICASSP), Jun.2023.

[5] **Fangzheng Lin**, Kasidis Arunruangsirilert, Heming Sun, and Jiro Katto: "Recoil: Parallel rANS Decoding with Decoder-Adaptive Scalability", International Conference on Parallel Processing (ICPP), Aug.2023.

[6] Ao Luo, Heming Sun, Jinming Liu, **Fangzheng Lin**, and Jiro Katto: "PTS-LIC: Pruning Threshold Searching for Lightweight Learned Image Compression", IEEE International Conference on Visual Communications and Image Processing (VCIP), Dec.2023.

[7] Shota Hirose, Kazuki Kotoyori, Kasidis Arunruangsirilert, **Fangzheng Lin**, Heming Sun, and Jiro Katto: "Real-Time Video Prediction with Fast Video Interpolation Model and Prediction Training", *IEEE International Conference on Image Processing (ICIP)*, Oct. 2024.

Research Projects

Efficient Architecture of Learned Image Compression Codecs   2021.9 – 2022.2

- Proposed a high-performance architecture for implementing Learned Image Compression, featuring multi-threaded pipelining and memory pooling.
- Boosts the throughput of the encoder by 4x and decoder by 2x on embedded platforms, and 21x and 8x on desktops. Built a video streaming demo based on the proposed architecture with an embedded device as encoder.
- Work is published in IPSJ Convention [D1] and IEEE ICIP [1].

FPGA-based Learned Image Compression   2021.9 – 2023.3

- Joint project between Waseda University and Tokyo University.
- Contributed to porting a fixed-point Learned Image Compression codec to a FPGA-CPU architecture. Ported the above-mentioned pipeline architecture to this project. Mostly involved in the software part.
- Work is published in IEEE ASSCC [2] and IEEE VCIP Demos [3].

Multistage Spatial Context Models   2022.3 - 2022.10

- The state-of-the-art spatial context model method has the best image quality to file size ratio but cannot run in parallel. Currently published parallel algorithms degrade the image quality too much.
- Developed an alternative algorithm that not only allows parallel execution but even outperforms the previous state-of-the-art in image quality.
- Work is published in PCSJ/IMPS [D2] and IEEE ICASSP [4]

Parallel rANS Entropy Coder with Decoder-Adaptive Scalability 2022.10 – 2023.7

- Entropy Coding is widely used to encode information at a bit rate close to the Shannon limit. Entropy Coding algorithms typically run in serial. Working on a particular type of Entropy Coder, the Range Variant of Asymmetrical Numerical Systems, or rANS.
- Proposed Recoil which is an extension to rANS that allows flexible tradeoff between parallelism and compression rate.
- Work is published in ICPP [5].

Efficient binary-based Spectre gadget detector   2023.7 – now

- Spectre exposes a new threat to system security as secrets can even be leaked via functionally correct programs through abusing speculative execution.
- Proposed an efficient binary-based Spectre gadget detector that outperforms a previous work in both performance (more than 20x performant) and gadget detectability.

Resource-Adaptive Scalable Distributed Deep Learning Infrastructure 2024.2 – now

- Distributed Deep Learning systems are a necessity for training large-scale models. While existing approaches well utilize dedicated stable clusters, training models on instances that are limited in availability (e.g. spot instances) is not well established.
- Proposed an infrastructure that scales the deep learning training pipeline when spot instance availability changes.
- Work in progress.

Professional Experiences

Co-founder of **Luogu**, a major Online Judge platform in China   2013 - present
- Luogu is a platform for automatically grading programs, namely an Online Judge, similar to Codeforces and AtCoder. It is used by 1 million+ users in China.
- Co-founded Luogu as a website in 2013 and registered as a company in 2017.
- Lead of the development team and designed the highly concurrent web services system and program grading system.

Teaching Assistant at **Waseda University**   2021.4 – 2022.12
- Working as a TA in the Fundamentals Programming course and the Digital Circuits Lab from.
- Received numerous positive comments from past students.

Research Assistant at **Waseda Research Institute**   2022.4 - 2023.3
- Working under the supervision of Prof. Sun in Waseda Research Institute.
- Mainly participated in the FPGA-based Learned Image Compression joint project between Waseda University and the University of Tokyo.

Research Assistant at **Waseda University**   2023.9 - now
- Working under the supervision of Prof. Sakai in Waseda University.
- Consultant of the MRI analysis & 3D reconstruction joint project between Waseda University and Tokyo Medical University. Mainly providing technical insights on latest state-of-the-art computer vision methodologies that can be applied to MRI.

AD/AE Program Committee at **ICPP**   2024.4 - 2024.7
- Artifact reviewer of the 53nd International Conference of Parallel Processing.
- Evaluated the reproducibility of the experiments conducted in the assigned papers, through provided artifact programs.