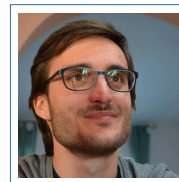


Alessandro Pellegrini

Curriculum Vitæ



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Personal Information

first name Alessandro
last name Pellegrini
place/date of birth Roma (Italy), Wednesday 7th January, 1987
nationality Italian
Abilitazione 01/B1—II fascia (abilitato il 23/11/2020)
Scientifica Nazionale 09/H1—II fascia (abilitato il 09/09/2019)
 09/H1—I fascia (abilitato il 17/12/2023)

Academic Positions

March 2022 **Tenure-Track Assistant Professor (RTDb)**, *University of Rome Tor Vergata*
present

Education

November 2010 **PhD Course**, *Sapienza, University of Rome*, Judgment: *top 5% (Outstanding)*
September 2014 Thesis Title: *Techniques for Transparent Parallelization of Discrete Event Simulation Models.*
December 2010 **Professional Qualification as Information Engineer**, Professional license obtained by passing the Italian State Exam
February 2009 **Master's Degree in Computer Engineering**, *Sapienza, University of Rome*, Mark:
September 2010 *110/110*
Thesis Title: *Autonomic State Saving of Simulation Objects in Optimistic Simulation Systems.*
September 2005 **Bachelor's Degree in Computer Engineering**, *Sapienza, University of Rome*,
February 2009 Mark: *105/110*
Thesis Title: *Efficient and Transparent Tracking of Dynamic Memory Updates with Arbitrary Granularity in Optimistic Simulation Architectures.*
September 2000 **Classical Lyceum Diploma**, *Pontificio Istituto Apollinare, Rome, Italy*,
July 2005 Mark: *100/100*

Research Activities

- March 2020 **Research Fellow**, *IASI*, National Research Council, Rome, Italy
- February 2022 Research Project: Italian National Project of Interest (PRIN) SISMA, Grant Agreement #201752ENYB.
- March 2019 **Research Fellow**, *DIAG*, Sapienza, University of Rome, Rome, Italy
- February 2020 Research Project: *Transparently Transitioning to Heterogeneous Exascale Computing Systems*.
- September 2018 **Researcher**, *ISSNOVA—Institute for Sustainable Society and Innovation*
- May 2019 Research project: SJU H2020 EU Project—EvoATM, Grant Agreement #783189.
- December 2017 **Research Fellow**, *DIAG*, Sapienza, University of Rome, Rome, Italy
- November 2018 Research Project: *Assistive Methodologies for IT Consolidation and Modernization*.
- September 2016 **Researcher**, *DGSIA—Direzione generale per i sistemi informativi automatizzati*,
- April 2017 *Italian Ministry of Justice*, Rome, Italy
- Research Project: Assessment of the National Telematic Criminal Trial System
- September 2015 **Visiting Researcher**, *Barcelona Supercomputing Center (BSC)*, Barcelona, Spain
- October 2015 Visit funded by the “Severo Ochoa” Excellence Program.
- June 2014 **Researcher**, *IRIANC—International Research Institute for Autonomic Network*
- May 2016 *Computing*, Munich, Germany
- Researcher in the EU FP7 Project—Panacea, Grant Agreement #610764.
- April 2014 **Researcher**, *CINFAL—Consorzio Interuniversitario Nazionale per la Fisica delle*
- February 2015 *Atmosfere e delle Idrosfere*, Tolentino (MC), Italy
- Researcher for the project SIGMA (Italian PON R&C), to develop an integrated cloud system for the acquisition and management of data coming from heterogeneous sensor networks.
- December 2014 **Research Fellow**, *DIAG*, Sapienza, University of Rome, Rome, Italy
- November 2015 Research Project: *Design and Development of Wait-Free Algorithms for Synchronization/Coordination in Multi-core Environments*.

Summary of Research Results (updated on December 2023)

Publication Type	Count	Indexing	Since	To
Journal Articles (excluding editorial)	25	DBLP/Scopus/WoS	2012	2021
International Conferences/Workshops	75	DBLP/Scopus/WoS	2009	2021
Book Chapters	2	DBLP	2014	2019
Books	1	OPAC SBN	2015	2015

Bibliometric Index	Google Scholar	Scopus	WoS
Total Citations	1091	653	285
Average Citations per Publication	8.20	6.73	2.61
h-index	20	14	9
i10-index	37	27	8

