Fangzheng Lin

Personal Information

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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.

[D3] Shimon Murai, **Fangzheng Lin**, Heming Sun, and Jiro Katto: "深層学習画像圧縮のコンテキストモデルにおける潜在表現分割の検討", PCSJ/IMPS, Nov.2023.

[D4] Eiko Nakajima, **Fangzheng Lin**, and Jiro Katto: "Evaluation of patch-frame based error concealment methods in V-PCC point cloud streaming", IEICE-IE Technical Report, Mar.2025.

[D5] Hayato Shimizu, **Fangzheng Lin**, and Jiro Katto: "Multi-Stage Context Model for 3D Point Cloud Compression", IEICE-IE Technical Report, Mar.2025.

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.

[8] **Fangzheng Lin**, Zhongfa Wang, and Hiroshi Sasaki: "Teapot: Efficiently Uncovering Spectre Gadgets in COTS Binaries", *ACM/IEEE International Symposium on Code Generation and Optimization (CGO),* Mar. 2025.

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.

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.