LUCA CASTRI

PhD Student in
AI and Robotics
University of Lincoln, UK

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SUMMARY

I am a Robotic and AI scientist specialised in Causal Inference applied to Robotics. My research focuses 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.

Research interests: Causal Inference - Causal Robotics

SKILLS

Robotics & AI: ROS, Gazebo, Docker, Keras, Tensorflow, Scikit-learn

Computer Science: Python, C++, Java, SQL, JavaScript, HTML, LaTeX, git

Languages: Italian (native) - English (fluent)

ACADEMIC EXPERIENCE

Apr 2024 – Nov 2024 — **Causal Discovery for Time-Series Data** — **University of Padua**
- Lecture in the Artificial Intelligence course of the Computer Science program

Jan 2024- Jun 2024 — **MSc Student Supervisor** — **University of Lincoln**
- Thesis: "Learning hierarchical tasks for human-robot on-demand co-production"

Apr 2023 — **Causal Discovery** — **University of Padua**
- Lecture in the Artificial Intelligence course of the Computer Science program

Jan 2023 – Jul 2023 — **Team member of LCASTOR RoboCup team** — **University of Lincoln**
- 2023 RoboCup@Home Open Platform League – Responsible for the "Person Following" task
- Technical tools – libraries – sensors: `ROS, Docker, Python, C++` – Bayes People Tracker – Velodyne VLP-16

Oct 2021 – Jun 2022 — **Associate Demonstrator (Workshop assistant)** — **University of Lincoln**
- Advanced Artificial Intelligence (Autumn term)
- Autonomous and Mobile Robotics (Spring term)

PROFESSIONAL EXPERIENCE

Jan 2020 – Jun 2021 — **Software Specialist** — **Metapack Engineering**
- Designed, developed, and validated HMI and PLC systems
- Developed communication protocols (motors, cameras, printers, PLCs)
- Supported test and start-up procedures
- Acquired skills: Collaborative coding using `GitHub - Python - C++`
- Main fields: Food and beverages – Pharmaceutical

Apr 2019 – Dec 2019 — **Test Engineer** — **Ferrari (via Amaris)**
- Analysed logic and HMI requirements, legal constraints, and edge cases
- Contributed to ECU design and validation
- Key Areas: ADAS (ACC, Blind Spot Detection, Park Assist) – Event Data Record (AirBag) – Infotainment

EDUCATION

Jul 2021 - present — **PhD in AI and Robotics** — **University of Lincoln**
- Supervisors: Nicola Bellotto and Marc Hanheide
- Responsible for the "Causal Reasoning for Safe HRSI" task of the European H2020 DARKO project
- Research focuses on enhancing robot understanding of its surroundings through causal inference to improve autonomy in dynamic, human-populated environments
- Active participation in review and integration meetings
- Main research topics: Causality, Robotics, Human-Robot Spatial Interaction (HRSI)

Oct 2016 - Jan 2019 — **Master of Science – Control Engineering (Mark: 110/110)** — **La Sapienza University of Rome**
- Relevant modules: Robotics, Process Automation, Multivariable systems, Control system.
- Thesis: "*Autonomous car driving systems: new control strategy*" – Supervisors: Gianluca Pepe, Antonio Carcaterra

Sep 2013 - Oct 2016 — **Bachelor of Science – Information and Control Engineering (Mark: 101/110)** — **La Sapienza University of Rome**
- Relevant modules: Systems Theory, Automation, Telecommunications, Electronics.
- Thesis: "*Modeling and Control of Robot KUKA LWR4+ in Simulink / VRML*" – Supervisor: Alessandro De Luca

HONORS

Oct/2016 - Jan/2019 — **Percorso d'Eccellenza (Honors Program) - Master's Degree** — **La Sapienza University of Rome**
Graduated in 2 years with an average grade > 28/30

INVITED TALKS

Jun 2025 **Causal Inference for Intelligent Mobile Robots in Dynamic Interaction Settings**
Oxford Robotics Institute, University of Oxford

Oct 2023 **Enhancing Human-Robot Spatial Interaction through Causal Inference**
University of Padua

EVENTS PARTICIPATION

Conference Reviewer: *CLeaR - ICRA - IROS*

Workshop Reviewer: *ICRA Long-term Human Motion Prediction*

Attended courses: *Advanced Course on AI (ACAI2021)*

PUBLICATIONS

Causality-enhanced Decision-Making for Autonomous Mobile Robots in Dynamic Environments
L. Castri, G. Beraldo and N. Bellotto. (2025)
under-review
https://github.com/lcastri/PeopleFlow

Hierarchical System to Predict Human Motion and Intentions for Efficient and Safe Human-Robot Interaction in Industrial Environments
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)
German Robotics Conference (GRC)

DARKO-Nav: Hierarchical Risk- and Context-aware Robot Navigation in Complex Intralogistic Environments
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).
European Robotics Forum (ERF)

CAnDOIT: Causal Discovery with Observational and Interventional Data from Time-Series
L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2024)
Advanced Intelligent Systems
https://github.com/lcastri/causalflow

neuROSym: Deployment and Evaluation of a ROS-based Neuro-Symbolic Model for Human Motion Prediction
S. Mghames, **L. Castri**, M. Hanheide and N. Bellotto. (2024)
Proceedings of IEEE International Conference on Cybernetics and Intelligent Systems (CIS) and IEEE Conference on Robotics, Automation and Mechatronics (RAM)
https://github.com/sariahmghames/neuROSym

Experimental Evaluation of ROS-Causal in Real-World Human-Robot Spatial Interaction Scenarios
L. Castri, G. Beraldo, S. Mghames, M. Hanheide and N. Bellotto. (2024)
Proceedings of IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)
https://lcastri.github.io/roscausal

ROS-Causal: A ROS-based Causal Analysis Framework for Human-Robot Interaction Applications
L. Castri, G. Beraldo, S. Mghames, M. Hanheide and N. Bellotto. (2024)
Causal-HRI Workshop, ACM/IEEE International Conference on Human-Robot Interaction (HRI)
https://lcastri.github.io/roscausal

Efficient Causal Discovery for Robotics Applications
L. Castri, S. Mghames and N. Bellotto. (2023)
Proceedings of Italian Conference on Robotics and Intelligent Machines (I-RIM 3D)

Qualitative Prediction of Multi-Agent Spatial Interactions
S. Mghames, **L. Castri**, M. Hanheide and N. Bellotto. (2023)
Proceedings of IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)

A Neuro-Symbolic Approach for Enhanced Human Motion Prediction
S. Mghames, **L. Castri**, M. Hanheide and N. Bellotto. (2023)
Proceedings of International Joint Conference on Neural Networks (IJCNN).

Enhancing Causal Discovery from Robot Sensor Data in Dynamic Scenarios
L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2023)
Proceedings of Conference on Causal Learning and Reasoning (CLeaR)
https://github.com/lcastri/fpcmci

From Continual Learning to Causal Discovery in Robotics
L. Castri, S. Mghames and N. Bellotto. (2023)
AAAI Bridge Program "Continual Causality"

Causal Discovery of Dynamic Models for Predicting Human Spatial Interactions
L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2022)
Proceedings of International Conference on Social Robotics (ICSR)

From Human Perception and Action Recognition to Causal Understanding of Human-Robot Interaction in Industrial Environments
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)
Convegno Nazionale CINI sull'Intelligenza Artificiale (Ital-IA)