Teaching Activities

- 2021 – 2022 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the *Network and System Defence* course in the Master's Degree in Computer Engineering.
- 2021 – 2022 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the *Computer Architectures* course in the Bachelor's Degree in Computer Engineering.
- 2020 – 2021 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the *Computer Architectures* course in the Bachelor's Degree in Computer Engineering.
- 2020 – 2022 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the *Fundamentals of Computer Science* course, integrative to the *IT Systems, Data and Applications* course in the Master of Science in Business Administration.
- 2019 – 2021 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the Algorithm Engineering course in the Bachelor's Degree in Computer Engineering.
- 2018 – 2022 **Adjunct Professor**, *University of Rome Tor Vergata*
Professor of the Technologies and Methodologies for the Development and Management of Data Bases course, integrative to the Data Bases and Knowledge course in the Bachelor's Degree in Computer Engineering.
- May 2018 **Adjunct Professor**, *Luiss Business School*
Professor of the Data Management for Big Data Introduction course in the Big Data Management Master.
- 2017 – 2020 **Adjunct Professor**, *Sapienza, University of Rome*
Professor of the Advanced Operating Systems and Virtualization course in the Master's Degree in Computer Engineering and Cyber Security.
- October 2014 **Lecturer**, *CINI—Consorzio Interuniversitario Nazionale per l'Informatica*
November 2014 Course on Distributed Simulation for the Private/Public COSMIC Laboratory.
- 2012 – 2013 **Teaching Assistant**, *Sapienza, University of Rome*
Assistant for the "*Computer Architectures*" course, in the Bachelor's Degree in Computer Science.
- 2011 – 2012 **Teaching Assistant**, *Sapienza, University of Rome*
Assistant for the "*Operating Systems*" course, in the Bachelor's Degree in Computer Science.

National/International Research Projects

- November 2023 **DOMAIN**, *Taming Heterogeneous Computing Complexity with Full-Stack Governance of Domain-Specific Languages*, PRIN 2022, Grant Agreement #2022TSYYKJ, Principal Investigator
present
- Advancements in computing hardware, driven by physical limits and the need for more power and efficiency, have led to the rise of Heterogeneous Systems. These systems, blending general-purpose and specialized units, are key in evolving from petascale to exascale computing. However, this shift reveals the hardware's complexity to programmers, necessitating new, though intricate, programming paradigms primarily accessible to ICT experts. To address this, the project aims to overhaul the software stack, creating high-level, user-friendly abstractions suitable for various domains. This involves developing Domain-Specific Languages (DSLs) for transparently targeting heterogeneous architectures, supported by new tools for compiling, runtime environments, and operating systems with self-tuning and optimization capabilities. The goal is to enable domain experts to efficiently code in languages aligned with their expertise, fully leveraging the heterogeneous architectures' capabilities.

- March 2020 **SISMA**, *Solutions for Engineering Microservice Architectures*, PRIN 2017, Grant Agreement #201752ENYB
 February 2022
 The SISMA project focuses on the improvement of the design of test cases for distributed software systems abiding by the microservices paradigm. Areas of interest of the study concern: strategies for the aggregation of test cases, algorithms to select and prioritise elements in a set of test cases, composition strategies of functional and non-functional aspects for exploring alternative operating conditions. The structured and reusable design of testing bundles would increase the quality of the test suites, and their level of automation as well. Also, a workflow-based planning of test cases would contribute to the incremental development of end-to-end tests, and to the enactment of dynamic strategies for governing regression testing activities.
- February 2019 **SPARTA**, *Strategic Programs for Advanced Research and Technology in Europe*,
 January 2022 EH H2020 Project, Grant Agreement #830892
 The digital era has brought with it many advantages for mankind, but the issue of secure data exchange remains among the most significant concerns. The EU-funded SPARTA project is bringing together a unique set of actors at the crossroads of scientific excellence, technological innovation and social sciences to address the issue of cybersecurity. The project aims to set up unique collaborations, build transformative capabilities and form world-leading expertise centres. Through innovative governance, ambitious demonstration cases and active community engagement, SPARTA intends to re-think the way cybersecurity research is performed in Europe across various domains and fields of expertise.
- January 2018 **EvoATM**, *Evolutionary Air Traffic Management*, EU H2020 SJU Project, Grant
 December 2019 Agreement #783189
 The goal of the EvoATM project is to model ATM system in the Free Route scenario, combining an agent based simulation paradigm with Evolutionary Computing optimization techniques to understand the influence of ATM components and parameters on the behaviour at whole system performances level. By using quantitative indicators, EvoATM has opened the way to more efficient change impact assessment, supporting design and strategic thinking in ATM evolution.
- June 2014 **PANACEA**, *Proactive Autonomic Management of Cloud Resources*, EU FP7 Project,
 May 2016 Grant Agreement #610764
 The main objective of the PANACEA project is to provide Proactive Autonomic Management of Cloud Resources, based on Machine Learning, as a remedy to the exponentially growing Cloud complexity. Main targets are: i) proactive autonomic management of Cloud resources, ii) proactive software migration within the Cloud(s), iii) efficient usage of Cloud resources, iv) monitoring, controlling, and proactively managing applications' execution. The main objective of the PANACEA project is to provide Proactive Autonomic Management of Cloud Resources, based on Machine Learning, as a remedy to the exponentially growing Cloud complexity. Main targets are: i) proactive autonomic management of Cloud resources, ii) proactive software migration within the Cloud(s), iii) efficient usage of Cloud resources, iv) monitoring, controlling, and proactively managing applications' execution.
- April 2014 **SIGMA**, *Sistema Integrato di sensori in ambiente Cloud per la Gestione Multirischio*
 February 2015 *Avanzata*, National Italian Project, Grant Agreement #PON01_00683
 The Integrated Sensors System in Cloud Environments for Advanced Multirisk Management (SIGMA) is a multi-layered architecture for acquiring, integrating, and elaborating heterogeneous data coming from differentiated sensor networks. Its goal is to enhance (both environmental and factory) monitoring and control systems to provide data useful for the prevention of risk situations.

