

Claudio Coppola

PhD in Robotics, Machine Learning Expert

London, UK

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Robotics AI researcher. Experienced in Robot Manipulation and Machine Learning.

Experience

Machine Learning Applied Scientist

Amazon

Jul 2022 – Present

London, UK

- Developed and deployed Deep Learning solutions for demand forecasting and Cost Estimation.
- Deployed Machine Learning solutions using the AWS cloud infrastructure.
- Led a product team in project scoping, data engineering, and software architecture design.

Scientific Advisor

Queen Mary University of London

Jul 2022 – Present

London, UK

- Collaborated on a teleoperation system having a VR headset and exoskeleton leader reconstructing object shape from tactile information of a multi-fingered robot manipulator follower.
- Collaborated on deep-learning model for haptic robot primitives segmentation and a controller reproducing multi-fingered robot demonstrations.
- Developed a machine-learning model for contact localisation and pressure estimation for a soft tactile sensor.

Postdoctoral Researcher

Queen Mary University of London

May 2019 – Jun 2022

London, UK

- Developed a *teleoperation platform* for a dexterous manipulator using the real-time robot middleware ROS tested on Mujoco simulations and a real robot.
- Developed a supervised Machine Learning system to segment robot grasp and manipulation skills from long-horizon robot demonstrations based on robot state and tactile perception.
- Developed a robust robot grasp exploration system based on Bayesian Optimization and contributed to the open-source library *scikit-optimize*.
- Published articles in multiple top-level robotics conferences.

Research Associate

University of Lincoln

May 2017 – May 2018

Lincoln, UK

- Developed state-of-the-art Machine Learning Ensemble for Human Activity Recognition and Re-identification systems for mobile assistive robots used in the EU H2020 research projects ENRICHME and FLOBOT.
- Conducted demonstrations for AI and Mobile Robotics courses.

Other Experiences

- **BrainStation** - *Instructor* - (Nov 2023 - Present):
Lead Instructor for the Data Science & Gen AI courses.
- **2Watch** - *Data Scientist Contractor* - (Jan - Dec 2020):
Developed an OCR system extracting information from gaming dashboards.
- **Entrepreneur First** - *LD11 Cohort Member* - (Oct 2018 – Jan 2019)
CTO in a startup ideation.
- **Buzzoole** - *Lead Data Scientist* - (May 2018 - Oct 2018)
Trained InceptionNet model and sequence-to-sequence models to support product development.
- **KPMG** - *Business Intelligence Consultant* - (Jan - Jun 2014):
Developed Data warehouse logic for business intelligence applications.

Education

PhD in Robotic Perception

University of Lincoln

Jul 2014 – Aug 2018

Lincoln, UK

- Developed a Machine Learning workflow for Human Social Activity Segmentation using real-world RGB-D data for assistive robotics.

MSc cum Laude in Computer Science Engineering

University Federico II of Napoli

Oct 2011 – Dec 2013

Napoli, Italy

- Top 5% Student
- Focus: Computer Vision, Machine Learning, Signal Processing.
- Thesis: *Iris Liveness detection for authentication systems based on Iris Recognition*

BSc in Computer Science Engineering

University Federico II of Napoli

Oct 2011 – Dec 2013

Napoli, Italy

- Top 5% Student
- Focus: Software Engineering, Artificial Intelligence, Control Theory.
- Thesis: *Algorithm and systems for voice recognition*.

Technical Skills

- **Machine Learning & AI** - Deep Learning, Bayesian Optimization, Ensemble Learning, Supervised/Unsupervised Learning, Reinforcement Learning.
- **Frameworks** - ROS, Pytorch, Scikit-learn, Lightning, Mujoco, Pandas, Streamlit, Docker, AWS, Kinect SDK2, OpenCV.
- **Methodological** - Robot Manipulation, Machine Learning, Time-Series Forecasting, Computer Vision, Mobile Robotics, Optimization, Scientific writing, Software Engineering.

Programming Skills

Proficient: Python, Matlab, SQL.

