LUCA CASTRI

Embodied AI & Robotics Researcher | Intelligent Autonomy & Robot Learning

Researcher in Embodied AI with extensive experience deploying data-driven learning and reasoning frameworks on real-world mobile platforms. Expert in navigation, spatial HRI, and fleet coordination using ROS/ROS2. Proven track record in EU-funded research (DARKO), bridging the gap between theoretical AI models and robust physical deployment.

Nationality **Italian** Languages **Italian (native), English (fluent)** Rome, IT

lcastri.github.io lcastri lcastri lucacastri94@gmail.com +39 3341011284 List of Publications

ACADEMIC EXPERIENCE

Postdoctoral Research Associate

University of Lincoln (Partnered with JABAS AI)

Jul 2025 – Ongoing Lincoln, UK

- Designed multi-robot coordination algorithms on a heterogeneous fleet, optimizing path planning and collision avoidance in dynamic shared environments
- Developed a fleet management system dashboard for real-time monitoring, task allocation, and remote intervention of the robot fleet

Researcher Associate

University of Lincoln (EU H2020 DARKO Project)

Jul 2021 – Jul 2025 Lincoln, UK

- Pioneered Causal Inference frameworks to enhance robot decision-making in human-shared environment
- Bridged the Sim-to-Real gap by developing containerized (Docker) ROS/ROS2 software stacks on real mobile robots (TIAGo, RB-KAIROS+)
- Directed research and implementation of RL strategies for robot task planning

PROFESSIONAL EXPERIENCE

Industrial Automation Engineer

Metapack Engineering

Jan 2020 – Jun 2021 Rome, Italy

- Led the full-cycle deployment (design, testing, on-site commissioning) of automated pharmaceutical lines under strict production deadlines
- Designed and implemented real-time communication protocols (`TCP/IP`, `UDP`) integrating vision systems, motors, and PLCs

Embedded System Validation Engineer

Ferrari

Apr 2019 – Dec 2019 Maranello, Italy

- Validated safety-critical embedded software for ADAS and Airbag ECUs, ensuring compliance with strict automotive safety standards. Conducted HIL testing and analyzed CAN bus data for fault detection in real-time systems

EDUCATION

Ph.D. in AI and Robotics

University of Lincoln

Jul 2021 – Sept 2025 Lincoln, UK

- My research focused on exploiting causal inference to advance intelligent mobile robotics in dynamic interaction settings, enabling robots to improve prediction, decision-making, and overall autonomy in human-shared environments
- Thesis: "*Causal Inference for Intelligent Mobile Robots in Dynamic Interaction Settings*"
- Ph.D. Advisors: Nicola Bellotto and Marc Hanheide

M.Sc. in Control Engineering

La Sapienza, University of Rome

Oct 2016 – Jan 2019 Rome, Italy

- Thesis: "*Autonomous car driving systems: new control strategy*" – Advised by Antonio Carcaterra
- Final Mark: 110/110 (Italian grading system)
- Awarded with the **Honors Program ("Percorso d'Eccellenza")** for graduating in 2 years with high honors

B.Sc. in Information and Control Engineering

La Sapienza, University of Rome

Sep 2013 – Oct 2016 Rome, Italy

- Thesis: "*Modeling and Control of Robot KUKA LWR4+ in Simulink / VRML*" – Advised by Alessandro De Luca
- Final Mark: 101/110 (Italian grading system)

SKILLS

- **Languages:** `Python`, `C++`, `C`, `SQL`
- **AI & Robotics:** `Tensorflow`, `Keras`, `Scikit-learn`, `ROS`, `ROS2`, `Gazebo`, `pyBullet`
- **Robots & Sensors:** TIAGo, RB-KAIROS+, HUNTER 2.0, 3D LiDAR
- **DevOps & Tools:** `Docker`, `Git`, `GitHub Actions`, `CI/CD`

EVENT PARTICIPATION

- **Peer Reviewer:** IEEE ICRA, IEEE IROS, Knowledge-Based Systems, CLeaR
- Attended the Advanced Course on AI (ACAI 2021)

PUBLICATIONS

Journal Articles

- L. Castri, G. Beraldo and N. Bellotto. (2025), "Causality-enhanced Decision-Making for Autonomous Mobile Robots in Dynamic Environments," *Expert Systems with Applications*. Project Website
- L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2024), "CAnDOIT: Causal Discovery with Observational and Interventional Data from Time-Series," *Advanced Intelligent Systems*. GitHub repo