PhD Supervision

Student	Graduation	Thesis topic
Matteo Ciccaglione	2026 (expected)	Generative grammars
Pierciro Caliendo	2026 (expected)	Security evasion techniques
Xiaorui Du	2024 (expected)	Distributed data analytics (cotutorship with Alois Knoll)
Adriano Pimpini	2024 (expected)	Simulation of Spiking Neural Networks
Andrea Piccione	2023	High-performance Distributed Simulation

Awards and Honors

- 2022 **Best Paper Award**, 27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications (DS-RT)
Award for the paper [Inferring Relations Among Test Programs in Microservices Applications](#).
- 2021 **Best Paper Award**, 15th IEEE International Conference on Service Oriented Systems Engineering (SOSE)
Award for the paper [Inferring Relations Among Test Programs in Microservices Applications](#).
- 2018 **HiPEAC Technology Transfer Award**, HiPEAC—European Network on High Performance Embedded Architecture and Compilation
Technology transfer project: *Transparent HPC Simulation on Heterogeneous Distributed Architectures*. The HiPEAC's Tech Transfer Awards recognize successful examples of technology transfer. For the purposes of the awards, technology transfer is defined as a contractually documented joint- or privately funded academia-industry project or technology licence agreement, with the goal of bringing a concrete research result into industrial practice. All applications are evaluated by an internal technology transfer committee.
- 2016 **Best Paper Award**, 20th International Symposium on Distributed Simulation and Real Time Applications (DS-RT)
Award for the paper [A Lock-Free O\(1\) Event Pool and its Application to Share-Everything PDES Platforms](#).
- 2015 **Best PhD Thesis of the year**, Sapienza Università Editrice
The Doctoral Thesis Award is announced to reward the best doctoral theses discussed each year at Sapienza, University of Rome. The Selection Committee selects the 10 best winning theses among all the macro-areas of the university considering the quality of the research, the rigorous methodology applied and the scientific results obtained. The winning theses are published internationally within the *Studies and Research* series.
- 2012 **Best Paper Award**, 5th International ICST Conference on Simulation Tools and Techniques (SIMUTools)
Award for the paper [Cache-Aware Memory Manager for Optimistic Simulations](#).

Memberships and Societies

- October 2018 present **HiPEAC**, *European Network on High Performance and Embedded Architecture and Compilation*, Elected Member
- November 2011 present **ACM**, *Association for Computing Machinery*, Member
- March 2012 **IEEE**, *Institute of Electrical and Electronics Engineers*, Member
- March 2021

International Scientific Activity

Steering Committees

- 2022 – present **ACM SIGSIM PADS**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*, Steering Committee Member

Editorial Boards

- 2022 – present **ACM TOMACS**, *Editorial Board member*, Associate Editor
2018 – 2022 **ACM TOMACS**, *Editorial Board member*, Reproducibility Board
2019 **ACM TOMACS**, *Guest Editor for the PADS 2018 Special Issue*

Chairmanship

- 2021 **Workshop Co-Chair**, *ACM/SPEC International Conference on Performance Engineering (ICPE)*
2021 **Reproducibility Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*
2020 **Reproducibility Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*
2019 **Reproducibility Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*
2018 **General Co-Chair**, *ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (PADS)*
2017 **Track Co-Chair**, *“Environment and Sustainability Applications” Track*, Winter Simulation Conference (WSC)
2016 **Program Co-Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*
2016 **Financial Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*
2015 **Financial Chair**, *IEEE International Symposium on Network Computing and Applications (NCA)*

Review Activity for Journals

CBM, *Computers in Biology and Medicine*, Elsevier
CCPE, *Concurrency and Computation: Practice and Experience*, Wiley
COMLAN, *Computer Languages, Systems and Structures*, Elsevier
IEEE Access, IEEE
JPDC, *Journal of Parallel and Distributed Computing*, Elsevier
JSS, *Journal of Systems and Software*, Elsevier
NGC, *New Generation Computing*, Springer
Scientific Programming, Hindawi
SIMPAT, *Journal of Simulation Modelling Practice and Theory*, Elsevier
SPE, *Software: Practice and Experience*, Wiley
TC, *Transactions on Computers*, IEEE
TOMACS, *Transactions of Modeling and Computer Simulation*, ACM
TOPC, *Transactions on Parallel Computing*, ACM
TOPS, *Transactions on Privacy and Security*, ACM