Experienced: C, C++, C#, Java

Certifications

- **Machine Learning** - *Stanford University on Coursera*
- **Deep Learning Specialization** *deeplearning.ai on Coursera*
- **Deep Reinforcement Learning Nanodegree** *Udacity*
- **Fundamentals of Reinforcement Learning** *University of Alberta on Coursera*
- **BMVA Computer Vision Summer School 2015** *Swansea University.*

Awards

- 2022 *PD Enrichment Awards* - [Alan Turing Institute](#)
- 2022 *AI-Net PostDoc Awards* - [DAAD](#)
- 2020 *Hult regionals winner* - [Hult Foundation](#)
- 2016 *Research Travel Award* - *Santander*
- 2016 *Research Travel Awards* - *EURAI*

Projects

ZeroShot Forecasting initiative

Amazon - Led a team to innovate the deployed forecasting models with zero-shot forecasting foundation models to replace the ad-hoc trained models in production.

- Performed research on zero-shot forecasting models based on meta-learning (e.g. N-beats, N-Hits) and LLM-based models (e.g. Chronos).
- Implemented experiments to compare the performance of zero-shot models with models in deployment for multiple businesses.
- Organised an internal hackathon to adopt the Chronos foundational forecasting model in existing business solutions.

Skill Segmentation for Long-Horizon Robot Task Learning

Queen Mary University of London - Developed methods to automatically segment robot dexterous manipulation skills from long-horizon demonstration videos enabling the learning of complex tasks.

- Designed and implemented features capturing robot proprioception and tactile data for skill segmentation.
- Built and compared machine learning models (Random Forests and Deep Learning) using scikit-learn and PyTorch for robust skill segmentation.
- Enabled robots to learn complex skills from long demonstrations, improving automation capabilities in manufacturing.
- Released a dataset of robot teleoperation data to facilitate further research in robot learning from demonstrations.

The early version of the approach used *Random Forests*, but in the recent formulation, it uses a custom Deep-Learning model. The data collected has been made available [here](#).

RoboPuppeteer: Dexterous robot teleoperation system

Queen Mary University of London - Developed a low-cost (£200) teleoperation system for an UR5 robot with Allegro hand, enabling real-time control with vision-based hand tracking and haptic feedback using a custom vibrotactile glove.

- Utilized ROS for system communication and implemented inverse kinematics for accurate robot pose control.
- Integrated a custom haptic glove for tactile feedback, enhancing user control during manipulation using Arduino.
- Validated finger mapping logic rigorous testing in Mujoco simulations and live robot demonstrations.

Source code & videos available [here](#).

Human Social Activity Recognition for assistive robotics

University of Lincoln - Developed a novel occlusion-resistant social activity detection and recognition system from long RGB-D videos.

- Developed a sequential Machine Learning model based on a multi-modal probabilistic mixture of learners for social activity recognition.
- Developed a continuously learning model that estimates spatio-temporal priors of human habits and uses them to improve activity classification performance.
- Created three public datasets for human social activity recognition combining RGB-D data and the pose of individuals.

The code of the algorithm is implemented in Matlab.

Other Projects

Details of other projects can be found [here](#)

Publications & Invited Talks

Invited Talks

- "How to Train your Robot: Teaching Robot Behaviour Using Teleoperation". Where Is My Robot Butler? - Future House *London, UK* 2024
- "Human Activity Recognition and Monitoring" Symposium of the British Machine Vision Association 2017 (BMVA), *London, UK*.
- Learning Human Actions: from Perception to Robot Learning, University of Leeds, UK
- Learning Human Actions: from Perception to Robot Learning, University of Lincoln, UK

Journals

- [1] Xompero, A., Donaher, S., Iashin, V., Palermo, F., Solak, G., Coppola, C., ... & Cavallaro, A. (2022). The CORSMAL benchmark for the prediction of the properties of containers. *IEEE Access*.
- [2] Siddiqui, M. S., Coppola, C., Solak, G., & Jamone, L. (2021). Grasp Stability Prediction for a Dexterous Robotic Hand Combining Depth Vision and Haptic Bayesian Exploration. *Frontiers in Robotics and AI*, 237.
- [3] Coppola, C., Cosar, S., Faria, D., & Bellotto, N. (2019). Social Activity Recognition on Continuous RGB-D Video Sequences. *International Journal of Social Robotics*, 1–15.

