europass

Giulio Campagna

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Website: https://vbn.aau.dk/en/persons/153215 **Skype:** xaldinwow4e

LinkedIn: https://www.linkedin.com/in/giulio-campagna-7505881a4

Date of birth: 03/05/1995 **Nationality:** Italian

ABOUT ME

Born the 3rd of May 1995 in Siena, Italy.

Received **B.S. degree** in **Computer and Information Engineering** in 2018 from the **Univ ersity of Siena** with a **thesis** entitled "*Experimentation on Real Video of Systems for Object Detection*".

Received **M.S. degree** in **Computer and Automation Engineering - Robotics and Automation** in 2021 from the **University of Siena** with a **thesis** entitled "*Commanding Grasping Robot through Virtual Reality and Simulated Wrenches*".

Actually, **PhD fellow** at **Aalborg University** with the **research group Human Machine Interaction**.
The **actual research** is focused on **automatic trust assessment in human robot interaction** through machine learning techniques and sensorial data.

In **MIT**'s **report** of March **2018**, **Aalborg University** was considered to be the **fourth best university** in the **world** within **engineering**. This equated to a **first place** among universities in **Europe**.

WORK EXPERIENCE

[Current]

Ph.D. fellow in Human-Robot Interaction

Aalborg University - Technical Faculty of IT and Design

City: Aalborg

Country: Denmark

- Research projects (e.g. Automatic Trust Assessment in Human Robot Interaction)
- Research works in collaboration with other important universities (e.g. Southern Denmark University) and German Aerospace Center (DLR)
- Participation in workshops and conferences
- Dissemination and Press-Media
- Peer Reviewer
- Courses
- Teaching

Research Line: Human - Robot Interaction
Research Group: Human Machine Interaction | Aalborg U Robotics
Laboratory: Human Robot Interaction

[02/12/2020 – 31/03/2021]

Curricular internship: Robotics and Virtual Reality

University of Siena https://computer-automation.unisi.it/it

City: Siena
Country: Italy
Links: https://www.linkedin.com/in/giulio-campagna-7505881a4 | https://www.campagna-robotics.com/

The purpose of the study was to manipulate the object grasped in real world through the virtual reality.
The experimental setup included the following components:
- CyberGloveIII motion data glove
- IMU MPU 6050
- Leap Motion Controller
Using these devices, the user was able to control in real-time the avatar of the hand in the virtual environment. Moreover, when the user touched virtual items in the virtual world, the forces were provided through an haptic feedback device.
The KINOVA robot was teleoperated using position and rotation information of the virtual object.

The experiments were performed in SIRSLab laboratory at the University of Siena.

[04/2018 – 09/2018]

Curricular internship: Artificial Intelligence

University of Siena https://ing-informatica-informazione.unisi.it/it

Address: 53010, Siena, Italy
City: Siena
Country: Italy
- Object Detection Task.
Experimentation on real videos of systems for object detection.
The goal was to analyze videos of highways and detecting various vehicles (e.g. cars) using OpenCV library that is suitable for image manipulation, tracking and recognition of the objects.

EDUCATION AND TRAINING

[Current]

Ph.D. Fellow in Human-Robot Interaction

Aalborg University - Technical Faculty of IT and Design

Address: Rendsburggade 14, 9000, Aalborg, Denmark
Level in EQF: EQF level 8
◦ Research projects (e.g. Automatic Trust Assessment in Human Robot Interaction)
◦ Research works in collaboration with other important universities (e.g. Southern Denmark University) and German Aerospace Center (DLR)
◦ Participation in workshops and conferences
◦ Dissemination and Press-Media
◦ Peer Reviewer
◦ Courses

Research Line: Human - Robot Interaction
Research Group: Human Machine Interaction | Aalborg U Robotics
Laboratory: Human Robot Interaction

[30/09/2018 – 25/04/2021]

Master's Degree: Computer and Automation Engineering- Robotics and Automation

University of Siena - Department of Information Engineering and Mathematical Sciences https://computer-automation.unisi.it/it

Address: 56, Via Roma, San Niccolò, 53010, Siena, Italy

Final grade: 109/110 (missed 110 by 0.06 in terms of weighted average of marks) **Level in EQF:** EQF level 7

Thesis: Commanding Grasping Robot through Virtual Reality and Simulated Wrenches - The thesis is available on link

- Relevant Courses:
Human-Centered Robotics, Complex Dynamic Systems, Discrete Event Systems, Machine Learning, Sensors and Microsystems, Artificial Intelligence, Mathematical Methods for Engineering, Network Optimization, Data and Decision Analysis, Multivariable, Nonlinear and Robust Control