Conference Program Committees

- 2017 – present **ACM SIGSIM PADS**, *PC Member of the ACM SIGSIM Conference on Principles of Advanced Discrete Simulation*
2017 – present **WSC**, *PC Member of the Winter Simulation Conference*
2019 – present **SIMUL**, *PC Member of the International Conference on Advances in System Simulation*

- 2019 – present **CLOUD COMPUTING**, *PC Member of the International Conference on Cloud Computing, GRIDs, and Virtualization*
- 2014 – present **SIMULTECH**, *PC Member of the Workshop on Dependable Parallel, Distributed and Network-Centric Systems*
- 2020 – 2022 **ICPE**, *PC Member of the ACM/SPEC International Conference on Performance Engineering, Reproducibility Board*
- 2019 **Euro-Par**, *PC Member of the International European Conference on Parallel and Distributed Computing, Springer-Verlag*
- 2019 **AHCP**, *PC Member of the International Workshop on Autonomic High Performance Computing—co-located with the International Conference on High Performance Computing & Application Simulation (HPCS)*
- 2015 – 2019 **IEEE/ACM DS-RT**, *PC Member of the IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications*
- 2015 – 2017 **IEEE NCA**, *PC Member of the IEEE International Symposium on Network Computing and Applications*
- 2015 – 2017 **IEEE DPDNS**, *PC Member of the Workshop on Dependable Parallel, Distributed and Network-Centric Systems—co-located with the IEEE International Parallel & Distributed Processing Symposium (IPDPS)*

Technology Transfer Activities

- March 2016 **Co-Founder**, *Lockless S.r.l.*, University Startup of Sapienza and Tor Vergata Universities

Consulting

- December 2020 **Business Integration Partners S.p.A**
- February 2021 *with Lockless S.r.l.: securing a Kubernetes environment for Leonardo S.p.A..*
- June 2019 **Business Integration Partners S.p.A**
- August 2019 *with Lockless S.r.l.: High-level Design for Trans Austria Gasleitung GmbH to enhance the security level of the company's IT infrastructure.*
- August 2017 **Ministero della Giustizia—DGSIA (Direzione Generale per i Sistemi Informativi Automatizzati)**, *with CRUI—Conferenza dei Rettori delle Università Italiane*
- December 2017 *Analysis and evaluation of software systems to support the information system of criminal trials.*
- September 2016 **Ministero della Giustizia—DGSIA (Direzione Generale per i Sistemi Informativi Automatizzati)**, *with CRUI—Conferenza dei Rettori delle Università Italiane*
- December 2016 *Analysis and evaluation of software systems to support the information system of criminal trials.*
- February 2012 **IES—Ingegneria Elettronica Sistemi s.r.l**
- October 2012 *Project of a redundancy system for the HELabor microcontroller, and reliability assessment.*
- July 2011 **Poste Italiane S.p.A**
- September 2011 *Assessment and Capacity Analysis of the Business Main Core Infrastructure.*

Languages

Italian Mother Tongue

English Proficient (C2)

*CAE – Cambridge University (2004). Mark: C
 FCE – Cambridge University (2003). Mark: B
 PET – Cambridge University (2002). Mark: Passed
 KET – Cambridge University (2001). Mark: Passed with Merit*

Spanish Independent (B2) *Diploma Básico de Español – Cervantes (2002). Mark: 81/100*

French Independent (B1) *DELF 1 – St. Louis de France (2002). Mark: 12,35/20*

Attachments

- 1 List of Publications
- 2 Summary of the Ph.D. Thesis
- 3 International Conferences/Workshops

Rome, Thursday 21st December, 2023

Attachment 1: List of Publications

Books

- [1] [Alessandro Pellegrini](#). *Parallelization of Discrete Event Simulation Models*. Studi e Ricerche. Sapienza Università Editrice, November 2015.

Book Chaptrs

- [2] Diego Rughetti, Pierangelo Di Sanzo, [Alessandro Pellegrini](#), Bruno Ciciani, and Francesco Quaglia. Tuning the level of concurrency in software transactional memory: An overview of recent analytical, machine learning and mixed approaches. In Rachid Guerraoui and Paolo Romano, editors, *Transactional Memory. Foundations, Algorithms, Tools, and Applications*, volume 8913 of *Lecture Notes in Computer Science*, pages 395–417. Springer International Publishing, 2015.
- [3] Francesco Quaglia, [Alessandro Pellegrini](#), and Roberto Vitali. Reshuffling PDES platforms for multi/many-core machines: a perspective with focus on load sharing. In Daniele Gianni, Andrea D’Ambrogio, and Andreas Tolk, editors, *Modeling and Simulation-based Systems Engineering Handbook*, pages 203–232. Crc Pr I Llc, December 2014.

