

Thomas Köehler

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🌐 thok.eu

I am a postdoctoral researcher working on interactive source-to-source code optimization with Arthur Charguéraud at INRIA Strasbourg. Before that, I worked closely with Michel Steuwer on high performance code generation via rewriting in the high-level functional Rise language (rise-lang.org), during my PhD in computer science at the University of Glasgow. I proposed a technique called sketch-guided equality saturation that allows programmers to guide program rewriting by providing incomplete programs called sketches.

🏛️ EDUCATION

- 2018–2022 | **Ph.D in Computer Science**
🕒 3.5 years | University of Glasgow, Scotland, United Kingdom
Supervisors: Michel Steuwer, Phil Trinder
- 2016–2018 | **Master of Software Science and Technology**
Sorbonne Universités (Université Pierre et Marie Curie), France
Parcours d'Excellence
- 2014–2016 | **Licence of Computer Science (Bachelor)**
Sorbonne Universités (Université Pierre et Marie Curie), France
Mention Bien (High Commendation)

👤 EXPERIENCE

- 2023 | **Post-Doc: Interactive, Trustworthy, Source-to-source code optimization**
🕒 2 years | INRIA CAMUS, Strasbourg, France
Project Leader: Arthur Charguéraud
- 2020 | **Compiler and Language Research Internship**
🕒 4 months | Huawei Research and Development, Edinburgh, UK
- 2018 | **Efficient object tracking algorithms on heterogeneous and parallel architectures**
🕒 6 months | Laboratoire d'Informatique de Paris 6, France
Supervisors: Lionel Lacassagne, Emmanuel Chailloux
- 2017 | **Optical flow computing optimisation on GPU (CUDA)**
🕒 2 months | Laboratoire d'Informatique de Paris 6, France
Supervisor: Lionel Lacassagne
- 2015–2017 | **Contribution to GFX-rs, a graphics API (Rust)**
- 2014–today | **Binding of the Box2D physics engine (Rust)**

🏆 AWARDS

- 2021, Nov. | **Communications of the ACM Research Highlight**, recognition for our ICFP 2020 paper
- 2021, Sep. | **1 of 4 ACM SIGPLAN Research Highlight 2020**, awarded to our ICFP 2020 paper
- 2020 | **HiPEAC Paper Award Winner**, for our ICFP 2020 paper

✍️ PUBLICATIONS

Jackson Woodruff, Thomas Köehler, Alexander Brauckmann, Sam Ainsworth, Michel Steuwer, Michael O'Boyle:
Rewriting History: Repurposing Domain-Specific Accelerators with Rewrite Exploration
submitted to ASPLOS 2023

Thomas Koehler:

A Domain-Extensible Compiler with Controllable Automation of Optimisations

PhD Thesis defended in 2022

Thomas Koehler, Phil Trinder and Michel Steuwer:

Sketch-Guided Equality Saturation: Scaling Equality Saturation to Complex Optimizations of Functional Programs

arXived in 2022

Michel Steuwer, Thomas Koehler, Bastian Köpcke, Federico Pizzuti:

RISE & Shine: Language-Oriented Compiler Design

arXived in 2022

Thomas Koehler and Michel Steuwer:

Towards a Domain-Extensible Compiler: optimizing an image processing pipeline on mobile CPUs

CGO 2021: International Symposium on Code Generation and Optimization

Bastian Hagedorn, Johannes Lenfers, Thomas Koehler, Xueying Qin, Sergei Gorlatch and Michel Steuwer:

Achieving High-Performance the Functional Way:

A Functional Pearl on Expressing High-Performance Optimizations as Rewrite Strategies

ICFP 2020: International Conference on Functional Programming

A. Petreto, A. Hennequin, T. Koehler, T. Romera, Y. Fargeix, B. Gaillard, M. Bouyer, Q. Meunier and L. Lacassagne:

Energy and Execution Time Comparison of Optical Flow Algorithms on SIMD and GPU Architectures

