Curriculum vitae - Daniele Meli
Updated to July 23, 2024

Tutto quanto dichiarato in questo CV corrisponde a verità. Le dichiarazioni rese nel curriculum sono rilasciate ai sensi degli articoli 46 e 47 del D.P.R. 445/2000.

Personal information

- **First Name**: Daniele

- **Family Name**: Meli

- **Gender**: Male

- **Birth date**: 16th January 1994

- **Address**: via Imola 12, 37135, Verona, Italy

- **Open Researcher and Contributor ID (ORCID)**: 0000-0002-3162-388X

- **Scopus ID**: 57209605337

- **Research metrics (Scopus) July 23, 2024:**
  206 citations (from 134 documents)
  H-index = 9

- **Research metrics (Google Scholar) July 23, 2024:**
  296 citations
  H-index = 10
  i10-index = 10

- **Email**: daniele.meli@univr.it

Short abstract

I received my Master's degree in Automation Engineering from Politecnico di Bari, IT, in 2017, and my PhD in Computer Science from University of Verona in 2021. I am currently a research fellow and assistant professor in Artificial Intelligence and Robotics at University of Verona.

My research is mainly focused on robotics and AI integration. In particular, during my PhD I worked on symbolic reconfigurable planning for safety-critic surgical robotic systems, integrating task and motion planning. As a post-doctoral researcher, I am now focusing on the integration of data-driven and symbolic (**neurosymbolic**) AI for autonomous agent planning. This involves the combination of reinforcement learning, non-monotonic reasoning and inductive logic programming for explainability, trustability and higher-efficiency of autonomous agents. At the same time, I am recently working on the problem of explainable system analysis exploiting causal discovery techniques, which can be ultimately combined into reinforcement learning frameworks for explainability or anomaly detection purposes.

I have served as reviewer and PC member for several national and international conferences and journals,

including: IEEE Transactions on Medical Robotics and Bionics; IEEE Transactions on Control System Technologies; IEEE Robotics and Automation Magazine; ACM AAMAS, ECAI, ICAPS Conferences; IEEE ICRA, IROS, CASE, Humanoids Conferences; AIxIA thematic workshops.

Moreover, I am member of AIxIA (Italian Association for AI) and I-RIM (Italian Institute of Robotics and Intelligent Machines), and part of I-RIM working group for Robotics 4.0 (AI for manufacturing systems, http://dclab.poliba.it/i-rim-working-group-on-robotics-4-0/).

Finally, I am currently the topic editor of an open special issue on **Merging symbolic and data-driven AI for robot autonomy** (https://www.frontiersin.org/research-topics/50600/merging-symbolic-and-data-driven-ai-for-robot-autonomy), on *Frontiers in Robotics and AI*, with co-editors Dr. Nikos Katzouris (Demokritos Research Center, GR); Prof. Simona Perri (University of Calabria, IT), and Prof. Mohan Sridharan (University of Edinburgh, UK). I am also review editor for the same journal (section *Computational intelligence in robotics*, https://loop.frontiersin.org/people/1577338/overview).

WORK EXPERIENCE

Jan 2022 - present	**Non-tenure track assistant professor (RTD-A)**
	Department of Computer Science, University of Verona, Italy
	Topic: Automatic planning for autonomous robotic platforms involved in environmental monitoring
	Funded by: PON Ricerca e Innovazione (DM 1062/2021)
Dec 2020 - Dec 2021	**Post-doctoral researcher**
	Department of Computer Science, University of Verona, Italy
	Topic: Learning logical task specifications from noisy uncertain examples of robotic execution
	Funded by: ERC Horizon 2020 *Autonomous Robotic Surgery (ARS)* project (https://www.ars-project.eu/)

EDUCATION

2017 - 2021	**PhD in Computer Science**
	University of Verona, Italy
	Dissertation title: Interpretable task planning and learning for autonomous robotic surgery with logic programming
	Funded by: ERC Horizon 2020 *Autonomous Robotic Surgery (ARS)* project (https://www.ars-project.eu/)
2015 - 2017	**Master's Degree in Automation Engineering**
	Politecnico di Bari, Italy