Journal Articles

- [4] Romolo Marotta, Mauro Ianni, [Alessandro Pellegrini](#), and Francesco Quaglia. A conflict-resilient lock-free linearizable calendar queue. *ACM Transactions on Parallel Computing*, December 2023.
- [5] Stefano Carnà, Romolo Marotta, [Alessandro Pellegrini](#), and Francesco Quaglia. Strategies and software support for the management of hardware performance counters. *Software: Practice and Experience*, 53:1928–1957, July 2023.
- [6] Emanuele De Angelis, Guglielmo De Angelis, [Alessandro Pellegrini](#), and Maurizio Proietti. What makes test programs similar in microservices applications? *Journal of Systems and Software*, 201:111674, January 2023.
- [7] [Alessandro Pellegrini](#), Pierangelo Di Sanzo, Andrea Piccione, and Francesco Quaglia. Design and implementation of a fully-transparent partial abort support for software transactional memory. *Software: Practice and Experience*, 52:2456–2475, June 2022.
- [8] Stefano Carnà, Serena Ferracci, Francesco Quaglia, and [Alessandro Pellegrini](#). Fight hardware with hardware: System-wide detection and mitigation of side-channel attacks using performance counters. *Digital Threats: Research and Practice*, 2022.
- [9] Romolo Marotta, Mauro Ianni, [Alessandro Pellegrini](#), and Francesco Quaglia. Nbbs: A non-blocking buddy system for multi-core machines. *Transactions on Computers*, 71:599–612, 2022.
- [10] Emiliano Silvestri, [Alessandro Pellegrini](#), Pierangelo Di Sanzo, and Francesco Quaglia. Effective runtime management of tasks and priorities in gnu openmp applications. *Transactions on Computers*, 71:2632–2645, October 2022.
- [11] Gabriella Gigante, Roberto Palumbo, Domenico Pascarella, [Alessandro Pellegrini](#), Gabriella Duca, Miquel Àngel Piera, and Juan José Ramos. Support to design for air traffic management: An approach with agent-based modelling and evolutionary search. *International Journal of Aviation, Aeronautics, and Aerospace*, 8(1), 2021.
- [12] Pierangelo Di Sanzo, Dimiter R. Avresky, and [Alessandro Pellegrini](#). Autonomic rejuvenation of cloud applications as a countermeasure to software anomalies. *Software: Practice and Experience*, 51(1):46–71, January 2021.

- [13] Stefano Conoci, Pierangelo Di Sanzo, [Alessandro Pellegrini](#), Bruno Ciciani, and Francesco Quaglia. On power capping and performance optimization of multi-threaded applications. *Concurrency and Computation: Practice and Experience*, 33(11), January 2021.
- [14] [Alessandro Pellegrini](#). Replication of computational results report for “green simulation with database monte carlo”. *ACM Transactions on Modeling and Computer Simulation*, 31(1), 12 2020.
- [15] [Alessandro Pellegrini](#), Pierangelo Di Sanzo, Beatrice Bevilacqua, Gabriella Duca, Domenico Pascarella, Roberto Palumbo, Juan José Ramos, Miquel Àngel Piera, and Gabriella Gigante. Simulation-based evolutionary optimization of air traffic management. *IEEE Access*, 8:161551–161570, September 2020.
- [16] 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*, 32(22), 6 2020.
- [17] Matteo Principe, Tommaso Tocci, Pierangelo Di Sanzo, Francesco Quaglia, and [Alessandro Pellegrini](#). A distributed shared-memory middleware for speculative parallel discrete event simulation. *ACM Transactions on Modeling and Computer Simulation*, 30(2):11:1–11:26, February 2020.
- [18] Francesco Quaglia, Georgios Theodoropoulos, and [Alessandro Pellegrini](#). Editorial to the special issue on the principles of advanced discrete simulation (pads). *Transactions on Modeling and Computer Simulations*, 69(5):8:1–8:2, March 2020.
- [19] Pierangelo Di Sanzo, [Alessandro Pellegrini](#), Marco Sannicandro, Bruno Ciciani, and Francesco Quaglia. Adaptive model-based scheduling in software transactional memory. *IEEE Transactions on Computers*, 69(5):621–632, 5 2020.
- [20] [Alessandro Pellegrini](#) and Francesco Quaglia. Cross-state events: a new approach to parallel discrete event simulation and its speculative runtime support. *Journal of Parallel and Distributed Computing*, 132:48–68, 10 2019.
- [21] Mauro Ianni, [Alessandro Pellegrini](#), and Francesco Quaglia. Anonymous readers counting: A wait-free multi-word atomic register algorithm for scalable data sharing on multi-core machines. *IEEE Transactions on Parallel and Distributed Systems*, 30:286–299, 2 2019.
- [22] Davide Cingolani, [Alessandro Pellegrini](#), and Francesco Quaglia. Transparently mixing undo logs and software reversibility for state recovery in optimistic pdes. *ACM Transactions on Modeling and Computer Simulation*, 27(2):11:1–11:26, May 2017.
- [23] [Alessandro Pellegrini](#) and Francesco Quaglia. A fine-grain time-sharing time warp system. *ACM Transactions on Modeling and Computer Simulation*, 27(2), May 2017.
- [24] [Alessandro Pellegrini](#), Sebastiano Peluso, Francesco Quaglia, and Roberto Vitali. Transparent speculative parallelization of discrete event simulation applications using global variables. *International Journal of Parallel Programming*, 44(6):1200–1247, December 2016.
- [25] Pierangelo Di Sanzo, Francesco Quaglia, Bruno Ciciani, [Alessandro Pellegrini](#), Diego Didona, Paolo Romano, Roberto Palmieri, and Sebastiano Peluso. A flexible

