

# Dr Francesco Leofante

last updated: July 25, 2024

**Area of research:** Safe & Explainable AI.

**Contact:** f.leofante@imperial.ac.uk

**Personal webpage:** <https://fraleo.github.io/>.

## Qualifications

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**2015 - 20** PhD Computer Science, RWTH Aachen University (DE) (co-tutelle University of Genoa).

**2014 - 15** MSc Advanced Robotics, Ecole Centrale de Nantes (FR).

**2013 - 14** MSc Robotics Engineering, University of Genoa (IT).

**2010 - 13** BSc Electronics Engineering, University of Genoa (IT).

## Employment

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**2022 - present** Imperial College Research Fellow, Department of Computing, Imperial College London (UK).

- Research outputs available at: <https://fraleo.github.io/contrust/>

**2020 - 22** Research Associate, Department of Computing, Imperial College London (UK).

- Research outputs available at: [https://vas.doc.ic.ac.uk/projects/darpa\\_aa/](https://vas.doc.ic.ac.uk/projects/darpa_aa/)

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

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

**2015** Research Internship in Mobile Robotics, Airbus Group Innovations.

## Grants

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**2023** UK-Italy Trustworthy AI Visiting Researcher Programme, Alan Turing Institute. Amount: **£4500**.

**2022** Imperial College Research Fellowship, Imperial College London. Amount: **~£250,000**.

**2019** AI\*IA Mobility Grant, Italian Association for Artificial Intelligence. Amount: **€2000**.

**2018** Various travel grants: AAAI'18, IJCAI-ECAI'18, IFM'18. Cumulative amount: **~£3000**.

## Teaching and supervision

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**PhD level** Intro to AI Planning. UKRI CDT on Safe and Trusted AI (4hrs). 2021 and 2022.

### MSc level

- Ethics, Fairness and Explanation in AI. Imperial College London (12hrs). 2024.
- Planning as Satisfiability. University of Genoa (16hrs). 2020.

**Teaching Assistant** Artificial Intelligence (40hrs), Topics in Satisfiability Checking (10hrs), Design and Analysis of Algorithms (40hrs), Modeling and Verification of Cyber-Physical Systems (40hrs). 2016-2019.

**Supervision** I have (co-)supervised a number of students covering topics including Explainable AI (2x PhD, 2x MSc) and Safe Machine Learning (2x MSc, 2x Summer UROPs) and AI Planning (1x MSc, 4x Bsc).

## Evidence of esteem

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### Awards

- Runner-up for the Pragnesh Jay Modi Best Paper Award at AAMAS'24.
- DAAD AINet Fellowship 2024, German Academic Exchange Service.
- PFDC Supporting Research Staff and Students Award 2023, Imperial College London.
- TechCelerate Fellow 2021: selected to join the Imperial TechCelerate accelerator programme. This also included a monetary award (£3000) to investigate market opportunities for my research.
- 1st place in the Planning and Execution Competition for Logistics Robots in Simulation at ICAPS'18.
- Best presentation award at the PhD Symposium at IFM'18.

### Selected invited talks

- "Robust Algorithmic Recourse", TU Dortmund and Bielefeld University, Germany, 2024.
- "Robustness (and Fairness) in Algorithmic Recourse, Goldman Sachs, Virtual, 2024.
- "Robustness Issues in Algorithmic Recourse", Responsible AI Workshop, London, 2024.
- "Verification Techniques for Robust Explainable AI". King's College London, 2023.
- "Robust Explainable AI". Fondazione Bruno Kessler and University of Trento, 2023.
- "Robust Counterfactual Explanations for Deep Neural Networks", IT University of Copenhagen, 2023.

**Programme Committee membership** FAccT'24, AAAI'21,22,23,24,25, IJCAI'20,21,22,23,24, KR'21,22,23,24, ECAI'23,24, xAI'23,24, AAMAS'22,23 (BlueSky), ACM SAC'22.

