Luca Di Stefano

Curriculum vitae
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Personal information

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Research interests

My research mainly concerns the formal modelling and analysis of agent-based models of complex collective systems, as well as verification and synthesis of reactive systems, program analysis, and applications of SAT/SMT.
Keywords associated with my interests include:
Modelling: Agent-based modelling, Attribute-based communication, Collective adaptive systems, Domain-specific languages, Multi-agent systems, Process algebras, Stigmergic interaction, Structural operational semantics, Temporal logics.

Analysis: Bounded model checking, Explicit-state and symbolic model checking, Reactive synthesis, Runtime monitoring, Software verification, Static analysis.

Education

Gran Sasso Science Institute **L'Aquila, Italy**
PhD in Computer Science *November 2016 – October 2020*
Thesis: *Modelling and Verification of Multi-Agent Systems via Sequential Emulation*

Advisors: Rocco De Nicola, Omar Inverso

URL: hdl.handle.net/20.500.12571/10181

Other activities: Student representative in the academic senate (2018–2020).

University of L'Aquila **L'Aquila, Italy**
MSc in Computer Science and Systems Engineering *March 2014 – October 2016*
Thesis: *Design of a reactive system for autonomous UAV navigation in unknown environments*. Thesis written in Italian. Original title: *Progettazione di un sistema reattivo per la navigazione autonoma di un drone in ambienti sconosciuti*.

Advisors: Eliseo Clementini, Enrico Stagnini

Final grade: 110/110, *cum laude*

Official degree name: *Ingegneria Informatica e Automatica*.

Academic Career

TU Wien **Vienna, Austria**
University assistant (Post-doc) *March 2024 – Present time*
Member of the TrustCPS research group within the Cyber-Physical Systems research unit. Web page of the group: `https://www.eziobartocci.com/team.php`

University of Gothenburg/Chalmers **Gothenburg, Sweden**
Post-doctoral researcher *May 2022 – February 2024*
Member of the d-SynMA ERC Consolidator project (Distributed Synthesis from Single to Multiple Agents). The main aim of the project is to develop the theoretical foundations that will enable reactive synthesis in the context of multiple agents.
Web page of the project: `https://dsynma.bitbucket.io`

CONVECS, Inria/LIG **Grenoble, France**
Post-doctoral researcher *November 2020 – April 2022*
I developed an automated translation from state-based temporal properties into MCL (an extension of the alternation-free fragment of the modal μ-calculus), and used it in combination with compositional techniques to verify collective adaptive systems.

SySMA, IMT Lucca **Lucca, Italy**
Grant holder *December 2019 – October 2020*
The grant topic was "Verification of Emerging Properties in Collective Adaptive Systems". I used a structural encoding procedure to enable verification of these systems with a variety of techniques, including predicate abstraction, k-induction, and property-directed reachability.

CONVECS, Inria/LIG **Grenoble, France**
Visiting PhD student *March – July 2019*
I focussed on topics related to my doctoral thesis, and worked on verification of multi-agent systems through a structural encoding into the LNT specification language.

Teaching

TU Wien **Vienna, Austria**
MSc course in GPU Architectures and Computing *2024 – 2025*
Teaching assistant (approx. 30 hours). The course aimed ad understanding GPU computer architectures, becoming familiar with GPU programming models and environments, and solving problems through GPU programming (CUDA). I assisted in supervision and grading of group assignments related to the course.

Seminar course in Scientific Research and Writing *2025*
Teaching assistant. Expected outcomes: After successful completion of the course, students should demonstrate a basic knowledge of philosophy of science, research methodology, the operation of the scientific community, ethical issues of science and research, and citation rules. They should be able to autonomously perform a literature search, and command basic skills of scientific reading and writing, correct handling of references and citations, and giving a scientific presentation. I gave presentations on how to perform a scientific literature review, and how to referee a paper, and assisted in grading assignments.

MSc course in Internet of Things *2024*
Teaching assistant. Expected outcomes: After successful completion of the course, students are able to design and develop IoT systems. They should be able to solve, within a team, the common related problems. They should master the knowledge of IoT protocols, and they should be able to assess both ethical and security issues arising in this context. I assisted in supervision and grading of group assignments related to the course.