framework for accurate simulation of cloud in-memory data stores. *Simulation Modelling Practice and Theory*, 58(2):219–238, July 2015.

- [26] Alessandro Pellegrini, Roberto Vitali, and Francesco Quaglia. Autonomic state management for optimistic simulation platforms. *IEEE Transactions on Parallel and Distributed Systems*, 26(6):1560–1569, June 2015.
- [27] Roberto Vitali, Alessandro Pellegrini, and Francesco Quaglia. Load sharing for optimistic parallel simulations on multi core machines. *SIGMETRICS Performance Evaluation Review*, 40(3):2–11, August 2012.

Conference Proceedings

- [28] Xiaorui Du, Adriano Pimpini, Andrea Piccione, Zhuoxiao Meng, Anibal Siguenza-Torres, Stefano Bortoli, Alois Knoll, and Alessandro Pellegrini. Autonomic orchestration of in-situ and in-transit data analytics for simulation studies. In *Proceedings of the 2023 Winter Simulation Conference, WSC*. IEEE, December 2023. To appear.
- [29] Andrea Piccione and Alessandro Pellegrini. Practical tie breaking for parallel/distributed simulations. In *Proceedings of the 27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, October 2023. Winner of the Best Paper Award.
- [30] Romolo Marotta, Federica Montesano, Alessandro Pellegrini, and Francesco Quaglia. Exploiting memory protection for incremental state saving. In *Proceedings of the 27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, October 2023. Shortlisted for the Best Paper Award.
- [31] Andrea Piccione, Philipp Andelfinger, and Alessandro Pellegrini. Hybrid speculative synchronisation for parallel discrete event simulation. In *Proceedings of the 2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, SIGSIM-PADS '23*. ACM, June 2023.
- [32] Andrea Piccione, Giorgio Bernardinetti, Alessandro Pellegrini, and Giuseppe Bianchi. Is your smartphone really safe? a wake-up call on android antivirus software effectiveness. In *Proceedings of the 2023 Italian Conference on Cybersecurity, ITASEC*. CEUR-WS.org, May 2023.
- [33] Philipp Andelfinger, Andrea Piccione, Alessandro Pellegrini, and Adelinde Uhrmacher. Comparing speculative synchronization algorithms for continuous-time agent-based simulations. In *Proceedings of the 26th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, September 2022. Winner of the Best Paper Award.
- [34] Adriano Pimpini, Andrea Piccione, and Alessandro Pellegrini. On the accuracy and performance of spiking neural network simulations. In *Proceedings of the 26th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, September 2022. Shortlisted for the Best Paper Award.
- [35] Adriano Pimpini, Andrea Piccione, Bruno Ciciani, and Alessandro Pellegrini. Speculative distributed simulation of very large spiking neural networks. In *Proceedings of the 2022 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS*. ACM, June 2022.
- [36] Emanuele De Angelis, Alessandro Pellegrini, and Maurizio Proietti. Automatic extraction of behavioral features for test program similarity analysis. In *Proceedings of the 2021 IEEE International Symposium on Software Reliability Engineering Workshops, ISSREW*, pages 129–136. IEEE, October 2021.