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

**Reviewer for national agencies** Czech Academy of Sciences (CZ).

**Jury member for international awards** CLAIRE Rising Researcher Network Paper Highlight 2024.

### Tutorials at international venues

- "Robust Explainable AI: the Case of Counterfactual Explanations". ECAI 2023.  
Website: <https://fraleo.github.io/ecai23-tutorial/>
- "SMT Solving and AI Planning". EU ETN REMARO PhD School, 2022.  
Website: <https://remaro.eu/index.php/remaro-fall-school-at-rwth-aachen-university/>
- "SMT Solving for AI Planning: Theory, Tools and Applications". ICAPS 2018.  
Website: <https://ths.rwth-aachen.de/research/talks/smt4planning/>

### Workshop organisation

- "ExplAI 2022: Robustness in Explainable AI". Imperial College London.  
Website: <https://www.doc.ic.ac.uk/~fleofant/explainAI22/index.html>

## EDI, outreach and engagement

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**2024** "Explainable AI (and other facts about AI research)". Lecture to A-level students aged 17 to 18 years old visiting Imperial in Feb 2024.

**2023** "Diverse career paths in AI". Panel organised by UKRI CDT on Safe and Trusted AI.

**2023** "My journey in Explainable AI". Talk at the Revolutions in Engineering Summer School for UK Undergraduates of Black or mixed Black heritage. Website: <https://rie-imperial.com/>.

**2022 - present** Mental Health First Aider (MHFA England).

# Publications

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## Journals

- [3] **F. Leofante**. "OMTPlan: a Tool for Optimal Planning Modulo Theories". In: *Journal on Satisfiability, Boolean Modeling and Computation* (2023).
- [2] D. Guidotti, **F. Leofante**, A. Tacchella, and C. Castellini. "Improving Reliability of Myocontrol Using Formal Verification". In: *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (2019).
- [1] **F. Leofante**, E. Ábrahám, T. Niemueller, G. Lakemeyer, and A. Tacchella. "Integrated Synthesis and Execution of Optimal Plans for Multi-Robot Systems in Logistics". In: *Information Systems Frontiers* (2019).

