

# Emmanouil Giortamis

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## Research Interests

My research interests lie in the field of systems software for quantum computing, where I bring systems software abstractions and mechanisms into quantum computing for improved programmability, performance, and scalability. In particular, I focus on compiler and operating systems mechanisms that address the low fidelity, heterogeneity, under-utilization, and significant queuing times of quantum resources. To achieve this, I design systems that leverage quantum error mitigation, circuit cutting and knitting, multi-programming, and hybrid quantum-classical resource estimation and scheduling. Recently, I started exploring emerging quantum technologies such as neutral atoms, as well as quantum error correction. 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.

### *Keywords:*

Quantum Compilers, Quantum Error Mitigation, Hybrid Quantum-Classical, Resource Estimation, Scheduling, HPC

## Education

**Ph.D.** in Computer Science (Sept 2021 - Aug 2026 (Expected))  
*TU Munich, Germany*

*Thesis: Systems Software for Scaling NISQ-era 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*

## 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.

## Honors and Awards

### **Best Student Paper Award Finalist**

Paper: "Qonductor: A Cloud Orchestrator for Quantum Computing"  
Supercomputing Conference, 2025, St. Louis, USA

### **Distinction DEPROFOIT, University of Crete, Greece, Sept 2018**

Undergraduate teaching assistant based on overall grades.

## Ph.D. Dissertation (ongoing)

**Topic:** Systems Software for Scaling NISQ-era Quantum Computing

**Supervisor:** Prof. Dr. Pramod Bhatotia

In the context of my Ph.D., I build systems that increase the scalability of Noisy, Intermediate-Scale Quantum (NISQ) era quantum computers, focusing on operating systems and compiler mechanisms that improve execution fidelity as well as the users' and the quantum cloud operator's objectives, i.e., better Quality-of-Service and higher resource efficiency, respectively. Such mechanisms include circuit compilation and optimization, error mitigation techniques, hybrid performance estimation, multi-tenant program execution (multi-programming), and hybrid multi-objective scheduling. Last, I have started looking beyond NISQ, by working in distributed quantum computing and quantum error correction.

### **Active Research projects:**

MCMit: Mid-circuit Measurement Error Mitigation

*Emmanouil Giortamis, Felix Gust, Yanbin Chen, Xiaorang Guo, Benjamin Lienhard, Martin Schulz, Pramod Bhatotia*

Realistic Benchmarking of Quantum Error Correction Codes on Mid-Term Quantum Devices

*Aleksandra Świerkowska, Jannik Pflieger, Emmanouil Giortamis, and Pramod Bhatotia*

MultiQ: Efficient Multiprogramming on Neutral Atom Quantum Computers

*Francisco Romão, Emmanouil Giortamis, and Pramod Bhatotia*

Quantum-Classical Computing via Tensor Networks

*Nathaniel Tornow, Emmanouil Giortamis, Christian B Mendl, and Pramod Bhatotia*

## Publications

### **Conference publications:**

*QOS: Quantum Operating System*

*Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, and Pramod Bhatotia*

**USENIX Symposium on Operating Systems Design and Implementation (OSDI) '25;**

Acceptance Rate: ~17%

*Qonductor: A Cloud Orchestrator for Quantum Computing*

*Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, Dmitry Lugovoy, and Pramod Bhatotia*

**The International Conference for High Performance Computing, Networking, Storage, and Analysis (Supercomputing / SC) '25;**

**Finalist-Best Student Paper Award**

Acceptance Rate: ~21%

**QVM: Quantum Gate Virtualization Machine**

*Nathaniel Tornow, Emmanouil Giortamis, and Pramod Bhatotia*

**ACM Programming Language Design and Implementation (PLDI) '25;**

Acceptance Rate: ~28%

**Weaver: A Retargetable Compiler Framework for FPQA Quantum Architectures**

*Oğuzcan Kirmemis\*, Francisco Romão\*, Emmanouil Giortamis, and Pramod Bhatotia*

**ACM/IEEE International Symposium on Code Generation and Optimization (CGO) '25**

Acceptance Rate: ~32%

**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;**

**Recipe: Hardware-Accelerated Replication Protocols**

*Dimitra Giantsidi, Emmanouil Giortamis, Julian Pritzi, Maurice Bailleu, Manos Kapritsos, and Pramod Bhatotia*