- [37] Emanuele De Angelis, Guglielmo De Angelis, Alessandro Pellegrini, and Maurizio Proietti. Inferring relations among test programs in microservices applications. In *Proceedings of the 15th IEEE International Conference on Service Oriented Systems Engineering, SOSE*, pages 114–123. IEEE, August 2021. Winner of the Best Paper Award.
- [38] Maryan Rab, Romolo Marotta, Mauro Ianni, Alessandro Pellegrini, and Francesco Quaglia. Numa-aware non-blocking calendar queue. In *Proceedings of the 24th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, September 2020.
- [39] Andrea Piccione and Alessandro Pellegrini. Agent-based modeling and simulation for emergency scenarios: A holistic approach. In *Proceedings of the 24th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications, DS-RT*. IEEE, September 2020.
- [40] Stefano Conoci, Mauro Ianni, Romolo Marotta, and Alessandro Pellegrini. Autonomic power management in speculative simulation runtime environments. In *Proceedings of the 2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS*. ACM, June 2020.
- [41] Matteo Principe, Andrea Piccione, Alessandro Pellegrini, and Francesco Quaglia. Approximated rollbacks. In *Proceedings of the 2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS*. ACM, June 2020.
- [42] Emiliano Silvesti, Cristian Milia, Romolo Marotta, Alessandro Pellegrini, and Francesco Quaglia. Exploiting inter-processor-interrupts for virtual-time coordination in speculative parallel discrete event simulation. In *Proceedings of the 2020 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation, PADS*. ACM, June 2020.
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- [44] Stefano Carnà, Serena Ferracci, Emanuele De Santis, Alessandro Pellegrini, and Francesco Quaglia. Hardware-assisted incremental checkpointing in speculative parallel discrete event simulation. In *Proceedings of the 2019 Winter Simulation Conference, WSC*. IEEE, December 2019.
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Attachment 2: Summary of the Ph.D. Thesis

Simulation is a powerful technique to represent the evolution of real-world phenomena or systems over time. It has been extensively used in different research fields (from medicine to biology, to economy, and to disaster rescue) to study the behaviour of complex systems during their evolution (*symbiotic simulation*) or before their actual realization (*what-if analysis*).

A traditional way to achieve high-performance simulations is the employment of Parallel Discrete Event Simulation (PDES) techniques, which are based on the partitioning of the simulation model into Logical Processes (LPs) that can execute events in parallel on different CPUs and/or different CPU cores, and rely on synchronization mechanisms to achieve causally consistent execution of simulation events. As it is well recognized, the optimistic synchronization approach, e.g. based on the the Time Warp synchronization protocol, which grounds on rollbacks to recover possible timestamp-order violations due to the absence of block-until-safe policies for event processing, is likely to favour speedup in general application/architectural contexts.

However, the optimistic PDES paradigm implicitly relies on a programming model that shifts from traditional sequential-style programming, given that there is no notion of global address space (fully accessible while processing events at any LP). Furthermore, there is the underlying assumption that the code associated with event handlers cannot execute unrecoverable operations given their speculative processing nature. Nevertheless, even though no unrecoverable action is ever executed by event handlers, a means to actually undo some action (if requested) needs to be devised and implemented within the software stack.

On the other hand, sequential-style programming is an easy paradigm for the development of simulation models, given that it does not require the programmer to reason about memory partitioning (and therefore message passing) and speculative (concurrent) processing of the application.

My PhD Thesis presents methodological and technical innovations which show how it is possible, by developing innovative runtime mechanisms, to allow a programmer to implement its simulation model in a fully sequential way, and demand from the underlying simulation runtime environment supports to execute it in parallel according to speculative processing techniques. Some of the approaches we provide show applicability in either shared- or distributed-memory systems, while others are specifically tailored to multi/many-core architectures.

We show, while developing these supports, what is the effect on performance of these solutions, which are nevertheless negligible, allowing a fruitful exploitation of the available computing power. In the end, I highlight which are the clear benefits on the programming model that the model developer will experience by relying on these innovative solutions.