## Conferences

- [26] J. Jiang, **F. Leofante**, A. Rago, and F. Toni. "Recourse under Model Multiplicity via Argumentative Ensembling". In: *Proc. of AAMAS*. Runner-up for the Pragmesh Jay Modi Best Paper Award. 2024.
- [25] J. Jiang, **F. Leofante**, A. Rago, and F. Toni. "Robust Counterfactual Explanations in Machine Learning: A Survey". In: *Proc. of IJCAI*. 2024.
- [24] L. Marzari, **F. Leofante**, F. Cicalese, and A. Farinelli. "Rigorous Probabilistic Guarantees for Robust Counterfactual Explanations". In: *Proc. of ECAI*. The first two authors contributed equally. 2024.
- [23] **F. Leofante**, Hamed Ayoobi, Adam Dejl, Gabriel Freedman, Deniz Gorur, Junqi Jiang, Guilherme Paulino-Passos, Antonio Rago, Anna Rapberger, Fabrizio Russo, Xiang Yin, Dekai Zhang, and Francesca Toni. "Contestable AI needs Computational Argumentation". In: *Proc. of KR*. 2024.
- [22] **F. Leofante** and N. Potyka. "Promoting Counterfactual Robustness through Diversity". In: *Proc. of AAAI*. 2024.
- [21] J. Jiang, J. Lan, **F. Leofante**, A. Rago, and F. Toni. "Provably Robust and Plausible Counterfactual Explanations for Neural Networks via Robust Optimisation". In: *Proc. of ACML*. 2023.
- [20] J. Jiang, **F. Leofante**, A. Rago, and F. Toni. "Formalising the Robustness of Counterfactual Explanations for Neural Networks". In: *Proc. of AAAI*. The first two authors contributed equally. 2023.
- [19] P. Kouvaros, **F. Leofante**, B. Edwards, C. Chung, D. Margineantu, and A. Lomuscio. "Verification of Semantic Key Point Detection for Aircraft Pose Estimation". In: *Proc. of KR*. 2023.
- [18] **F. Leofante**, E. Botoeva, and V. Rajani. "Counterfactual Explanations and Model Multiplicity: a Relational Verification View". In: *Proc. of KR*. 2023.
- [17] **F. Leofante**, P. Henriksen, and A. Lomuscio. "Verification-friendly Networks: The Case for Parametric ReLUs". In: *Proc. of IJCNN*. The first two authors contributed equally. 2023.
- [16] **F. Leofante** and A. Lomuscio. "Robust Explanations for Human-Neural Multi-agent Systems with Formal Verification". In: *Proc. of EUMAS*. 2023.
- [15] **F. Leofante** and A. Lomuscio. "Towards Robust Contrastive Explanations for Human-Neural Multi-agent Systems". In: *Proc. of AAMAS*. 2023.
- [14] P. Henriksen, **F. Leofante**, and A. Lomuscio. "Repairing Misclassifications in Neural Networks Using Limited Data". In: *Proc. of SAC*. The first two authors contributed equally. 2022.
- [13] P. Kouvaros, T. Kyono, **F. Leofante**, A. Lomuscio, D. Margineantu, D. Osipychyev, and Y. Zheng. "Formal Analysis of Neural Network-based Systems in the Aircraft Domain". In: *Proc. of FM*. 2021.
- [12] D. Guidotti, **F. Leofante**, L. Pulina, and A. Tacchella. "Verification of Neural Networks: Enhancing Scalability through Pruning". In: *Proc. of ECAI*. 2020.
- [11] **F. Leofante**, E. Giunchiglia, E. Ábrahám, and A. Tacchella. "Optimal Planning Modulo Theories". In: *Proc. of IJCAI*. 2020.
- [10] A. Bit-Monnot, **F. Leofante**, L. Pulina, and A. Tacchella. "SMT-based Planning for Robots in Smart Factories". In: *Proc. of IEA/AIE*. 2019.

- [9] 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.
- [8] D. Guidotti, **F. Leofante**, A. Tacchella, and C. Castellini. "Repairing learned controllers with convex optimization: A case study". In: *Proc. of CPAIOR*. 2019.
- [7] **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] **F. Leofante**. "Guaranteed Plans for Multi-Robot Systems via Optimization Modulo Theories". In: *Proc. of AAAI*. 2018.
- [5] **F. Leofante**. "Optimal Multi-robot Task Planning: From Synthesis to Execution (and Back)". In: *Proc. of IJCAI*. 2018.
- [4] **F. Leofante**, E. Ábrahám, and A. Tacchella. "Task Planning with OMT: An Application to Production Logistics". In: *Proc. of IFM*. 2018.
- [3] **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.
- [2] **F. Leofante** and A. Tacchella. "Learning in Physical Domains: Mating Safety Requirements and Costly Sampling". In: *Proc. of AI\*IA*. 2016.
- [1] **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

- [9] **F. Leofante**, P. Henriksen, and A. Lomuscio. "Verification-friendly Networks: the Case for Parametric ReLUs". In: *Proc. of WDVML@ICML*. The first two authors contributed equally. 2022.
- [8] S. Schupp, **F. Leofante**, L. Behr, E. Ábrahám, and A. Tacchella. "Robot Swarms as Hybrid Systems: Modelling and Verification". In: *Proc. of SNR@ETAPS*. 2021.
- [7] 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.
- [6] **F. Leofante**, N. Narodytska, L. Pulina, and A. Tacchella. "Reasoning about Neural Networks: a Taxonomy of Current Approaches". In: *Proc. of VNN*. 2019.
- [5] **F. Leofante**. "Planning as Satisfiability for Cyber-physical Systems". In: *Proc. of CPSWS*. 2018.
- [4] 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.
- [3] 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.
- [2] **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.
- [1] **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.

#### Thesis

- [1] **F. Leofante**. "Optimal Planning Modulo Theories". PhD thesis. RWTH Aachen University and University of Genoa, 2020.