University of Gothenburg and Chalmers **Gothenburg, Sweden**
BSc course in Principle of Concurrent Programming *2023*
Teaching assistant (approx. 80 hours). The course covered both shared-memory and message-passing concurrency, using Java and Erlang as reference languages. I provided assistance in lab sessions, grading of assignments and exams, and Erlang coding tutorials.

Polytech Paris-Saclay **Paris, France**
MSc course in Modelling and Verification *2021 – 2022*
36-hour course for Master students in Computer Science Engineering, *filière apprentissage*. Held remotely (2021) and in person (2022) as a supply teacher (*intervenant vacataire*). The course focused on the following topics: modelling of concurrent systems through communicating automata (labelled transition systems); behavioural equivalences; process algebras (CCS, LNT); modal and temporal logics (HML, μ-calculus, MCL); model checking; modelling of real-time systems through timed automata; model-based testing. Tools such as CADP and UPPAAL were showcased in lab sessions.

Supervised Master's students

Love Lyckaro. 2023. "Evaluating In-Memory Caching Strategies for Distributed Web Services". MA thesis. Gothenburg, Sweden: Chalmers University of Technology. URL: `http://hdl.handle.net/20.500.12380/307480`.

Other academic activities

Reviewing activity

Conferences: SEFM 2019, TASE 2019, AAMAS 2021, FM 2021, ICSOFT 2021, ISoLA 2021, FORTE 2022, ISoLA 2022, CSL 2023, iFM 2023, TACAS 2023, EMSOFT 2024, FMICS 2024, iFM 2024, ISoLA 2024, FMICS 2025.

Artifact evaluations: COORDINATION 2023.

Journals: Information and Computation (2025), Logical Methods in Computer Science (2023), Science of Computer Programming (2022, 2024), Software Tools for Technology Transfer (2023–2025).

Program Committees

FMICS 2024, NSAD 2024, ASQAP 2025, FMICS 2025.

Workshop Chair

FTfJP 2024.

Participation to PhD schools

1st VMCAI Winter School **Lisbon, Portugal**
Attendee *January 2019*
The school featured lectures on several topics associated with the VMCAI conference series, including: abstract interpretation (Patrick Cousot, New York University); computing with SAT oracles (João Marques-Silva, University of Lisbon); neural network verification (M. Pawan Kumar, University of Oxford); verification of distributed protocols (Ken McMillan, Microsoft Research).

Invited presentations

- *Compositional Verification of Stigmergic Collective Systems.* Invited presentation to the CONVECS research team (Inria/LIG). Grenoble, France, 16 May 2023.
- *Verifying collective adaptive systems by emulation.* Remote presentation to the Formal Methods unit of the Computer Science and Engineering department (University of Gothenburg and Chalmers). Gothenburg, Sweden, 10 March 2022.
- *Multi-agent (smart) systems with virtual stigmergies.* Kickoff meeting of Italian national research project (PRIN) *IT MATTERS: Methods and Tools for Trustworthy Smart Systems.* Pisa, Italy, 14 October 2019.
- *Multi-agent systems with virtual stigmergies.* Invited presentation at IMT School for Advanced Studies. Lucca, Italy, 3 July 2018.

Skills

Technical skills: My experience in programming spans more than a decade. As of now my languages of choice are mainly F# and Python, but I have worked with a number of popular languages across the years (e.g., C, C++, C#, Erlang, Go, Java, Prolog). I am familiar with software verification tools (CBMC, ESBMC, Infer), model checking software (CADP, NuXmv, SPIN), and SAT/SMT solvers (Glucose, MathSat, Minisat, Z3). I have some knowledge of control theory, computer architectures, assembly languages, and hardware description languages (mainly VHDL). I am also familiar with version control systems such as Git and Subversion.

Language skills: Italian is my first language. I am fluent in English (CEFR level C2) and have some knowledge of French (CEFR level A2–B1). I have basic Swedish and German skills (CEFR level A1).

Publications

Journal articles

L. Di Stefano and F. Lang. 2024. "Compositional Verification of Priority Systems Using Sharp Bisimulation". In: *Form Methods Syst. Des.* 62.