2) Teaching activities at University level

University of Verona, Italy

AY 2023 - 2024	**Explainable AI** (Master's degree in Artificial Intelligence)	24 hours
AY 2023 - 2024	**Mobile robotics** (Master's degrees in Robotics and AI)	12 hours
AY 2022 - 2023	**Mobile robotics** (Master's degrees in Robotics and AI)	12 hours
AY 2022 - 2023	**Knowledge representation** (Master's degree in AI)	24 hours
AY 2021 - 2022	**C Programming** (Bachelor's degree in Computer Science)	12 hours

2023 - present   Supervisor of PhD student
Student name: Celeste Veronese
Co-supervisor: Alessandro Farinelli
Topic: online neurosymbolic reinforcement learning

2022 - present   Member of internal evaluation committee for PhD student
Student name: Francesco Trotti
Supervisor: Alessandro Farinelli
Topic: Model-based reinforcement learning and control

2022 - present   Member of internal evaluation committee for PhD student
Student name: Federico Bianchi
Supervisor: Alberto Castellini
Topic: Safe policy improvement with model-based reinforcement learning

2022 - present   Member of internal evaluation committee for PhD student
Student name: Ashraf Sharifi
Supervisor: Davide Quaglia
Topic: Task planning mixing formal methods and neural networks

2022 - present   Supervisor / co-supervisor of > 5 Bachelor and Master's students in Computer Science, Robotics and AI

University of Amsterdam, NL

2024 - present   Master's thesis co-supervisor
Student name: Paulius Skaisgiris
Supervisor: Balder ten Cate
Topic: Learning alternating temporal logic specifications from datasets of executions of multi-agent systems

3) Research and education activities in University and research centers (out of Education and Work sections)

Sep - Dec 2019   Visiting PhD at the School of Computer Science, University of Birmingham, UK
Topic: Inductive learning of answer set programs from robotic task executions
Supervisor: Mohan Sridharan

Mar - Sep 2017   Erasmus traineeship for Master's thesis at the Mechatronic and Automation Center (https://zema.de/), Saarbrucken, DE
Topic: Finite element modeling of shape memory alloy artificial tendons
Supervisor: Stefan Seelecke

5) PROJECT ACTIVITIES

2022 - present	Non-tenure track researcher (RTD-A) on PON Ricerca e Innovazione (DM 1062/2021) *Automatic planning for autonomous robotic platforms involved in environmental monitoring* **Topic:** Neurosymbolic task planning and learning under uncertainty **Company partner:** Witted Srl (Trento, Italy, https://www.witted.eco/)
2022-2023	Scientific responsible for 1-year research contract (25000 euros) **Topic:** Efficient collision-free inverse kinematics and planning for hyper-redundant robotic manipulators **Company partner:** Hibot Corporation (Tokyo, JP, https://hibot.co.jp/)
2017-2021	Research collaborator for ERC Horizon 2020 project **Autonomous robotic surgery (ARS** -https://www.ars-project.eu/) **Topic:** Symbolic and neurosymbolic task planning and learning for autonomous robotic surgery with logic programming

6) ORGANIZATION OR PARTICIPATION TO RESEARCH GROUPS

2022 - present	Member of Intelligent Systems Lab (ISLa - https://isla-lab.github.io/) Department of Computer Science, University of Verona
2017 - 2021	Member of ALTAIR Robotics Lab (https://metropolis.scienze.univr.it/team/) Department of Engineering for Innovation Medicine, University of Verona
Sep - Dec 2019	Visiting at Cognitive Robots and Systems Lab (https://www.cs.bham.ac.uk/ sridharm/SEARL.html) School of Computer Science, University of Birmingham, UK
Mar - Sep 2017	Visiting student at the Mechatronic and Automation Center (https://zema.de/), Saarbrucken, DE

8) Speaker at conferences and symposiums

Invited speaker

2022 **IEEE International Conference on Intelligent and Robotic Systems (IROS)**
Workshop: Robotic manipulation of deformable objects - challenges in perception, planning and control (https://romado-workshop.github.io/ROMADO2022/)
Topic: Autonomy for deformable soft tissue manipulation in robotic surgery

2020 **IEEE International Conference on Intelligent and Robotic Systems (IROS)**
Workshop: Cognitive robotic surgery
Topic: Learning action rules in surgery
Co-speaker: Paolo Fiorini
Note: The workshop website is no longer active. See attachments to the application, for the email conversation where Prof. Fiorini and I were invited by the workshop organizers.

