

Romolo Marotta

Curriculum Vitæ for publishing

Work Experience

- March 2023 **Researcher (RTD-a).** *Università degli Studi di Roma "Tor Vergata"*.
present
- January 2022 **Researcher.** *Università degli Studi di Roma "Tor Vergata"*.
December 2022 Design and development of a cloud-based platform for satellite images.
- January 2020 **Researcher.** *Università degli Studi dell'Aquila*.
December 2021 Instrumentation of models and code of railway systems for the management of controlled simulations.
- October 2017 **Co-founder.** *Lockless S.r.l.*
Present University Start Up of Sapienza and Tor Vergata Universities of Rome, Italy.
- September 2016 **Researcher.** *Fondazione CRUI*.
December 2017 Assessment of the National Telematic Criminal Trial System.

Education

- November 2016 **Ph.D. in Computer Engineering,** *Sapienza, University of Rome, Italy*, Courses held in
February 2020 English
THESIS TITLE: **Innovative Concurrent Data Structures and Synchronization Supports in Multi-core Platforms.**
ADVISOR: **Francesco Quaglia.**
- January 2013 **Master's Degree cum laude in Engineering in Computer Science,** *Sapienza, University*
January 2016 *of Rome, Italy, Courses held in English, GPA: 29.14/30, Mark: 110/110 cum laude*
THESIS TITLE: **A Lock-Free O(1) Priority Queue For Pending Event Set Management.**
ADVISOR: **Francesco Quaglia.**
- September 2008 **Bachelor's Degree in Engineering in Computer Science,** *Sapienza, University of Rome,*
December 2012 *Italy, Taught in Italian, GPA: 26.88/30, Mark: 110/110*
THESIS TITLE: **Input-Sensitive Profiling on I/O Flows and Multi-Threading.**
ADVISOR: **Camil Demetrescu.**

Awards and Honors

- 2016 **Best Paper Award,** *20th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications.* Award for the paper "A Lock-Free O(1) Event Pool and its Application to Share-Everything PDES Platforms".

Reviewing Activities and Services

- 2023 **PADS 2024.** 2024 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation.
present Phd. Colloquium Chair.
- 2021 **CLOUD COMPUTING.** International Conference on Cloud Computing, GRIDs, and
Present Virtualization. PC Member.
- 2020 **SIMUL.** International Conference on Advances in System Simulation. PC Member.
Present
- 2020 **ACM TOMACS.** Transactions on Modeling and Computer Simulation. Information Director.
Present

- 2023 **EuroSys'24**. European Conference on Computer Systems. Artifact evaluator.
Present
- 2022 **IEEE Access**. The Multidisciplinary Open Access Journal. Reviewer.
- 2023 **PECS'23**. The Third Workshop on Performance and Energy-efficiency of Concurrent Systems. Program Chair.
- 2022 **IEEE Access**. The Multidisciplinary Open Access Journal. Reviewer.
- 2022 **PECS'22**. The Second Workshop on Performance and Energy-efficiency of Concurrent Systems. Program Chair.
- 2021 **PECS'21**. The First Workshop on Performance and Energy-efficiency of Concurrent Systems. General Co-Chair.
- 2021 **SIMULTECH**. International Conference on Advances in System Simulation. PC Member.
- 2020 **OPODIS 2020**. 2020 Conference On Principles Of Distributed Systems. Subreviewer.
- 2019 **IEEE Access**. The Multidisciplinary Open Access Journal. Reviewer.
- March 2018 **PADS 2018**. 2018 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation. Artifact evaluator.
- March 2017 **RC 2017**. 9th Conference on Reversible Computation. Subreviewer.
- September 2016 **NCA 2016**. 15th IEEE International Symposium on Network Computing and Applications. Subreviewer.

Teaching Activities

- September 2021 **Lecturer** Course: *Operating Systems*.
- September 2023 DI, University of Rome "Roma Tre", Rome, Italy.
- October 2022 **Teaching Assistant** (Tutoring) Course: *Databases*.
- June 2023 DICII, University of Rome "Tor Vergata", Rome, Italy.
- September 2021 **Teaching Assistant** (Tutoring) Course: *Operating Systems*.
- June 2022 DICII, University of Rome "Tor Vergata", Rome, Italy.
- September 2019 **Teaching Assistant** (Tutoring) Course: *Algorithm Engineering*.
- June 2020 DICII, University of Rome "Tor Vergata", Rome, Italy.
- 2017 **Teaching Assistant** (Tutoring) Course: *Capacity Planning*.
- 2019 DIAG, University of Rome "La Sapienza", Rome, Italy.
- 2017 **Teaching Assistant** (Lectures about *Concurrent Programming*). Course: *Data Center and High Performance Computing*.
- 2019 DIAG, University of Rome "La Sapienza", Rome, Italy.