Y. Abd Alrahman, S. Azzopardi, L. Di Stefano, and N. Piterman. 2023. "Language Support for Verifying Reconfigurable Interacting Systems". In: *STTT* 25.

R. De Nicola, L. Di Stefano, O. Inverso, and S. Valiani. 2023. "Modelling Flocks of Birds and Colonies of Ants from the Bottom Up". In: *STTT* 25.

R. De Nicola, L. Di Stefano, O. Inverso, and A. Uwimbabazi. 2022. "Automated Replication of Tuple Spaces via Static Analysis". In: *Sci. Comput. Program.* 223.

L. Di Stefano, R. De Nicola, and O. Inverso. 2022. "Verification of Distributed Systems via Sequential Emulation". In: *TOSEM* 31.

R. De Nicola, L. Di Stefano, and O. Inverso. 2020. "Multi-Agent Systems with Virtual Stigmergy". In: *Sci. Comput. Program.* 187.

R. De Nicola, L. Di Stefano, and O. Inverso. 2018. "Toward Formal Models and Languages for Verifiable Multi-Robot Systems". In: *Frontiers Robotics AI* 5.

Peer-reviewed conference and workshop papers

S. Azzopardi, L. Di Stefano, N. Piterman, and G. Schneider. 2025. "Full LTL Synthesis over Infinite-state Arenas". In: *CAV '25*. To appear.

Y. Abd Alrahman, S. Azzopardi, L. Di Stefano, and N. Piterman. 2024. "Attributed Point-to-Point Communication in R-CHECK". In: *12th International Symposium on Leveraging Applications of Formal Methods, Verification and Validation* (*ISoLA*). Ed. by T. Margaria and B. Steffen. Vol. 15220. LNCS.

L. Di Stefano and O. Inverso. 2024. "Emerging Synchrony in Applauding Audiences: Formal Analysis and Specification". In: *12th International Symposium on Leveraging Applications of Formal Methods, Verification and Validation* (*ISoLA*). Ed. by T. Margaria and B. Steffen. Vol. 15219. LNCS.

R. De Nicola, L. Di Stefano, O. Inverso, and S. Valiani. 2023. "Intuitive Modelling and Formal Analysis of Collective Behaviour in Foraging Ants". In: *21st International Conference on Computational Methods in Systems Biology* (*CMSB*).

L. Di Stefano and F. Lang. 2023. "Compositional Verification of Stigmergic Collective Systems". In: *24th International Conference on Verification, Model Checking, and Abstract Interpretation* (*VMCAI*).

R. De Nicola, L. Di Stefano, O. Inverso, and S. Valiani. 2022. "Modelling Flocks of Birds from the Bottom Up". In: *11th International Symposium on Leveraging Applications of Formal Methods, Verification and Validation* (*ISoLA*).

L. Di Stefano and F. Lang. 2021. "Verifying Temporal Properties of Stigmergic Collective Systems Using CADP". In: *10th International Symposium On Leveraging Applications of Formal Methods, Verification and Validation* (*ISoLA*).

L. Di Stefano, F. Lang, and W. Serwe. 2020. "Combining SLiVER with CADP to Analyze Multi-agent Systems". In: *22nd International Conference on Coordination Models and Languages* (*COORDINATION*).

R. De Nicola, L. Di Stefano, and O. Inverso. 2018. "Multi-Agent Systems with Virtual Stigmergy". In: *STAF Collocated Workshops, Revised Selected Papers*.

Book chapters

R. De Nicola, L. Di Stefano, O. Inverso, and S. Valiani. 2022. "Process Algebras and Flocks of Birds". In: *A Journey from Process Algebra via Timed Automata to Model Learning - Essays Dedicated to Frits Vaandrager on the Occasion of His 60th Birthday*.

Preprints and technical reports

L. Di Stefano and F. Lang. *Compositional Verification of Priority Systems using Sharp Bisimulation*. Tech. rep. INRIA. URL: `https://hal.inria.fr/hal-03640683`.

S. Azzopardi, N. Piterman, G. Schneider, and L. Di Stefano. 2023. *LTL Synthesis on Infinite-State Arenas defined by Programs*. arXiv: `2307.09776 [cs.LO]`.

Citation metrics

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