Dr Francesco Leofante

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Area of research: Safe & Explainable AI.
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Personal webpage: https://fraleo.github.io/.

Qualifications

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

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/`

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

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

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

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

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

EDI, outreach and engagement

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

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

[24] J. Jiang, **F. Leofante**, A. Rago, and F. Toni. "Recourse under Model Multiplicity via Argumentative Ensembling". In: *Proc. of AAMAS*. Runner-up for the Pragnesh Jay Modi Best Paper Award. 2024.

[23] J. Jiang, **F. Leofante**, A. Rago, and F. Toni. "Robust Counterfactual Explanations in Machine Learning: A Survey." In: *Proc. of IJCAI*. 2024 (to appear).

[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. Osipychev, 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 WFVML@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. Manzanas 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.