

Francesco Leofante

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Current position

Research Associate

Department of Computing, Imperial College London.
Topic: Verification of learning-enabled systems (DARPA Assured Autonomy).
Date started: November 2019.

Other experience

Freelance AI consultant, Imperial Consultants (ICON) Ltd, 2021.

Visiting Ph.D. student (2 months), Universitat Pompeu Fabra, Host: Hector Geffner, 2019.

Research Internship in Mobile Robotics (6 months), Airbus Group Innovations, 2015.

Education

PhD Computer Science, co-tutelle RWTH Aachen University and University of Genoa, 2015 - 2019.

MSc Advanced Robotics, Ecole Centrale de Nantes, 2014 - 2015.

MSc Robotics Engineering, University of Genoa, 2013 - 2014.

BSc Electronics Engineering, University of Genoa, 2010 - 2013.

Teaching

AI Planning. Co-lecturer (4h), UKRI CDT on Safe and Trusted AI, Imperial College London, 2021.

Planning as Satisfiability. Main lecturer (16h), University of Genoa, 2020.

Artificial Intelligence. T.A. (40h), University of Genoa, 2019.

Topics in Satisfiability Checking. T.A. (10h), RWTH Aachen University, 2018.

Design and Analysis of Algorithms. T.A. (40h), University of Genoa, 2016.

Modeling and Verification of Cyber-Physical Systems. T.A. (40h), University of Genoa, 2016.

Student (co-)supervision

L. Dirks, "A CEGAR approach for efficient planning with SMT", BSc thesis, RWTH, 2021.

K. Alwadhi, "Runtime monitoring of neural networks", Summer internship, Imperial College London, 2021.

L. Rabanus, "Solving planning problems with success probabilities with SMT", BSc thesis, RWTH, 2019

D. Guidotti, “Verification and repair of ML-based robotic prosthesis control”, MSc thesis, UNIGE, 2018.

I. Bongartz, “Explaining unsolvable planning tasks with unsat cores”, MSc thesis, RWTH, 2018.

L. Korp, “SMT-based planning for autonomous robot fleets”, BSc thesis, RWTH, 2017.

S. Vuotto, “Static and runtime methods for safe standing-up in humanoid robots”, MSc thesis, UNIGE, 2016.

Tutorials

“SMT Solving for AI Planning: Theory, Tools and Applications” half-day tutorial at ICAPS, 2018.

Website: <https://ths.rwth-aachen.de/research/talks/smt4planning/>

Projects

During my career I actively contributed to the following projects:

“DARPA Assured Autonomy”, Imperial College London.

Website: https://vas.doc.ic.ac.uk/projects/darpa_aa/

“Optimal Plans with Optimization Modulo Theories”, RWTH Aachen University.

Website: <https://ths.rwth-aachen.de/research/projects/smt4robots/>

Invited talks

“Safe and Trusted AI: Verification, Explainability and All That”

Workshop on Formal Methods for AI-Controlled Systems (FMACS’21), 2021.

“AI Planning Meets Production Logistics”

Workshop on Formal Methods and AI for Logistics (FMAIL’19), 2019.

“Optimal Multi-robot Task Planning with SMT”

Photogrammetry and Robotics Lab, University of Bonn, 2018.

“Are you Doing What I Think You Are Doing? Robust AI via Verification, Monitoring and Repair”

Dept. of Computer Science, Technical University of Munich, 2017.

“Combining Static and Runtime Methods to Achieve Safe Standing-up for Humanoid Robots”

Dept. of Computer Engineering, University of Sassari, 2017.

Grants and awards

Imperial Techcelerate Fellow 2021: selected to join the Techcelerate accelerator programme. This also included a monetary award to investigate market opportunities for my research.

AI*IA Mobility Grant 2019: my proposal on planning and learning was awarded a grant by the Italian Association for Artificial Intelligence to support a two-month visit to Hector Geffner’s group at UPF.

1st place in the Planning and Execution Competition for Logistics Robots in Simulation @ ICAPS’18.

Best presentation award at the PhD Symposium @ IFM’18 (sponsored by Science Foundation of Ireland).

Various travel grants: AAAI’18, IJCAI-ECAI’18, IFM’18.

Service to the profession

Reviewer for conferences: ACM SAC'22 (PC), AAI'22 (PC), AAMAS'22 (PC), IJCAI'22 (PC), KR'21 (PC), IJCAI'21 (Senior PC), AAI'21 (PC), IJCAI'20 (PC).

Reviewer for journals: Artificial Intelligence Journal, Logic Journal of the IGPL, Machine Learning, Information and Computation, Cognitive Systems Research.

External reviewer for conferences: ISCAS'22, PADL'19, ICAPS'19, ICORR'19, TASE'{19,18,17}, TACAS'18, QEST'18, HSCC'{18,17}, AAI'17 .

