YUSUKE MATSUSHITA

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https://shiatsumat.github.io

I am a software scientist working as a Program-Specific **Assistant Professor** at the **Hakubi Center for Advanced Research** and the **Graduate School of Informatics**, **Kyoto University**. I specialize in **formal verification** of **stateful programs**, especially those written in Rust (e.g., my work **RustHorn**, **RustHornBelt**, and **Nola**). I am also curious about many other topics, including algorithms and natural language processing (e.g., **SoftMatcha**).

PAPERS

PLDI 2025 — **Yusuke Matsushita** and Takeshi Tsukada. **Nola: Later-Free Ghost State for Verifying Termination in Iris**. https://dl.acm.org/doi/10.1145/3729250.

ICLR 2025 — Hiroyuki Deguchi, Go Kamoda, **Yusuke Matsushita**, Chihiro Taguchi, Kohei Suenaga, Masaki Waga and Sho Yokoi. **SoftMatcha: A Soft and Fast Pattern Matcher for Billion-Scale Corpus Searches**. https://softmatcha.github.io/, https://openreview.net/forum?id=Q6PAnqYVpo.

VMCAI 2024 — Takashi Nakayama, **Yusuke Matsushita**, Ken Sakayori, Ryosuke Sato and Naoki Kobayashi. **Borrowable Fractional Ownership Types for Verification**. https://doi.org/10.1007/978-3-031-50521-8_11.

ACM PLDI 2022 — **Yusuke Matsushita**, Xavier Denis, Jacques-Henri Jourdan and Derek Dreyer. **RustHornBelt: A Semantic Foundation for Functional Verification of Rust Programs with Unsafe Code**. **Distinguished Paper Award**. https://dl.acm.org/doi/10.1145/3519939.3523704.

ACM TOPLAS 2021 — **Yusuke Matsushita**, Takeshi Tsukada and Naoki Kobayashi. **RustHorn: CHC-based Verification for Rust Programs**. https://dl.acm.org/doi/10.1145/3462205.

ESOP 2020 — **Yusuke Matsushita**, Takeshi Tsukada and Naoki Kobayashi. **RustHorn: CHC-based Verification for Rust Programs**. **Selected for the Special Issue of ACM TOPLAS**. https://link.springer.com/chapter/10.1007/978-3-030-44914-8_18.

THESES

Ph.D. Dissertation, 2024 — **Yusuke Matsushita**. **Non-Step-Indexed Separation Logic with Invariants and Rust-Style Borrows**. **University of Tokyo**, 2024. Precursor to **Nola**. https://shiatsumat.github.io/papers/phd-thesis.pdf, https://shiatsumat.github.io/talks/phd-thesis-talk.pdf.

Master Thesis, 2021 — **Yusuke Matsushita**. **Extensible Functional-Correctness Verification of Rust Programs by the Technique of Prophecy**. **University of Tokyo**, 2021. Precursor to **RustHornBelt**. https://shiatsumat.github.io/papers/masters-thesis.pdf.

Senior Thesis, 2019 — **Yusuke Matsushita**. CHC-based Program Verification Exploiting Ownership Types. **University of Tokyo**, 2019. Precursor to **RustHorn**. https://shiatsumat.github.io/papers/senior-thesis.pdf.

LECTURES

Hakubi Seminar 2025 — **Yusuke Matsushita**. Science of Software, the Fun of Rust. Hakubi Seminar. https://shiatsumat.github.io/talks/2025-hakubi-seminar-talk.pdf. https://www.hakubi.kyoto-u.ac.jp/en/sem/sem_273/.

Lecture at Kyoto University in 2024 — **Yusuke Matsushita**. The Fun of Rust. For the Course of CCE, Grad School of Informatics, Kyoto University. https://shiatsumat.github.io/talks/2024-course-talk.pdf.

PPL Summer School 2024, Invited Lecture — **Yusuke Matsushita**. The World of the Separation Logic Iris. http://ppl.jssst.or.jp/index.php?ss2024.

