Emmanouil Giortamis

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Research Interests

My research interests lie in the field of software systems for quantum computing with a particular focus on building software abstractions to scale Noisy Intermediate-Scale Quantum (NISQ) era computing. Specifically, I design and build systems that increase the scalability of real-world quantum applications while efficiently managing the underlying NISQ resources in terms of utilization and load balance.

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, with a focus on software abstractions such as virtualization and resource management. Before that, I worked in the distributed systems area, specifically in distributed shared logs and replication protocols.

Research projects:

QOS: An operating system for quantum computing that manages NISQ resources while mitigating their limitations
Emmanouil Giortamis, Francisco Romão, Nathaniel Tornow, and Pramod Bhatotia
[under submission];

QVM: A system for scalable execution of large quantum circuits with high fidelity on NISQ devices by leveraging gate virtualization
Nathaniel Tornow, Emmanouil Giortamis, Martin Ruefenacht, and Pramod Bhatotia
[under submission];

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];

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

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:

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:

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`