Memberships and Societies

- April 2019 **IEEE**, *Institute of Electrical and Electronics Engineers*. Member.
- Present
- March 2017 **ACM**, *Association for Computing Machinery*. Member.
- Present

Funding and Scholarships

- July 2018 **HiPEAC ACACES Grant cover**
AMOUNT: **1000€**, ORGANIZATION: **HiPEAC**, European Network on High Performance and Embedded Architecture and Compilation.
- November 2017 **Excellent Ph.D. Student Grant**
AMOUNT: **1000€**, ORGANIZATION: **DIAG**, University of Rome "La Sapienza".

- April 2017 **Research Starter Grant**
AMOUNT: **1000€**, ORGANIZATION: University of Rome “La Sapienza”
PROJECT TITLE: **Adaptive Coordination Algorithms in Multi-core Platforms.**
PROJECT EVALUATION: Innovation: 7/7; Quality and feasibility: 6.5/7.
- January 2017 **ACM SIGSIM Travel Grant**
AMOUNT: **1000\$**, ORGANIZATION: ACM SIGSIM
- October 2016 **Ph.D. Scholarship**
ORGANIZATION: University of Rome “La Sapienza”.

Seminars

- June 2023 *Effective Access to the Committed Global State in Speculative Parallel Discrete Event Simulation on Multi-core Machines.* PADS'23, Orlando, Florida, US..
- June 2022 *Spatial/Temporal Locality-based Load-sharing in Speculative Discrete Event Simulation on Multi-core Machines.* PADS'22, Virtual Event..
- March 2020 *Concurrent and Parallel Programming. Seminars in Advanced Topics in Computer Science Engineering* at DIAG, La Sapienza, Rome, Italy.
- May 2019 *NBBS: A Non-blocking Buddy System for Multi-core Machines.* CCGrid'19, Larnaca, Cyprus.
- October 2017 *Towards a Fully Non-blocking Share-everything PDES Platform.* DS-RT'17, Rome, Italy.
- May 2017 *A Conflict-Resilient Lock-Free Calendar Queue for Scalable Share-Everything PDES Platforms.* PADS'17, Singapore.
- March 2017 *An overview on solid-state-drives architectures and enterprise solutions.* DIAG, La Sapienza, Rome, Italy.
- August 2016 *A Non-Blocking Priority Queue for the Pending Event Set.* SIMUTools'16, Prague, Czech Republic.

Projects

- January 2022 **Earth In The Cloud**, Tor Vergata
present The Earth in the Cloud project focuses on the thematic Earth observation of the area S3 Aerospace specialization. Specifically, the goal is to develop an innovative technology to automate and optimize the entire data analysis process on cloud platforms computing.
- January 2020 **Ermes**, *Envisioning Railway systems through Model-driven Engineering approaches*,
December 2021 UNIVAQ
The ERMES project aims at the definition of a modelling notation for railway systems based on existing standards and practices, at the generation of operative environments relying on the modeling notation, and at providing appropriate validation and verification processes. The project is fully funded by Rete Ferroviaria Italiana.
- November 2018 **libmutlock**, *Mutable lock library*, Open Source Software
present Libmutlock (<https://github.com/HPDCS/libmutlock>) provides implementations of locking primitives combining both passive and active waiting phases to maximize critical-section usage and reduce waste of clock cycles. The work has led to one contribution to the *CCPE* journal.
- November 2017 **NBBS**, *Non-blocking Buddy System*, Open Source Software
present NBBS (<https://github.com/HPDCS/NBBS>) is a non-blocking implementation of a buddy system allocator for multi-core machine. My major contribution has been providing the algorithm design and implementation and protocols, and formally proving its correctness and progress guarantees. The work has led to two publications in the *IEEE Cluster 2018* and *IEEE/ACM CCGrid 2019* conferences and one article on *IEEE Transaction on Computers*.