UTokyo Open Campus 2023 — **Yusuke Matsushita** and Takashi Nakayama. Science of Software, Aspiring to a World Free of Bugs. Open Campus 2023, the Faculty of Science, the University of Tokyo. https://www.youtube.com/watch?v=DDdEtx05dZ4.

TALKS

PLDI 2025 — **Yusuke Matsushita** and Takeshi Tsukada. Nola: Later-Free Ghost State for Verifying Termination in Iris. https://www.youtube.com/watch?v=D7wD5tty_FY.

TPSA 2025 & **PLanQC 2025** — **Yusuke Matsushita** (Presenter at TPSA 2025), Kengo Hirata and Ryo Wakizaka (Presenter at PLanQC 2025). Concurrent Quantum Separation Logic for Fine-Grained Parallelism. Extended abstracts: https://shiatsumat.github.io/papers/tpsa2025-cqsl.pdf, https://shiatsumat.github.io/papers/planqc2025-cqsl.pdf.

PRO-2024-1, Invited Talk — **Yusuke Matsushita**. New Perspectives on Program Verification and Testing Spreading from Rust. https://shiatsumat.github.io/talks/pro-2024-1-invited-talk.pdf.

ACM PLDI 2022 — **Yusuke Matsushita**, Xavier Denis (Co-presenter), Jacques-Henri Jourdan and Derek Dreyer. RustHornBelt: A Semantic Foundation for Functional Verification of Rust Programs with Unsafe Code. https://www.youtube.com/watch?v=pOg4dEhr5hI.

ESOP 2020 — **Yusuke Matsushita**, Takeshi Tsukada and Naoki Kobayashi. RustHorn: CHC-based Verification for Rust Programs. https://www.morressier.com/article/rusthorn-chcbased-verification-rust-programs/604907f41a80aac83ca25d55.

JSSST 2020, Invited Talk — **Yusuke Matsushita**, Takeshi Tsukada and Naoki Kobayashi. RustHorn: CHC-based Verification for Rust Programs. https://www.youtube.com/watch?v=Ah_Bds6I_YI.

PPL 2020 — **Yusuke Matsushita**, Takeshi Tsukada and Naoki Kobayashi. RustHorn: CHC-based Verification for Rust Programs.

POSTERS

PPL 2025 — **Yusuke Matsushita**, Yudai Tanabe, Taro Sekiyama and Atsushi Igarashi. **Pure Realization of Rust-Style Borrows in Linear Haskell**. **Best Poster Award**.

PPL 2019 — **Yusuke Matsushita**, Naoki Kobayashi and Takeshi Tsukada. **CHC-based Program Verification Exploiting Ownership Types**.

ARTICLES

ISPJ 2024 — **Yusuke Matsushita**. **Non-Step-Indexed Separation Logic with Invariants and Rust-Style Borrows**. Bulletin of Ph.D. Dissertations in AY 2023 Recommended by SIGs, Information Processing Society of Japan. Aug 15, 2024. https://note.com/ipsj/n/nc0ae275045eb.

UTokyo Science News 2022 — **Yusuke Matsushita**. **Breaking Ground in the World of Software**. News from Faculty of Science, the University of Tokyo, Vol. 54, No. 1, 2022. https://dl5s7ayfvssw3.cloudfront.net/WEB_info/p/pub/8311/54-1.pdf#page=7.

GRANTS

Apr 2025 – (Mar 2030) — **The Hakubi Project**, **Kyoto University.** Exploring a New Age of Software Development Springing from Rust.

Apr 2024 – Mar 2027 — **JSPS Research Fellowship for Young Scientists PD**. Foundations and Applications for Robust and High-Performance System Software.

Apr 2021 – Mar 2024 — **JSPS Research Fellowship for Young Scientists DC1**. Theory and Application for Robust and High-Performance Systems Programming Languages.