Publications

* authors ordered by contribution

@ indicates alphabetical order

+ indicates random order

JOURNALS

- [1] D. Guidotti, **F. Leofante**, A. Tacchella, and C. Castellini*. Improving reliability of myocontrol using formal verification. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 2019.
- [2] **F. Leofante**, E. Ábrahám, T. Niemueller, G. Lakemeyer, and A. Tacchella*. Integrated synthesis and execution of optimal plans for multi-robot systems in logistics. *Information Systems Frontiers*, 2019.

CONFERENCES

- [1] P. Kouvaros, T. Kyono, **F. Leofante**, A. Lomuscio, D. Margineantu, D. Osipychiev, and Y. Zheng@. Formal analysis of neural network-based systems in the aircraft domain. In *Proc. of FM*, 2021.
- [2] **F. Leofante**, E. Giunchiglia, E. Ábrahám, and A. Tacchella*. Optimal planning modulo theories. In *Proc. of IJCAI*, 2020.
- [3] D. Guidotti, **F. Leofante**, L. Pulina, and A. Tacchella*. Verification of neural networks: Enhancing scalability through pruning. In *Proc. of ECAI*, 2020.
- [4] D. Guidotti, **F. Leofante**, L. Pulina, and A. Tacchella*. Verification and repair of neural networks: A progress report on convolutional models. In *Proc. of AI*IA*, 2019.
- [5] **F. Leofante**, S. Schupp, E. Ábrahám, and A. Tacchella*. Engineering controllers for swarm robotics via reachability analysis in hybrid systems. In *Proc. of ECMS*, 2019.
- [6] A. Bit-Monnot, **F. Leofante**, L. Pulina, and A. Tacchella*. SMT-based planning for robots in smart factories. In *Proc. of IEA/AIE*, 2019.
- [7] D. Guidotti, **F. Leofante**, A. Tacchella, and C. Castellini*. Repairing learned controllers with convex optimization: A case study. In *Proc. of CPAIOR*, 2019.
- [8] **F. Leofante**. Optimal multi-robot task planning: From synthesis to execution (and back). In *Proc. of IJCAI*, 2018.
- [9] **F. Leofante**, E. Ábrahám, and A. Tacchella*. Task planning with OMT: An application to production logistics. In *Proc. of IFM*, 2018.
- [10] **F. Leofante***. Guaranteed plans for multi-robot systems via optimization modulo theories. In *Proc. of AAI*, 2018.
- [11] **F. Leofante**, E. Ábrahám, T. Niemueller, G. Lakemeyer, and A. Tacchella*. On the synthesis of guaranteed-quality plans for robot fleets in logistics scenarios via optimization modulo theories. In *Proc of IRI*, 2017.
- [12] **F. Leofante** and A. Tacchella*. Learning in physical domains: Mating safety requirements and costly sampling. In *Proc. of AI*IA*, 2016.
- [13] **F. Leofante**, S. Vuotto, E. Ábrahám, A. Tacchella, and N. Jansen*. Combining static and runtime methods to achieve safe standing-up for humanoid robots. In *Proc. of ISoLA*, 2016.

WORKSHOPS, TECHNICAL REPORTS

- [1] T. Johnson, D. Manzananas Lopez, P. Musau, H. Tran, E. Botoeva, **F. Leofante**, A. Maleki, C. Sidrane, J. Fan, and C. Huang⁺. ARCH-COMP20 category report: Artificial intelligence and neural network control systems (AINNCS) for continuous and hybrid systems plants. In *Proc. of ARCH Workshop*, 2020.
- [2] **F. Leofante**, N. Narodytska, L. Pulina, and A. Tacchella⁺. Reasoning about neural networks: a taxonomy of current approaches. In *Proc. of VNN*, 2019.
- [3] **F. Leofante**. Planning as satisfiability for cyber-physical systems. In *Proc. of CPSWS*, 2018.
- [4] S. Schupp, **F. Leofante**, E. Ábrahám, and A. Tacchella*. Robot swarms as hybrid systems. In *Proc. of SNR@ETAPS*, 2018.
- [5] T. Niemueller, G. Lakemeyer, **F. Leofante**, and E. Ábrahám⁺. Towards CLIPS-based task execution and monitoring with SMT-based decision optimization. In *Proc. of PlanRob@ICAPS*, 2017.
- [6] **F. Leofante**, G. LeMoal, G. Garcia, and P. Rabaté. Improving Monte Carlo localization using reflective markers: An experimental analysis*. In *Proc. of PPNIV@IROS*, 2015.
- [7] N. Arnaldi, C. Barone, F. Fusco, **F. Leofante**, and A. Tacchella. Autonomous driving and undergraduates: an affordable setup for teaching robotics*. In *Proc. of AIRO@AI*IA*, 2016.
- [8] **F. Leofante**, L. Pulina, and A. Tacchella*. Learning with safety requirements: State of the art and open questions. In *Proc. of RCRA@AI*IA*, 2016.

THESIS

- [1] **F. Leofante**. *Optimal planning modulo theories*. PhD thesis, RWTH Aachen University and University of Genoa, 2020.