

Nicolò Carpentieri

SYSTEMS & COMPUTER ARCHITECTURE

PhD Student, Systems Research Group
Technical University of Munich

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Research Interests

My interests lie in **computer architecture and systems**, particularly **memory disaggregation** at rack scale and the scale-up interconnects, like CXL and related fabrics, that make it possible. Within that space, I focus on **cache coherence protocols** for heterogeneous systems.

Education

Ph.D. in Computer Science Oct 2024 -- present

Technical University of Munich

Advisor: Prof. Dr. Pramod Bhatotia

M.Sc. in Computer Engineering 2021 -- 2024

Politecnico di Torino

Thesis: Designing and Evaluating Mapping of CNN Layers on an Edge-CGRA

B.Sc. in Electronic Engineering 2018 -- 2021

Politecnico di Torino

Experience

RESEARCH

Ph.D. Student, Technical University of Munich Oct 2024 -- present

Group: Chair of Computer Systems · Host: Prof. Dr. Pramod Bhatotia

- **Cache coherence protocols:** automated synthesis of controllers for heterogeneous systems.
- **CXL bridges:** integrating CXL 3.0 cache coherence into arbitrary host architectures.
- **CXL GPUs:** GPUs with CXL 3.0 integration for symmetric cache coherence with host CPUs.

UNDERGRADUATE RESEARCH PROJECT

Visiting Student, Embedded Systems Laboratory (ESL), EPFL 2023 -- 2024

Mapping of convolutional neural network algorithms onto CGRA architectures, in collaboration with DAUIN, Politecnico di Torino.

Publications

CONFERENCES

- [C1] Decoupling Protocol, Topology, and Policy for Automated Synthesis of Coherence Controllers
Nicolò Carpentieri, Anatole Lefort, David Schall, Julian Pritzi, Pramod Bhatotia
IEEE/ACM MICRO 2026
- [C2] vCXLGen: Automated Synthesis and Verification of CXL Bridges for Heterogeneous Architectures
Anatole Lefort*, Julian Pritzi*, Nicolò Carpentieri, David Schall, Simon Dittrich, Soham Chakraborty, Nicolai Oswald, Pramod Bhatotia (*equal contribution)
ACM ASPLOS 2026 ★ Best Paper Award
- [C3] C3: CXL Coherence Controllers for Heterogeneous Architectures
Anatole Lefort, David Schall, Nicolò Carpentieri, Julian Pritzi, Nicolai Oswald, Pramod Bhatotia
IEEE HPCA 2026
- [C4] Performance Evaluation of Acceleration of Convolutional Layers on OpenEdgeCGRA
Nicolò Carpentieri, Juan Sapriza, Davide Schiavone, Daniele Jahier Pagliari, David Atienza, Maurizio Martina, Alessio Burrello
ACM CF 2024

JOURNALS

- [J1] Invited extended journal version of *vCXLGen: Automated Synthesis and Verification of CXL Bridges for Heterogeneous Architectures*
 Anatole Lefort*, Julian Pritzi*, **Nicolò Carpentieri**, David Schall, Simon Dittrich, Soham Chakraborty, Nicolai Oswald, Pramod Bhatotia (*equal contribution)
ACM Transactions on Computer Systems (TOCS) forthcoming, 2026

UNDER SUBMISSION

- [S1] CXL-GPU: Cache-Coherent Memory Expansion for GPUs over CXL
 Under submission 2026

</> Projects

Synapse — Generic synthesis of verified, gem5-ready coherence controllers by decoupling protocol, topology, and policy specifications

github.com/TUM-DSE/Synapse

🎤 Talks

- Decoupling Protocol, Topology, and Policy for Automated Synthesis of Coherence Controllers
 IEEE/ACM MICRO 2026, Athens, Greece 2026
- Automated Synthesis of Verified CXL Bridges for Heterogeneous Architectures
 DFG SPP 2377 “Disruptive Memory Technologies” Annual Meeting, Dresden, Germany 2026
- ProtoSLICC: Automated Synthesis of Gem5-based Cache Coherence Controllers
 gem5 Workshop @ ISCA 2025, Tokyo, Japan 2025

👥 Academic Service

- Artifact Evaluation Committee** 2026
 ACM ASPLOS 2026
 IEEE/ACM MICRO 2026

📚 Teaching Experience

- Introduction to Software Engineering (EIST) — *Exam Team* 2024--2026
 Systems Programming — *Course Organizer* 2026--2027

🎓 Student Supervision

- Disaggregated, Vendor-Generic APUs with CXL
 Victor Fritz Trost — B.Sc. Thesis SS 2025

🏆 Honors and Awards

- Best Paper Award, ACM ASPLOS 2026 2026
 Induction in IEEE-HKN (Mu Nu Chapter), Politecnico di Torino chapter 2022

✂ Skills and Interests

Programming languages C/C++ · Verilog HDL · VHDL · Python · Shell script · $\text{\LaTeX}$ · Matlab

Development Unix/Linux · gem5 simulator · FPGA · CUDA · RDMA

Other interests Skiing · Tennis · Football · Basketball · Padel · Volleyball · Piano · Flute