Conferences & Workshops

- [4] Giudici G., Bonzini Aramis A., Coppola C., Althoefer K., Farkhatdinov I. & Jamone L. (2024). "Leveraging Tactile Sensing to Render both Haptic Feedback and Virtual Reality 3D Object Reconstruction in Robotic Telemanipulation", **Submitted to** IEEE Robotics and Automation Letters
- [5] Mao X., Giudici G., Coppola C., ..., Zhibin Li & Lorenzo Jamone(2024). Segmenting long-horizon teleoperated robot manipulation demonstrations using multi-modal single-skill data for flexible robot learning. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024*
- [6] Dawood A. B., Coppola C. & Althoefer K. Learning Decoupled Multi-touch Force Estimation, Localization and Stretch for Soft Capacitive E-skin. *IEEE International Conference of Robotics and Automation (ICRA) 2023*
- [7] Coppola C., & Jamone L.(2022). Master of Puppets: Multi-modal Robot Activity Segmentation from Teleoperated Demonstrations. In *2022 IEEE Conference on Development and Learning (ICDL)*.
- [8] Coppola C., Solak G. & Jamone L.(2022). A portable and affordable system for the teleoperation of dexterous robotic hands using Leap Motion hand tracking and vibrotactile feedback. In *2022 31st IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*.
- [9] Zenha R., Denoun B., Coppola C. & Jamone L. (2021). Tactile Slip Detection in the Wild Leveraging Distributed Sensing of both Normal and Shear Forces. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021*
- [10] Xompero, A., Donaher, S., Iashin, V., Palermo, F., Solak, G., Coppola, C., ... & Cavallaro, A. (2021). Multi-modal estimation of the properties of containers and their content: survey and evaluation. *arXiv preprint arXiv:2107.12719*.
- [11] Siddiqui, M. S., Coppola, C., Solak, G., & Jamone, L. (2021, September). Discovering Stable Robot Grasps for Unknown Objects in Presence of Uncertainty Using Bayesian Models. In *Annual Conference Towards Autonomous Robotic Systems* (pp. 46-55). Springer
- [12] Iashin V. and Palermo F. and Solak G. and Coppola C. (2020). Filling Mass Estimation Using Multi-modal Observations of Human-robot Handovers. *CoRR*, abs/2012.01311.
- [13] Coppola, C., Cosar, S., Faria, D., & Bellotto, N. (2017). Automatic detection of human interactions from RGB-D data for social activity classification. In *2017 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)* (pp. 871-876).
- [14] Fernandez-Carmona, M., Cosar, S., Coppola, C., & Bellotto, N. (2017). Entropy-based abnormal activity detection fusing RGB-D and domestic sensors. In *2017 IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI)* (pp. 42-48).
- [15] Coppola, C., Faria, D., Nunes, U., & Bellotto, N. (2016). Social activity recognition based on probabilistic merging of skeleton features with proximity priors from RGB-D data. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021*.
- [16] Cosar, S., Coppola, C. & Bellotto, N. (2017). Volume-based Human Re-identification with RGB-D Cameras. In *VISIGRAPP (4: VISAPP)* .
- [17] Coppola, C., Krajník, T., Duckett, T., & Bellotto, N. (2016). Learning temporal context for activity recognition. In *European Conference on Artificial Intelligence (ECAI2016)*.
- [18] Coppola, C., Mozos, O., Bellotto, N.(2015). Applying a 3d qualitative trajectory calculus to human action recognition using depth cameras. In *IEEE/RSJ IROS Workshop on Assistance and Service Robotics in a Human Environment*.

Peer-Review Work

Actively contributed to the academic community through peer review for the following conferences and Journals on Robotic perception, Robot Learning and Machine Learning:

Conferences: IROS; ICRA; ICAR; ICDL; IJCNN; ROMAN;

Journals: Nature Machine Intelligence; Transaction of Robotics; Cognitive Systems Research; IEEE Transactions on Haptics; IEEE RA-L; MDPI Applied Sciences;