- April 2016 **USE**, *Ultimate Share-Everything Simulator*, Open Source Software
 present USE (<https://github.com/HPDCS/USE>) is a Parallel Discrete Event Simulation engine optimized for multi-core shared-memory platforms. It exploits fine-grained synchronization to ensure scalability in platforms with high core counts and resorts to speculative execution by implementing a custom Time-Warp protocol optimized for shared-memory. My major contribution has been the design of custom data structures and protocols for high scalability. The work has led to three publications in the *IEEE/ACM DS-RT'17*, *ACM SIGSIM PADS'18* and *WSC'18* conferences.
- December 2015 **NBCQ**, *Non-Blocking Calendar Queues*, Open Source Software
 present NBCQ (<https://github.com/HPDCS/NBCQ>) provides priority queue implementations that jointly ensures non-blocking and constant time access. My major contribution has been the design and implementation of such data structures, proving their correctness and progress guarantees, and their integration in the open source simulation environment RAMSES (<https://github.com/HPDCS/RAMSES>). The work has led to three publications in the *ACM/ICTS SIMUTools'16*, *IEEE/ACM DS-RT'16* and *ACM SIGSIM PADS'17* conferences.
- June 2012 **Aprof**, *An input-sensitive performance profiler*, Open Source Software
 February 2014 Aprof (<https://github.com/ercoppa/aprof/wiki>) is a Valgrind tool that allows developers to identify asymptotic inefficiencies hidden in the code. My major contribution has been the design and implementation of a strategy to extend the operability of Aprof to programs with multi-threading and I/O from devices. The work has led to a publication in the *IEEE/ACM CGO'14* conference.

Research Interests

- Concurrent programming Concurrent algorithms and data structures, self-adaptive synchronization algorithms, optimistic synchronization
- Simulation Parallel Discrete Event Simulation platforms

Research Activities

My research is mainly focused on concurrent algorithms and follows three main paths: 1) designing efficient, scalable and general purpose data structures; 2) designing synchronization protocols (e.g. spin locks and semaphores) able to adapt their behavior according to the workload (e.g. concurrency profile and access pattern); 3) implementing and integrating the abovementioned solutions in real-world HPC scenarios, in particular parallel discrete event simulation platforms.

Technical and Computer Skills

- Algorithms** Advanced knowledge of algorithms, data structures and their mathematical analysis.
 Advanced knowledge and design of concurrent, parallel and non-blocking algorithms.
- Operating Systems** Linux (kernel level), Windows
- Program Languages** C, C++, Java, Python, SQL, OpenGL, GLSL, OpenCL, Assembly x86, Epsilon
 EOL/ETL/EGL, EMF OCL.
- Modeling** Queuing theory.
- Model Driven Engineering** Eclipse Modeling Framework.
- Simulation** Parallel Discrete Event Simulation.
- GPU** Physics simulation, Gauss-Seidel parallel solver, lighting, graphics pipeline.
- Instrumentation** Valgrind, gdb, Java Flight Recorder, Java Mission Control.
- Other** \LaTeX , HTML, CSS, and Hadoop.

Other Skills

- Art
- Studied electric guitar for 13 years.
 - Self-learning player of several instruments, in particular electric bass, ukulele, banjo, piano and drums.
 - Self-studying composition, arrangement and audio engineering.

Languages

Italian Mother tongue.
English Independent.

Publications

Journals

- 2023 Stefano Carnà, Romolo Marotta, Alessandro Pellegrini and Francesco Quaglia. **Strategies and Software Support for the Management of Hardware Performance Counters** *Software: Practice and Experience*. Volume 53, Issue 10. July 2023.
- 2023 Romolo Marotta, Mauro Ianni, Alessandro Pellegrini and Francesco Quaglia. **A Conflict-Resilient Lock-Free Linearizable Calendar Queue** *ACM Transaction on Parallel Computing* (to appear).
- 2022 Romolo Marotta. **RCR Report of “A Language for Agent-Based Discrete-Event Modeling and Simulation of Linked Lives”** *ACM Transactions on Modeling and Computer Simulation*. Volume 32, Issue 1. January 2022
- 2021 Romolo Marotta, Mauro Ianni, Alessandro Pellegrini and Francesco Quaglia. **NBBS: A Non-Blocking Buddy System for Multi-core Machines** *IEEE Transactions on Computers (TC)*. Preprint DOI: 10.1109/TC.2021.3060393
- 2020 Romolo Marotta, Davide Tiriticco, Pierangelo Di Sanzo, Alessandro Pellegrini, Bruno Ciciani and Francesco Quaglia. **Mutable Locks: Combining the Best of Spin and Sleep Locks** *Concurrency and Computation: Practice and Experience (CCPE)*. Volume 32, Issue 22.

Submitted Journals

- 2023 Federica Montesano, Romolo Marotta, Francesco Quaglia. **Spatial/Temporal Locality-based Load-sharing in Speculative Discrete Event Simulation on Multi-core Machines**, *ACM Transaction on Modeling and Computer Simulation*.