Paper presentation

2023 ACM Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)
Paper: Learning logic specifications for soft policy guidance in POMCP

2023 Italian workshop on AI and Robotics (AIRO), co-located with the AI Italian Conference (AIxIA)
Paper: Monte Carlo planning for mobile robots in large action spaces with velocity obstacles

2022 Workshop on Artificial Intelligence and fOrmal VERification, Logic, Automata, and sYnthesis (OVERLAY), co-located with the AI Italian Conference (AIxIA)
Paper: From POMDP executions to policy specifications

2022 Workshop on AI and Robotics (AIRO), co-located with the AI Italian Conference (AIxIA)
Paper: Inductive learning of surgical task knowledge from intra-operative expert feedback

2021 IEEE International Symposium on Medical Robotics (ISMR)
Paper: Autonomous tissue retraction with a biomechanically informed logic based framework

2021 International Joint Conference on Learning and Reasoning (IJCLR) - Machine Learning Journal track
Paper: Inductive learning of answer set programs for autonomous surgical task planning: Application to a training task for surgeons

2020 International Conference on Knowledge-based Information and Engineering Systems (KES)
Paper: Towards inductive learning of surgical task knowledge: a preliminary case study of the peg transfer task

2020 IEEE IROS
Paper: Autonomous task planning and situation awareness in robotic surgery

9) Research awards

2023 Top-3 main-track paper
Paper title: Learning logic specifications for soft policy guidance in POMCP
Conference: ACM AAMAS

Publications (* denotes equal primary contribution, where I am not the first author)

Journals (the latest classification according to Scimago is reported)

Meli, Daniele, Alberto Castellini, and Alessandro Farinelli (2024). "Learning Logic Specifications for Policy Guidance in POMDPs: an Inductive Logic Programming Approach". In: *Journal of Artificial Intelligence Research* 79. **Q1 in Artificial Intelligence - SJR 2023 = 1.61**, pp. 725–776.

Bombieri, Marco, Daniele Meli*, Diego Dall'Alba, Marco Rospocher, and Paolo Fiorini (2023). "Mapping natural language procedures descriptions to linear temporal logic templates: an application in the surgical robotic domain". In: *Applied Intelligence* 53.22. **Q2 in Artificial Intelligence - SJR 2023 = 1.19**, pp. 26351–26363.

Meli, Daniele, Hirenkumar Nakawala, and Paolo Fiorini (2023). "Logic programming for deliberative robotic task planning". In: *Artificial Intelligence Review* 56.9. **Q1 in Artificial Intelligence - SJR 2023 = 3.26**, pp. 9011–9049.

Ginesi, Michele, Daniele Meli, Andrea Roberti, Nicola Sansonetto, and Paolo Fiorini (2021). "Dynamic Movement Primitives: Volumetric Obstacle Avoidance Using Dynamic Potential Functions". In: *Journal of Intelligent and Robotic Systems: Theory and Applications* 101.4. **Q2 in Artificial Intelligence - SJR 2023 = 0.96**.

Meli, Daniele and Paolo Fiorini (2021). "Unsupervised Identification of Surgical Robotic Actions from Small Homogeneous Datasets". In: *IEEE Robotics and Automation Letters* 6.4. **Q1 in Artificial Intelligence and Computer Science Applications - SJR 2023 = 2.12**, pp. 8205–8212.

Meli, Daniele, Mohan Sridharan, and Paolo Fiorini (2021). "Inductive learning of answer set programs for autonomous surgical task planning: Application to a training task for surgeons". In: *Machine Learning* 110.7. **Q1 in Artificial Intelligence - SJR 2023 = 1.72**, pp. 1739–1763.

Roberti, Andrea, Nicola Piccinelli, Daniele Meli, Riccardo Muradore, and Paolo Fiorini (2020). "Improving Rigid 3-D Calibration for Robotic Surgery". In: *IEEE Transactions on Medical Robotics and Bionics* 2.4. **Q2 in Artificial Intelligence, Q1 in Computer Science Applications - SJR 2023 = 1.1**, pp. 569–573.

Conferences (papers still in publication are attached to the application)

Meli, Daniele (2024, in publication). "Explainable Online Unsupervised Anomaly Detection for Cyber-Physical Systems via Causal Discovery from Time Series". In: *IEEE International Conference on Automation Science and Engineering (CASE)*.

