Emmanouil Giortamis

Milbertshofener Str. 6
80807 Munich, Germany

Mobile:	+30 6945160711
Email:	emmanouil.giortamis@tum.de
Homepage:	https://manosgior.github.io/
GitHub:	https://github.com/manosgior

Research Interests

My research interests lie in the field of systems software for quantum computing, i.e., I bring systems abstractions and mechanisms into quantum computing for improved programmability, performance, and scalability. In particular, I focus on compiler and OS mechanisms that address the low fidelity, vast heterogeneity, and underutilization of quantum devices and the users' experience with respect to job queuing times. To achieve this, I design systems that leverage circuit cutting and knitting, spatiotemporal multiplexing (i.e., multi-programming and scheduling), and hybrid quantum-classical resource estimation and management.

Previously, I worked in the distributed systems area, specifically in distributed shared logs, state machine replication (SMR), and replication protocols.

Education

Ph.D. in Computer Science (Sept 2021 -)
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

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 investigate and build systems that increase the scalability of Noisy, Intermediate-Scale Quantum (NISQ) era quantum computers, focusing on operating systems and compiler abstractions such as virtualization, resource estimation and management, and performance optimization.

Research projects:

QOS: A Quantum Operating System
Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, and Pramod Bhatotia
[Arxiv pre-print];

Orchestrating the Quantum Clouds with Qonductor
Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, Dmitry Lugovoy, and Pramod Bhatotia
[Arxiv pre-print];

Weaver: A Retargetable Compiler Framework for FPQA Quantum Architectures
Oğuzcan Kırmemiş, Francisco Romão, Emmanouil Giortamis, and Pramod Bhatotia
[Arxiv pre-print];

Scaling Quantum Computations via Gate Virtualization
Nathaniel Tornow, Emmanouil Giortamis, and Pramod Bhatotia
[Arxiv pre-print];

Lara: An impossibility theorem on the three-way trade-off of crash-tolerant protocols: asynchrony, linearizability, and local reads. Implementation of linearizable *almost*-local reads under asynchrony and crash failures
Antonios Katsarakis*, Emmanouil Giortamis*, Vasilis Gavrielatos, Pramod Bhatotia, Aleksandar Dragojevic, Boris Grot, Vijay Nagarajan, and Panagiota Fatourou
[under submission];

Recipe: A system that leverages the state-of-the-art trusted hardware and networking to harden the security properties of a CFT protocol for Byzantine settings
Dimitra Giantsidi, Emmanouil Giortamis, Maurice Bailleu, Manos Kapritsios, and Pramod Bhatotia
[under submission];

Publications

Conference publications:

FlexLog: A Shared Log for Stateful Serverless Computing
Dimitra Giantsidi, Emmanouil Giortamis, Nathaniel Tornow, Florin Dinu, and Pramod Bhatotia
ACM HPDC '23

Posters and Talks:

CAP Off: Local Reads and Linearizable Asynchronous Replication
Antonios Katsarakis*, Emmanouil Giortamis*, Vasilis Gavrielatos, Pramod Bhatotia, Aleksandar Dragojevic, Boris Grot, Vijay Nagarajan, and Panagiota Fatourou
EuroSys '24

Beyond reCAP: Local Reads and Linearizable Asynchronous Replication
Antonios Katsarakis*, Emmanouil Giortamis*, Vasilis Gavrielatos, Pramod Bhatotia, Aleksandar Dragojevic, Boris Grot, Vijay Nagarajan, and Panagiota Fatourou
EuroSys '23

Open Source Projects

Quantum Operating System (QOS)
https://github.com/TUM-DSE/QOS

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, April 2024 - Present
— Cloud Software Engineering lab, TU Munich, October 2023 - March 2024
— Quantum Software Systems seminar, TU Munich, April 2023 - August 2023
— Distributed Systems lecture, TU Munich, October 2022 - March 2023
— Cloud Systems Engineering lab, TU Munich, April 2022, August 2022
— Distributed Systems lecture, TU Munich, October 2021 - March 2022
— Languages and Compilers lecture, University of Crete, Feb 2021 - July 2021
— Introduction to Computer Science lecture, University of Crete, Sept 2020 - Jan 2021
— Principles of Distributed Computing lecture, University of Crete, Feb 2020 - July 2020
— Data Structures lecture, University of Crete, Sept 2019 - Jan 2020

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, gdb (expert), Cirq, Intel Quantum SDK, NVIDIA cuQuantum (knowledgeable);

References

Prof. Dr. Pramod Bhatotia
TU Munich, Germany
Email: pramod.bhatotia@cit.tum.de

Prof. Dr. Panagiota Fatourou
University of Crete, Greece
Email: faturu@csd.uoc.gr