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Research Interests

My research interests lie in quantum systems, where I design compilers, OS mechanisms, and hardware-software co-designs to scale quantum computing toward fault-tolerant quantum computation. I leverage IRs, ISAs, and cross-stack optimizations to improve execution fidelity, programmability, and resource efficiency across the quantum software stack.

Previously, I worked in the distributed systems area, specifically in distributed shared logs, hardware-assisted replication protocols, and the implementation of fast reads in asynchronous replication protocols.

Research keywords:

Quantum Software Systems, Quantum Compilers, Operating Systems, HW-SW Co-design, QEC, FTQC, HPC

Education

Ph.D. in Computer Science (Sept 2021 - Dec 2026 (Expected))

TU Munich, Germany

Thesis: Systems Software and Hardware-Software Co-Design for Scalable Quantum Computing

Advisor: Prof. Dr. Pramod Bhatotia

M.Sc. in Computer Science (Sept 2019 - July 2021)

University of Crete, Greece

B.Sc. in Computer Science (Sept 2015 - July 2019)

University of Crete, Greece

Honors and Awards

Best Student Paper Award Finalist

Paper: "Qonductor: A Cloud Orchestrator for Quantum Computing"

SuperComputing (SC)'25

Best Paper Award

Paper: "Recipe: Hardware-Accelerated Replication Protocols"

ACM Middleware'25

Best Poster Nominee

Poster: "The LAW Behind ALRs: Redefining Crash-Tolerant Reads"

EuroSys'25

Distinction DEPROFOIT, University of Crete, Greece, Sept 2018

Undergraduate teaching assistant based on overall grades.

Publications

Under submission publications:

1. MCMit: Mid-circuit Measurement Error Mitigation
Emmanouil Giortamis, Felix Gust, Aleksandra Świerkowska, Sandra Stankovic, Yanbin Chen, Xiaorang Guo, Benjamin Lienhard, Martin Schulz, Pramod Bhatotia
IEEE/ACM International Symposium on Microarchitecture (MICRO) '26
2. Chipmunq: A Fault-Tolerant Compiler for Chiplet Quantum Architectures
Peter Wegmann, Aleksandra Świerkowska, Emmanouil Giortamis, and Pramod Bhatotia
SuperComputing (SC)'26
3. Multi-Stage Mamba-Based Architecture for Fast and Scalable Superconducting Qubit Readout
Luca Otting, Xiaorang Guo, Emmanouil Giortamis, Benjamin Lienhard, Pramod Bhatotia and Martin Schulz
IEEE International Conference on Quantum Computing and Engineering (QCE) '26
4. MultiQ: Efficient Multiprogramming on Neutral Atom Quantum Computers
Francisco Romão, Daniel Vonk, Emmanouil Giortamis, Dennis Sprokholt, and Pramod Bhatotia
Conference on Object-Oriented Programming, Systems, Languages & Application (OOPSLA) '26
5. AtomGuard: An Architecture-Centric ISA for Verified Compilation on Neutral Atom Quantum Architectures.
Francisco Romão, Nathaniel Tornow, Emmanouil Giortamis, Dennis Sprokholt, and Pramod Bhatotia.
ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS) '27

Conference publications:

1. qTPU: Hybrid Tensor Networks for Quantum-Classical Acceleration
Nathaniel Tornow, Emmanouil Giortamis, Dennis Sprokholt, Christian B. Mendl, and Pramod Bhatotia
USENIX Symposium on Operating Systems Design and Implementation (OSDI) '26
2. ECCentric: An Empirical Analysis of Quantum Error Correction Codes
Aleksandra Świerkowska, Jannik Pflieger, Emmanouil Giortamis, and Pramod Bhatotia
ACM Conference on Measurement and Modeling of Computer Systems (SIGMETRICS) '26
3. Qonductor: A Cloud Orchestrator for Quantum Computing (**Finalist-Best Student Paper Award**)
Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, Dmitry Lugovoy, and Pramod Bhatotia
Supercomputing (SC)'25;
4. QOS: Quantum Operating System
Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, and Pramod Bhatotia
USENIX Symposium on Operating Systems Design and Implementation (OSDI) '25;
5. Recipe: Hardware-Accelerated Replication Protocols (**Best Paper Award**)
Dimitra Giantsidi, Emmanouil Giortamis, Julian Pritzi, Maurice Bailleu, Manos Kapritsos, and Pramod Bhatotia
ACM/IFIP International Middleware Conference '25;
6. QVM: Quantum Gate Virtualization Machine
Nathaniel Tornow, Emmanouil Giortamis, and Pramod Bhatotia
ACM Programming Language Design and Implementation (PLDI) '25;

7. The LAW theorem: Local Reads and Linearizable Asynchronous Replication
*Antonios Katsarakis**, *Emmanouil Giortamis**, *Vasilis Gavrielatos*, *Pramod Bhatotia*, *Aleksandar Dragojevic*,
Boris Grot, *Vijay Nagarajan*, and *Panagiota Fatourou*
International Conference on Very Large Data Bases (VLDB) '25;
8. Weaver: A Retargetable Compiler Framework for FPQA Quantum Architectures
*Oğuzcan Kirmemiş**, *Francisco Romão**, *Emmanouil Giortamis*, and *Pramod Bhatotia*
ACM/IEEE International Symposium on Code Generation and Optimization (CGO) '25
9. FlexLog: A Shared Log for Stateful Serverless Computing
Dimitra Giantsidi, *Emmanouil Giortamis*, *Nathaniel Tornow*, *Florin Dinu*, and *Pramod Bhatotia*
ACM High-Performance Parallel and Distributed Computing (HPDC) '23