Morasso, Cristian, Daniele Meli*, Yann Divet, Salvatore Sessa, and Alessandro Farinelli (2024, in publication). "Planning and Inverse Kinematics of Hyper-Redundant Manipulators with VO-FABRIK". In: *Springer Proceedings in Advanced Robotics - European Robotics Forum (Editors: Bruno Siciliano, Oussama Khatib)*.

Bonanni, Lorenzo, Daniele Meli*, Alberto Castellini, and Alessandro Farinelli (2024). "Monte Carlo planning for mobile robots in large action spaces with velocity obstacles". In: *CEUR Workshop Proceedings* 3686, pp. 49–58.

Bianchi, Federico, Davide Corsi, Luca Marzari, Daniele Meli*, Francesco Trotti, Maddalena Zuccotto, Alberto Castellini, and Alessandro Farinelli (2023). "Safe and Efficient Reinforcement Learning for Environmental Monitoring". In: *CEUR Workshop Proceedings* 3486, pp. 610–615.

Mazzi, Giulio, Daniele Meli*, Alberto Castellini, and Alessandro Farinelli (2023). "Learning Logic Specifications for Soft Policy Guidance in POMCP". In: *Proceedings of the International Joint Conference on Autonomous Agents and Multiagent Systems, AAMAS* 2023-May, pp. 373–381.

Meli, Daniele, Marco Bombieri, Diego Dall'Alba, and Paolo Fiorini (2023). "Inductive learning of surgical task knowledge from intra-operative expert feedback". In: *CEUR Workshop Proceedings* 3417, pp. 48–54.

Roberti, Andrea, Daniele Meli, Giacomo De Rossi, Riccardo Muradore, and Paolo Fiorini (2023). "Semantic Monocular Surgical SLAM: Intra-Operative 3D Reconstruction and Pre-Operative Registration in Dynamic Environments". In: *2023 21st International Conference on Advanced Robotics, ICAR 2023*, pp. 486–491.

Veronese, Celeste, Daniele Meli*, Filippo Bistaffa, Manel Rodríguez-Sot, Alessandro Farinelli, and Juan A. Rodríguez-Aguilar (2023). "Inductive Logic Programming For Transparent Alignment With Multiple Moral Values". In: *CEUR Workshop Proceedings* 3615, pp. 84–88.

Meli, Daniele, Giulio Mazzi, Alberto Castellini, and Alessandro Farinelli (2022). "From POMDP executions to policy specifications". In: *CEUR Workshop Proceedings* 3311, pp. 93–98.

Tagliabue, Eleonora, Daniele Meli*, Diego Dall'alba, and Paolo Fiorini (2022). "Deliberation in autonomous robotic surgery: a framework for handling anatomical uncertainty". In: *Proceedings - IEEE International Conference on Robotics and Automation*, pp. 11080–11086.

Meli, Daniele, Eleonora Tagliabue, Diego Dall'alba, and Paolo Fiorini (2021). "Autonomous tissue retraction with a biomechanically informed logic based framework". In: *2021 International Symposium on Medical Robotics, ISMR 2021*.

Ginesi, Michele, Daniele Meli*, Andrea Roberti, Nicola Sansonetto, and Paolo Fiorini (2020). "Autonomous task planning and situation awareness in robotic surgery". In: *IEEE International Conference on Intelligent Robots and Systems*, pp. 3144–3150.

Meli, Daniele, Paolo Fiorini, and Mohan Sridharan (2020). "Towards inductive learning of surgical task knowledge: A preliminary case study of the PEG transfer task". In: *Procedia Computer Science* 176, pp. 440–449.

Ginesi, Michele, Daniele Meli*, Andrea Calanca, Diego Dall'Alba, Nicola Sansonetto, and Paolo Fiorini (2019). "Dynamic movement primitives: Volumetric obstacle avoidance". In: *2019 19th International Conference on Advanced Robotics, ICAR 2019*, pp. 234–239.

Ginesi, Michele, Daniele Meli*, Hirenkumar Nakawala, Andrea Roberti, and Paolo Fiorini (2019). "A knowledge-based framework for task automation in surgery". In: *2019 19th International Conference on Advanced Robotics, ICAR 2019*, pp. 37–42.

Simone, Filomena, Daniele Meli*, Gianluca Rizzello, David Naso, and Stefan Seelecke (2019). "Finite element modeling and simulation of a robotic finger actuated by Ni-Ti shape memory alloy wires". In: *Proceedings of SPIE - The International Society for Optical Engineering* 10968.