Conference and Workshops Proceedings

- A. Rudenko, Y. Zhu, T. Rodrigues de Almeida, T. Schreiter, L. Castri, N. Bellotto, T. Linder, N. Vaskevicius, L. Palmieri, M. Magnusson, A. J. Lilienthal. (2025), "Hierarchical System to Predict Human Motion and Intentions for Efficient and Safe Human-Robot Interaction in Industrial Environments," *German Robotics Conference (GRC)*.
- E. Stracca, A. Rudenko, L. Palmieri, P. Salaris, L. Castri, N. Mazzi, V. Rakcevic, N. Vaskevicius, T. Linder, N. Bellotto, T. Schreiter, Y. Zhu, M. Castellano-Quero, O. Napolitano, E. Stefanini, L. Heuer, M. Magnusson, A. Swikir and A. Lilienthal (2025)., "DARKO-Nav: Hierarchical Risk- and Context-aware Robot Navigation in Complex Intralogistic Environments," *European Robotics Forum (ERF)*.
- S. Mghames, L. Castri, M. Hanheide and N. Bellotto. (2024), "neuROSym: Deployment and Evaluation of a ROS-based Neuro-Symbolic Model for Human Motion Prediction," *IEEE International Conference on Cybernetics and Intelligent Systems (CIS) and IEEE Conference on Robotics, Automation and Mechatronics (RAM)*. GitHub repo
- L. Castri, G. Beraldo, S. Mghames, M. Hanheide and N. Bellotto. (2024), "Experimental Evaluation of ROS-Causal in Real-World Human-Robot Spatial Interaction Scenarios," *IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*. Project Website
- L. Castri, G. Beraldo, S. Mghames, M. Hanheide and N. Bellotto. (2024), "ROS-Causal: A ROS-based Causal Analysis Framework for Human-Robot Interaction Applications," *Causal-HRI Workshop, ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. Project Website
- L. Castri, S. Mghames and N. Bellotto. (2023), "Efficient Causal Discovery for Robotics Applications," *Italian Conference on Robotics and Intelligent Machines (I-RIM 3D)*.
- S. Mghames, L. Castri, M. Hanheide and N. Bellotto. (2023), "Qualitative Prediction of Multi-Agent Spatial Interactions," *IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*.
- S. Mghames, L. Castri, M. Hanheide and N. Bellotto. (2023), "A Neuro-Symbolic Approach for Enhanced Human Motion Prediction," *International Joint Conference on Neural Networks (IJCNN)*.
- L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2023), "Enhancing Causal Discovery from Robot Sensor Data in Dynamic Scenarios," *Conference on Causal Learning and Reasoning (CLeaR)*. GitHub repo
- L. Castri, S. Mghames and N. Bellotto. (2023), "From Continual Learning to Causal Discovery in Robotics," *AAAI Bridge Program "Continual Causality"*.
- L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2022), "Causal Discovery of Dynamic Models for Predicting Human Spatial Interactions," *International Conference on Social Robotics (ICSR)*.
- S. Ghidoni, M. Terreran, D. Evangelista, E. Menegatti, C. Eitzinger, E. Villagrossi, N. Pedrocchi, N. Castaman, M. Malecha, S. Mghames, L. Castri, M. Hanheide and N. Bellotto. (2022), "From Human Perception and Action Recognition to Causal Understanding of Human-Robot Interaction in Industrial Environments," *Convegno Nazionale CINI sull'Intelligenza Artificiale (Ital-IA)*.

INVITED TALKS

- **Causalflow: A Unified Framework for Causality in Time-Series**, **sktime Meetup Series** (Online), Jun 2025
- **Causal Inference for Intelligent Mobile Robots in Dynamic Interaction Settings**, **University of Oxford**, Jun 2025
- **Enhancing Human-Robot Spatial Interaction through Causal Inference**, **University of Padua**, Oct 2023
- Guest lectures on *Causal Discovery for Time-Series*, **University of Padua**, Nov (**2023**, **2024**, **2025**), Apr (**2024**)

OPEN-SOURCE CONTRIBUTIONS

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A unified framework for causality in time-series, with a suite of methods for causal discovery from both observational and interventional data.