**ACM/IFIP International Middleware Conference '25;**

**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**

Acceptance Rate: ~20%

### Posters and Talks:

**The LAW Behind ALRs: Redefining Crash-Tolerant Reads**

*Antonios Katsarakis\*, Emmanouil Giortamis\*, Vasilis Gavrielatos, Pramod Bhatotia, Aleksandar Dragojevic,*

*Boris Grot, Vijay Nagarajan, and Panagiota Fatourou*

**Posters at EuroSys '25 (best poster nominee), EuroSys '24, EuroSys '23**

**MCMit: Mid-circuit Measurement Error Mitigation**

**Invited talk at the UT Austin Architectures for Emerging Systems (ACES) research group, led by Prof. Poułami Das**

Online/Zoom

**MCMit: Mid-circuit Measurement Error Mitigation**

**Invited talk at the University of Wisconsin-Madison QUEST research group led by Prof. Swamit Tannu**

Online/Zoom

**Software Systems for Quantum Computing**

**Invited talk at the MIT Engineering Quantum Systems (EQuS) research group led by Prof. William D. Oliver**

Cambridge, MA, USA

**Software Systems for Neutral Atom Quantum Architectures**

**Invited talk at QuEra Computing**

Boston, MA, USA

**Qonductor: A Cloud Orchestrator for Quantum Computing**

**Invited talk at the Quantum Computing Applications and Systems (QCAS) Workshop, part of IC-CAD'25**

Munich, Germany

Software Systems for Quantum Computing Research of the Chair of Computer Systems  
Invited talk at Cisco Quantum Research  
Online

\*Equal Contribution

## Service

IEEE Quantum Week 2024, Student Volunteer  
Reviewer for the Quantum journal

## Open Source Projects

Quantum Operating System (QOS)  
<https://github.com/manosgior/QOS>

Qonductor: A Cloud Orchestrator for Quantum Computing  
<https://github.com/manosgior/Qonductor-SC25>

MCMit: Mid-circuit Measurement Error Mitigation  
<https://github.com/manosgior/MCMit>  
*Under development*

Alpha Programming Language  
<https://github.com/manosgior/Alpha-Programming-Language>

Alpha++ Programming Language  
<https://github.com/manosgior/A-plus-plus-Programming-Language>

User-Space Threads  
<https://github.com/manosgior/User-Space-Threads>

Simple java.util.concurrent  
<https://github.com/manosgior/Simple-Java-Util-Concurrent>

Mortal Kombat Game  
<https://github.com/manosgior/Mortal-CSD>

## Teaching experience

### Teaching assistant:

- Cloud Software Engineering lab, TU Munich, SS 2022, WS 2023-24, SS 24, SS 25
- Quantum Software Systems seminar: TU Munich, SS 2023
- Distributed Systems lecture, TU Munich, WS 2021-22, WS 2022-23
- Languages and Compilers lecture, University of Crete, SS 2021
- Introduction to Computer Science lecture, University of Crete, WS 2020-21
- Principles of Distributed Computing lecture, University of Crete, SS 2020
- Data Structures lecture, University of Crete, WS 2019-20

**Advising:**

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: Optimizing Resource Allocation for Efficient NISQ Computing

*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**

Microservice Architecture in Practice: Debugging the Behaviour of Concurrent Applications at financial.com AG

*Jonathan Ryan Wijaya Tumboimbela*

**M.Sc. thesis**

## Skills

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

**Frameworks:** Qiskit, OpenMP, MPI (expert), NVIDIA cuQuantum, CUDA, LLVM, Slurm (knowledgeable);

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

**CI/CD:** Git

**Core Concepts:** Scalability, Fault Tolerance, High Availability, Consistency Models, Concurrency, Load Balancing, PaaS (Platform as a Service), FaaS (Function as a Service / Serverless), Distributed Quantum Computing

**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**

TU Munich, Germany

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**Prof. Dr. Panagiota Fatourou**

University of Crete, Greece

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**Dr. Antonios Katsarakis**

Principal Researcher at Huawei

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