Ph.D. Dissertation

Topic: Hardware-Software Co-Design for Scalable Quantum Computing

Supervisor: Prof. Dr. Pramod Bhatotia

My dissertation builds the systems software infrastructure to scale quantum computing from NISQ toward fault-tolerant quantum computation. In my thesis, I designed four main systems: *QOS* introduces OS-level abstractions for managing quantum resources, improving fidelity and Quality-of-Service for end users, and resource efficiency for the quantum cloud provider. *Qonductor* extends this to hybrid quantum-classical resources, providing transparent hybrid application development and deployment on hybrid clusters. *MCMit* is a hardware-software co-design that couples ML-based qubit readout discrimination with software error mitigation to mitigate mid-circuit measurement errors. Finally, *Oraqle* examines qubit readout as a systems-level design decision by providing a systematic evaluation of ML-based qubit-state discriminators and their impact on quantum error correction code performance.

Publications based on my PhD thesis:

QOS: Quantum Operating System — OSDI'25
 Source code: <https://github.com/manosgior/QOS>

Qonductor: A Cloud Orchestrator for Quantum Computing — SC'25
 Source code: <https://github.com/manosgior/Qonductor-SC25>

MCMit: Mid-Circuit Measurement Error Mitigation — under submission at MICRO'26
 Source code: <https://github.com/manosgior/MCMit>

Oraqle: Qubit Readout as a Systems-level Knob — to be submitted at SIGMETRICS'27

Employment

TU Munich, Germany, Sept 2021 -

Scientific Employee

Responsibilities: conducting research, teaching assistant.

ICS-FORTH, Heraklion, Greece, July 2018 - Sept 2018

Research Internship

Responsibilities: experimental analysis of large-scale graphs on multiprocessor architectures.

ICS-FORTH, Heraklion, Greece, July 2017 - Sept 2017

Research Internship

Responsibilities: developing a concurrent, shared-page memory allocator in C.

Talks

Conference talks:

- QOS: Quantum Operating System
Conference talk at **OSDI'25** (Boston, MA, USA)
- Qonductor: A Cloud Orchestrator for Quantum Computing
Conference talk at **SC'25** (St. Louis, MI, USA)
- Recipe: Hardware-Accelerated Replication Protocols
Conference talk at **Middleware'25** (Nashville, TN, USA)
- FlexLog: A Shared Log for Stateful Serverless Computing
Conference talk at **HPDC'23** (Orlando, FL, USA)

Invited talks:

University of Texas, Austin (UT Austin)

Host: Prof. Poulami Das
MCMit: Mid-circuit Measurement Error Mitigation
April 2025

University of Wisconsin-Madison (UW Madison)

Host: Prof. Swamit Tannu
MCMit: Mid-circuit Measurement Error Mitigation
June 2025

Massachusetts Institute of Technology (MIT)

Host: Prof. William D. Oliver
Software Systems for Quantum Computing
July 2025

QuEra Computing

Software Systems for Neutral Atom Quantum Architectures
July 2025

QCAS Workshop (ICCAD'25)

Qonductor: A Cloud Orchestrator for Quantum Computing
October 2025

Cisco Quantum Research

Software Systems for Quantum Computing Research of the Chair of Computer Systems
November 2025

Service

Reviewer for the Quantum journal
Reviewer for Transactions on Architecture and Code Optimization (TACO) journal
IEEE Quantum Week 2024, Student Volunteer

Teaching experience

Teaching assistant:

TU Munich: Cloud Software Engineering lab, Quantum Software Systems seminar, Distributed Systems lecture

University of Crete: Languages and Compilers lecture, Introduction to Computer Science lecture, Principles of Distributed Computing lecture, Data Structures lecture

Advisees:

Scalable Fault-Tolerant Quantum Compiler for Chiplet Architectures

Peter Wegmann

M.Sc. thesis

Real-time and parallel task scheduling for Quantum Computing

Marcin Praski

M.Sc. thesis

Hardware-aware Optimal Quantum Circuit Cutting and Knitting

Thang Tran

M.Sc. thesis

Quantum Circuit Transpilation: Experimental Analysis and Subarchitecture Selection

Zeynep Erdogan

M.Sc. thesis

Scalable Quantum Cloud Scheduling

Dmitry Lugovoy

M.Sc. thesis

Extensions to QStack: Virtual Qubit Routing and SuperMarQ Benchmarks

Ahmed Darwish

Guided research

A System Stack for Distributed Quantum Computing

Nathaniel Tornow

Guided research

DQS: A Framework for Efficient Distributed Simulation of Large Quantum Circuits

Nathaniel Tornow

B.Sc. thesis

Skills

Languages: C, Python (expert), Unix shell, C++ (competent);

Frameworks: Qiskit, OpenMP, MPI, NVIDIA cuQuantum, CUDA, LLVM, Slurm;

Containerization & Orchestration: Docker, contained, Kubernetes (K8s)

CI/CD: Git

Soft skills: Technical/Scientific writing, Leading research projects, Presenting complex ideas to non-experts, Comfortable working under uncertainty (exploratory tech), Mentoring students;

References

Prof. Dr. Pramod Bhatotia
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Prof. Dr. Manos Kapritsos
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Dr. Dimitra Giantsidi
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Prof. Dr. Martin Schulz
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Dr. Antonios Katsarakis
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