

# Fangzheng Lin

## Personal Information

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Pronouns: he / him / his

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## Education

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### **Tokyo Institute of Technology, Department of Information and Communications Engineering**

MSc student, Enrolled **2023/09**

Member of the **CARAS Lab**

### **Waseda University, School of Fundamental Science and Engineering**

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

Major in Computer Science and Communications Engineering

GPA: **3.73 / 4.00**

## Japanese Domestic Publications

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[D1] **Fangzheng Lin**, Heming Sun, and Jiro Katto: “A high performance implementation of a factorized-prior image compression model,” The 84<sup>th</sup> 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

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[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.2322.

[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.

## Research Projects

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### **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 Demo [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 (Asymmetric Numeral Systems) Entropy Coder** 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 will appear in ICPP [5].

## Work Experiences

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**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 almost 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. Maintainer of a [1000+ star GitHub project](#).

**Teaching Assistant at Waseda University** 2021.4 - 2022.12

- Working as a TA in the Fundamentals Programming course since 2<sup>nd</sup> grade and will start tutoring the Digital Circuits Lab from 2022 autumn. A 2<sup>nd</sup> grade student working as TA is an exception and it was approved by the Head of Department.
- Received numerous positive comments from past students.

**Research Assistant at Waseda Research Institute** 2022.4 - 2023.3

- Invited by the professor to work as a paid Research Assistant. Working under the supervision of Prof. Sun in Waseda Research Institute for 11 hours per week.
- Mainly participating in the FPGA-based Learned Image Compression joint project between Waseda University and University of Tokyo.