Conference

- 2023 Romolo Marotta, Federica Montesano, Francesco Quaglia. **Incremental Checkpointing of Large State Simulation Models with Write-Intensive Events via Memory Update Correlation on Buddy Pages**, *27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT'23*, 2023, (Candidate for Best Paper Award).
- 2022 Romolo Marotta, Federica Montesano, Francesco Quaglia. **Effective Access to the Committed Global State in Speculative Parallel Discrete Event Simulation on Multi-core Machines**, *2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2023*.
- 2022 Federica Montesano, Romolo Marotta, Francesco Quaglia. **Spatial/Temporal Locality-based Load-sharing in Speculative Discrete Event Simulation on Multi-core Machines**, *2022 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2022*.
- 2021 Romolo Marotta, Francesco Quaglia, **PECS'21: The First Workshop on Performance and Energy-efficiency of Concurrent Systems**, *Proceedings of the ACM/SPEC International Conference on Performance Engineering, ICPE'21*, 2021.
- 2020 Maryan Rab, Romolo Marotta, Mauro Ianni, Alessandro Pellegrini, Francesco Quaglia, **NUMA-Aware Non-Blocking Calendar Queue**, *24th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT'20*, 2020.
- 2020 Emiliano Silvestri, Cristian Milia, Romolo Marotta, Alessandro Pellegrini, Francesco Quaglia, **Exploiting Inter-Processor-Interrupts for Virtual-Time Coordination in Speculative Parallel Discrete Event Simulation**, *2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2020*.
- 2020 Stefano Conoci, Mauro Ianni, Romolo Marotta, Alessandro Pellegrini, **Autonomic Power Management in Speculative Simulation Runtime Environments**, *2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2020*.
- 2019 Romolo Marotta, Mauro Ianni, Andrea Scarselli, Alessandro Pellegrini and Francesco Quaglia, **NBBS: A Non-blocking Buddy System for Multi-core Machines**, *2019 19th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGRID)*, Larnaca, Cyprus, 2019.

- 2018 Romolo Marotta, Mauro Ianni, Andrea Scarselli, Alessandro Pellegrini and Francesco Quaglia, **A Non-blocking Buddy System for Scalable Memory Allocation on Multi-core Machines**, [Poster abstract] *IEEE Cluster 2018, Belfast, United Kingdom, 2018*.
- 2018 Mauro Ianni, Romolo Marotta, Alessandro Pellegrini and Francesco Quaglia, **Optimizing simulation on shared-memory platforms: the smart cities case**, [Invited paper] *2018 Winter Simulation Conference (WSC), WSC 2018*.
- 2018 Mauro Ianni, Romolo Marotta, Alessandro Pellegrini and Francesco Quaglia, **The Ultimate Share-Everything PDES System**, *2018 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2018*.
- 2017 Mauro Ianni, Romolo Marotta, Alessandro Pellegrini and Francesco Quaglia, **A Non-blocking Global Virtual Time Algorithm with Logarithmic Number of Memory Operations**, *21th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT'17, 2017, (Candidate for Best Paper Award)*.
- 2017 Mauro Ianni, Romolo Marotta, Alessandro Pellegrini and Francesco Quaglia, **Towards a Fully Non-blocking Share-everything PDES Platform**, *21th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT'17, 2017*.
- 2017 Romolo Marotta, Mauro Ianni, Alessandro Pellegrini and Francesco Quaglia, **A Conflict-Resilient Lock-Free Calendar Queue for Scalable Share-Everything PDES Platforms**, *2017 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS 2017, 2017*.
- 2016 Romolo Marotta, Mauro Ianni, Alessandro Pellegrini and Francesco Quaglia, **A Lock-Free $O(1)$ Event Pool and its Application to Share-Everything PDES Platforms**, *20th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT'16, 2016, (Candidate for and winner of Best Paper Award)*.
- 2016 Romolo Marotta, Mauro Ianni, Alessandro Pellegrini and Francesco Quaglia, **A Non-Blocking Priority Queue for the Pending Event Set**, *9th ACM ICST Conference of Simulation Tools and Techniques, SIMUTools'16, 2016*.
- 2014 Emilio Coppa, Camil Demetrescu, Irene Finocchi, and Romolo Marotta. **Estimating the Empirical Cost Function of Routines with Dynamic Workloads**. *12th IEEE/ACM International Symposium on Code Generation and Optimization, CGO'14, 2014*.