DASIP 2018: Conference on Design and Architectures for Signal and Image Processing

 **TALKS**

- 2022, Aug. | *A Term Rewriting Path to High-Performance*
INRIA CAMUS, Strasbourg, France
- 2022, Jul. | *Sketch-Guided Program Optimization*
TUM, Munich, Germany
- 2022, Jun. | Invited Talk: *Sketch-Guided Equality Saturation*
EGRAPHWS Workshop, PLDI 2022, San Diego, CA, US
- 2022, Apr. | *Sketch-Guided Program Optimisation*
Saarland University, Germany
- 2022, Mar. | *Domain-Extensible Compilers and Controllable Automation of Program Optimizations*
Dagstuhl Seminar, Germany
- 2022, Feb. | *Sketch-Guided Equality Saturation*
Glasgow PLUG Seminar, Virtual
- 2021, Dec. | *Optimizing Processing Pipelines with a Rewrite-Based Domain-Extensible Compiler*
Huawei CSI Paris Seminar, Virtual
- 2021, Nov. | *Optimizing Processing Pipelines with a Rewrite-Based Domain-Extensible Compiler*
Languages, Systems, and Data Seminar, University of California, Santa Cruz, Virtual
- 2021, Jun. | *Optimizing Functional Programs with Equality Saturation*
Scottish Programming Languages Seminar 2021, Virtual
- 2021, Mar. | *Towards a Domain-Extensible Compiler:
Optimizing an Image Processing Pipeline on Mobile CPUs*
CGO 2021, Virtual
- 2020, Oct. | *Optimizing Image Processing Pipelines with a Domain-Extensible Compiler*
Systems Seminar, University of Glasgow, UK

2019, Jan. | *Development of efficient image processing applications*
Systems Seminar, University of Glasgow, UK

ATTENDED ACADEMIC EVENTS

2022, Jun. | *Programming Language Design and Implementation Conference (PLDI)*, San Diego, CA, US
2022, Mar. | *Dagstuhl Seminar (Tensor Computations: Applications and Optimization)*, Dagstuhl, Germany
2021, Feb. | *International Symposium on Code Generation and Optimization (CGO)*, Virtual
2020, Jun. | *Programming Language Design and Implementation (PLDI) Conference*, Virtual
2019, Dec. | *Google Compiler and Programming Language Summit*, Munich, Germany
Oct. | *Scottish Programming Languages Seminar*, Glasgow, UK
Aug. | *Scottish Programming Languages and Verification Summer School*, Glasgow, UK
Jul. | *ACACES HiPEAC Summer School*, Fiuggi, Italy
Jun. | *SICSA PhD Conference*, University of Stirling, UK
Jun. | *Scottish Programming Languages Seminar*, Edinburgh, UK
Apr. | *HiPEAC Computer Systems Week*, Edinburgh, UK
Mar. | *Scottish Programming Languages Seminar*, St Andrews, UK

COMMUNITY INVOLVEMENT

2023 | Reviewing ? papers for the EGRAPHS workshop (Program Committee member)
2022 | Reviewing 1 paper for the Journal of Computer Languages (COLA)
2022 | Student Volunteer at PLDI 2022, San Diego, CA, US
2022 | Reviewing 3 papers for the ARRAY workshop (Program Committee member)
2022 | Co-Reviewing 1 paper for IFL (Symposium on Implementation and Application of Functional Languages)
2020-2021 | PhD Mentor, University of Glasgow, UK
2020 | Student Volunteer at PLDI 2020, Virtual
2019 | Reviewing 2 artifacts for CGO 2020
2019-2020 | Intra-Systems Seminar Organizer, University of Glasgow, UK

TEACHING

2019-2020 | *Lab Assistant: Systems Programming (H). Level 4 (SCQF Level 10)*
Lab Assistant: Programming Languages (H). Level 4 (SCQF Level 10)
University of Glasgow, UK