

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 Human-Robot Spatial Interaction (HRSI). My research focuses on enabling robots to learn the effects of their behaviours by observing how humans react to the robot's actions and enhancing the quality of the interaction by exploiting the acquired causal knowledge.

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, MATLAB & Simulink
Languages:	Italian (native) - English (fluent)

ACADEMIC EXPERIENCE

Jan/2024 - Jun/2024	MSc Student Supervisor • Thesis: "Learning hierarchical tasks for human-robot on-demand co-production"	University of Lincoln
Apr/2024 - Nov/2024	Causal Discovery for Time-Series Data • Lecture in the Artificial Intelligence course of the Computer Science program	University of Padua
Apr/2023	Causal Discovery • Lecture in the Artificial Intelligence course of the Computer Science program	University of Padua
Jan/2023 - Jul/2023	Team member of LCASTOR RoboCup team • Competition: 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	University of Lincoln
Oct/2021 - Jun/2022	Associate Demonstrator (Workshop assistant) • Advanced Artificial Intelligence (Autumn term) • Autonomous and Mobile Robotics (Spring term)	University of Lincoln

PROFESSIONAL EXPERIENCE

Jan/2020 - Jun/2021	Software Specialist • Analysis of logic and HMI requirements • HMI and PLC development • Developing communication protocols for HMI and machine devices (motor, camera, printer, PLC) • Follow test and start-up procedures • Acquired skills: Collaborative coding using GitHub – Python – C++ • Main fields: Food and beverages – Pharmaceutical	Metapack Engineering
Apr/2019 - Dec/2019	Test Engineer • Analysis of logic and HMI requirements, legislative constraints and corner cases • Creation of test cases for single ECU validation • Planning of test cases creation activities in order to meet deadlines related to software releases • Participation in the ECU design process • Key Areas: ADAS (ACC, Blind Spot Detection, Park Assist System) – Event Data Record (AirBag) – Infotainment	Ferrari (Amaris Consultant)

EDUCATION

Jul/2021 - present	PhD in AI and Robotics • Supervisors: Nicola Bellotto and Marc Hanheide • Responsible for the "Causal Reasoning for Safe HRSI" task of the European H2020 DARKO project • Research focuses on discovering the features and causal structure of HRSI scenarios, embedding the causal model into forecasting and decision-making frameworks to enhance HRSI • Active participation in review and integration meetings • Main research topics: Causality, Robotics, Human-Robot Spatial Interaction (HRSI)	University of Lincoln
Oct/2016 - Jan/2019	Master of Science – Control Engineering (Mark: 110/110) • Relevant modules: Robotics, Process Automation, Multivariable systems, Control system. • Thesis: "Autonomous car driving systems: new control strategy" – Supervisors: Gianluca Pepe, Antonio Carcaterra • Technical tools: MATLAB & Simulink, VRML, \LaTeX	La Sapienza University of Rome
Sep/2013 - Oct/2016	Bachelor of Science – Information and Control Engineering (Mark: 101/110) • Relevant modules: Systems Theory, Automation, Telecommunications, Electronics. • Thesis: "Modeling and Control of Robot KUKA LWR4+ in Simulink / VRML" – Supervisor: Alessandro De Luca • Technical tools: MATLAB & Simulink, VRML, \LaTeX	La Sapienza University of Rome

PUBLICATIONS AND TALKS

CAnDOIT: Causal Discovery with Observational and Interventional Data from Time-Series

L. Castri, S. Mghames, M. Hanheide and N. Bellotto. (2024)

<https://github.com/lcastri/causalflow>

Advanced Intelligent Systems

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)

<https://github.com/sariahmghames/neuROSym>

Proceedings of IEEE International Conference on Cybernetics and Intelligent Systems (CIS)
and *IEEE Conference on Robotics, Automation and Mechatronics (RAM)*.

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)

<https://lcastri.github.io/roscausal>

Proceedings of IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)

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)

<https://github.com/lcastri/roscausal>

Causal-HRI Workshop, ACM/IEEE International Conference on Human-Robot Interaction (HRI)

Enhancing Human-Robot Spatial Interaction through Causal Inference

Invited talk at the University of Padua (Oct 2023)

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)

<https://github.com/lcastri/fpcmci>

Proceedings of Conference on Causal Learning and Reasoning (CLear)

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)

EVENTS PARTICIPATION

Conference Reviewer: *CLear - ICRA - IROS*

Workshop Reviewer: *ICRA LHMP*

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