Attachment 3: International Conferences/Workshops

- Speaker at the international conference *2009 ACM/IEEE/SCS 23rd Workshop on Principles of Advanced and Distributed Simulation* (PADS 2009), Lake Placid, NY, USA, presenting “**Di-DyMeLoR: Logging only Dirty Chunks for Efficient Management of Dynamic Memory Based Optimistic Simulation Objects**”;
- Speaker at the international conference *13-th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications* (DS-RT 2009), Singapore, presenting “**Benchmarking Memory Management Capabilities within ROOT-Sim**”;
- Speaker at the international conference *5th International ICST Conference on Simulation Tools and Techniques* (SIMUTools 2012), Desenzano del Garda, Italy, presenting “**Cache-Aware Memory Manager for Optimistic Simulations**”;
- Speaker at the international conference *20th International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunication Systems* (MASCOTS 2012), Arlington, VA, USA, presenting “**Transparent and Efficient Shared-State Management for Optimistic Simulations on Multi-core Machines**”;
- Speaker at the international conference *19th International Conference on High Performance Computing* (HiPC 2012), Pune, India, presenting “**A Load Sharing Architecture for Optimistic Simulations on Multi-Core Machines**”;
- Speaker at the international conference *6th International Conference on Simulation Tools and Techniques* (SIMUTOOLS 2013), Nice, France, presenting “**A Framework for High Performance Simulation of Transactional Data Grid Platforms**”;
- Speaker at the international conference *2013 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2013), Montréal, Canada, presenting “**Consistent and Efficient Output-Stream Management in Optimistic Simulation Platforms**”;
- Speaker at the international conference *2013 International Conference on High Performance Computing and Simulation* (HPCS 2013), Helsinki, Finland, presenting “**Hijacker: Efficient Static Software Instrumentation with Applications in High Performance Computing**”;
- Speaker at the international conference *19th International Conference on Parallel Processing* (Euro-Par 2013), Aachen, Germany, presenting “**Transparent Support for Partial Rollback in Software Transactional Memories**”;
- Speaker at the international conference *1st Workshop on Parallel and Distributed Agent-Based Simulations* (PADABS 2013), co-located with Euro-Par 2013, Aachen, Germany, presenting “**A Study on the Parallelization of Terrain-Covering Ant Robots Simulations**”;
- Invited Tutorial at the *1st Workshop on Parallel and Distributed Agent-Based Simulations* (PADABS 2013), co-located with Euro-Par 2013, Aachen, Germany, tutorial's title: “**The ROME OpTIMISTIC Simulator: A Tutorial**”;
- Speaker at the international conference *2014 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2014), Denver, Colorado, USA, presenting “**Transparent Multi-Core Speculative Parallelization of DES Models with Event and Cross-State Dependencies**”;
- Speaker at the international conference *2nd Workshop on Parallel and Distributed Agent-Based Simulation* (PADABS 2014), co-located with Euro-Par 2014, Porto, Portugal, presenting “**Programmability and Performance of Parallel ECS-based Simulation of Multi-Agent Exploration Models**”;

- Speaker at the international conference *2015 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2015), London, UK, presenting **“Transparently Mixing Undo Logs and Software Reversibility for State Recovery in Optimistic PDES”**;
- Speaker at the international conference *2015 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2015), London, UK, presenting **“NUMA Time Warp”**;
- Speaker at the international conference *3rd Workshop on Parallel and Distributed Agent-Based Simulations* (PADABS 2015), Vienna, Austria, co-located with Euro-Par 2015, presenting **“RAMSES: Reversibility-based Agent Modeling and Simulation Environment with Speculation support”**;
- Speaker at the international conference *2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2023), 2016 Banff, Canada, presenting **“Granular Time Warp Objects”**;
- Speaker at the international conference *16th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing* (CCGRID 2016), Cartagena, Colombia, presenting **“OS-based NUMA Optimization: Tackling the Case of Truly Multi-thread Applications with Non-Partitioned Virtual Page Accesses”**;
- Speaker at the international conference *21st IEEE Workshop on Dependable Parallel, Distributed and Network-Centric Systems* (DPDNS 2016), Chicago, IL, USA, presenting **“Proactive Cloud Management for Highly Heterogeneous Multi-Cloud Infrastructures”**;
- Speaker at the international conference *6th International Workshop on Big Data and Cloud Performance* (DCPerf 2016), co-located with ICDCS 2016, Nara, Japan, presenting **“Machine Learning-based Elastic Cloud Resource Provisioning in the Solvency II Framework”**;
- Speaker at the international conference *2016 International Workshop on Autonomous High Performance Computing* (AHPC 2016), co-located with HPCS 2016, Innsbruck, Austria, presenting **“Optimizing Memory Management for Optimistic Simulation with Reinforcement Learning”**;
- Speaker at the international conference *4th Workshop on Parallel and Distributed Agent-Based Simulations* (PADABS 2016), co-located with Euro-Par 2016, Grenoble, France, presenting **“Load-Sharing Policies in Parallel Simulation of Agent-Based Demographic Models”**;
- Speaker at the international conference *2016 Winter Simulation Conference* (WSC 2016), Washington, D.C., USA, presenting **“Programming Agent-Based Demographic Models with Cross-State and Message-Exchange Dependencies: A Study with Speculative PDES and Automatic Load-Sharing”**;
- Speaker at the international conference *2018 Winter Simulation Conference* (WSC 2018), Gothenburg, Sweden, presenting **“Optimizing Simulation on Shared-Memory Platforms: the Smart Cities Case”**.
- Speaker at the international conference *2021 International Conference on Service Oriented Systems Engineering* (SOSE 2021), Oxford, UK, presenting **“Inferring Relations Among Test Programs in Microservices Applications”**.
- Speaker at the international conference *2023 ACM SIGSIM Conference on Principles of Advanced Discrete Simulation* (PADS 2023), Orlando, FL, USA, presenting **“Hybrid Speculative Synchronisation for Parallel Discrete Event Simulation”**.
- Speaker at the international conference *27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications* (DS-RT 2023), Singapore, presenting **“Exploiting Memory Protection For Incremental State Saving”**.

- Speaker at the international conference *27th IEEE/ACM International Symposium on Distributed Simulation and Real Time Applications (DS-RT 2023)*, Singapore, presenting “**Practical Tie Breaking for Parallel/Distributed Simulations**” .