WORK

Apr 2025 – (Mar 2030) — **Program-Specific Assistant Professor** at **the Hakubi Center for Advanced Research**, **Kyoto University.**

Apr 2024 – Mar 2025 — **JSPS Fellow (PD)** at the Computer Software Group (Igarashi & Suenaga Lab), Graduate School of Informatics, **Kyoto University.**

TEACHING

Aug 2025 — Lecturer of L1 **Rust Verifier Development Seminar** at **IPA Security Camp** 2025 https://www.ipa.go.jp/jinzai/security-camp/2025/camp/zenkoku/program/l.html#l1.

Aug 2024 — Lecturer of S15 **Rust Program Verification Seminar** at **IPA Security Camp** 2024 https://www.ipa.go.jp/jinzai/security-camp/2024/camp/zenkoku/program/kaihatsu.html#s15.

Apr 2022 – Aug 2022, Apr 2019 – Aug 2019 — Teaching assistant of "Functional and Logic Programming Experiments" at Dept. of Information Science, School of Science, University of Tokyo.

Sept 2019 – Feb 2020 — Teaching assistant of "Processor and Compiler Experiments" at Dept. of Information Science, School of Science, University of Tokyo.

Mar 2018 — Lecturer of "Purely Functional Data Structures" at the Japanese Olympiad in Informatics 2017 Spring Training Camp.

Aug 2017 — Tutor on "Purely Functional Data Structures" by Chris Okasaki at the Japanese Olympiad in Informatics 2017 Summer Seminar.

SERVICE

Jan 2026 – Mar 2026 — Program committee member of PPL 2026.

Nov 2025 – Apr 2026 — Review committee member of ACM PLDI 2026.

Feb 2025 — External reviewer of ACM PLDI 2025.

Jan 2025 – Mar 2025 — Program committee member of PPL 2025.

HONORS & AWARDS

2025 — Hakubi Researcher at the Hakubi Center for Advanced Research, Kyoto University.

2025 — Best Poster Award at PPL 2025.

2024 — Invited Lecture at PPL Summer School 2024.

2022 — Distinguished Paper Award at ACM PLDI 2022.

2020 — Selected for ACM TOPLAS ESOP 2020 Special Issue.

2018 — Sub-leader of Japan's special team for the International Olympiad in Informatics 2018.

2013 & 2012 — Finalist in the Japanese Olympiad in Informatics 2013 & 2012.

2013 — Quarter-finalist in the National High School English Debate Tournament 2013.

EDUCATION

Apr 2021 – Mar 2024 — Ph.D. in the field of Information Science and Technology.

Apr 2019 – Mar 2021 — Master of Information Science and Technology.

Apr 2015 – Mar 2019 — Bachelor of Science.

University of Tokyo, Japan. Supervised by Naoki Kobayashi.

Apr 2009 – Mar 2015 — Nada Junior and Senior High School, Japan.

EXPERIENCES

Nov 2022 – Feb 2023 — **Software Engineer Intern** at **ChromeOS** Velocity Team, **Google Tokyo**.

Sept 2020 – June 2021 — **Visiting Scholar** at the **RustBelt** team, led by **Derek Dreyer**, at **Max Planck Institute for Software Systems**.

Aug 2019 – Jan 2020 — **Software Engineer Intern** at **CADDi**, a startup in Japan that builds a digital marketplace for manufacturing. Interview article: https://www.wantedly.com/companies/caddi/post_articles/200577.

Mar 2017 – Mar 2019 — **Research Intern** at **Morishita Lab** (human genome informatics), in Dept. of Computational Biology and Medical Sciences, Grad School of Frontier Science, University of Tokyo.

Dec 2015 – Dec 2016 — **President** of **UTokyo Piano Society**, a piano club of ~200 members.

SKILLS

Languages — **Japanese** (Native speaker), **English** (Advanced, EIKEN Grade 1, TOEFL iBT 92).

Programming — C/C++, Rust, Coq, OCaml, Haskell, TypeScript, …