- Projects:
■ Control of Allegro Hand through the use of ROS (Robot Operating System) in Ubuntu 16.04 LTS environment.
■ A machine learning algorithm for Atari Breakout.
After the development of the famous game in Python, Machine Learning was used to predict the optimal moves to win the game.
■ Project: Love Dynamics through Complex Dynamic Systems
■ Project Decision Analysis: Cooperation Robots.
The task of the two robots was to transport an object from an initial position to a final position trying to avoid collisions with objects.
The purpose was to find optimal policy reducing the costs. (Dynamic Programming, Markov Process and Monte Carlo simulation)
■ Project Filtering Techniques : Network Agents.
Network of agents was connected with a ring structure and they exchanged information about their status with neighbors.
The purpose was to estimate these states using the Kalman Filter and Extended Kalman Filter.
■ Project Network Optimization : Lin Kernighan Algorithm

[31/08/2020 – 14/11/2020]

Erasmus Traineeship

Aarhus University (AU)

Address: Denmark

Field(s) of study: Robotics and Virtual Reality

Links: https://www.linkedin.com/in/giulio-campagna-7505881a4 | https://www.campagna-robotics.com/

The project concerned exploiting virtual reality in order to perform a teleoperation task in the real world.
The experimental setup included a subject wearing a virtual reality viewer (Oculus Rift), KINOVA robot and objects to be grasped and manipulated. Through the Unity3D software, a virtual environment was displayed in which the avatar of the subject's hand was reproduced. Using Oculus Rift, the human could see the virtual hand, the virtual objects and a sphere.
The virtual sphere, since it is more suitable for contact detection, was the container of the target object to grasp. As consequence, the contact points were considered between the virtual hand and the sphere. Moreover, the sphere and the object had same reference frame and mass.
The position and rotation of the hand were tracked through Optitrack Motive, an accurate and precise tracking software for objects and rigid bodies. The hand applied forces to the sphere which were perceived through haptic devices that provided a feedback of the generalized forces applied.
The wrench applied on the center of mass of the sphere was considered the same one applied on the real object.
The purpose was to replicate the grasping task in the real world controlling the end-effector through the pose of the virtual object.

[01/10/2019 – 31/03/2020]

Erasmus for Studies

Technische Universität München (TUM), Munich (Germany)

Address: Munich, Germany
Links: https://www.campagna-robotics.com/ | https://www.linkedin.com/in/giulio-campagna-7505881a4

- Courses:
■ Dynamic Human Robot Interaction
■ Project In Human-Centered Neuroengineering for Cybathlon
■ Advanced Robot Control and Learning

- Relevant Projects:
■ Developing of a shape-based grasping algorithm using an Eye Tracking Device and a EMG Myo Armband, ROS and YOLO Neural Network (Project In Human-Centered Neuroengineering for Cybathlon).
■ "Robothon Competition", consisting in detecting the type of garbage and then placing it in the right container with Franka Panda Robot. (Advanced Robot Control and Learning).

[2013 – 2018]

Bachelor's Degree: Computer and Information Engineering

University of Siena - Department of Information Engineering and Mathematical Sciences https://ing-informatica-informazione.unisi.it/it

Address: 56, Via Roma, San Niccolò, 53010, Siena, Italy
Level in EQF: EQF level 6
Thesis: Experimentation for real video of systems for Object Detection
Integration of the studies with the following courses: Robotics, Digital Control.
Relevant courses present in the educational plan were Control Systems and Dynamic Systems.

High School Graduation

Scientific-Technological High School, Tito Sarrocchi

Address: 53010, Siena, Italy
Final grade: 100/100 **Level in EQF:** EQF level 5

RESEARCH INFORMATION

Research

- **ORCID:** 0000-0002-2422-1663
- **RESEARCHID:** ADG-0240-2022

- **SOCIAL PROFILES:**

1. Personal Website
2. Aalborg University Profile
3. LinkedIn
4. ORCID
5. Google Scholar
6. ResearchGate
7. Loop
8. Publons
9. Academia
10. IEEE Collabratec

PUBLICATIONS

[2019]

Commanding Grasping Robot through Virtual Reality and Simulated Wrenches

Campagna, G. (2019). Commanding Grasping Robot through Virtual Reality and Simulated Wrenches.

PEER REVIEWING SCIENTIFIC ARTICLES

[2023] **A coaching Approach to define Emotional Intelligence for Robots**

IEEE International Conference on Robotics and Automation

ACTIVITY

[01/03/2022] **10th Annual Aalborg Robotics Workshop**

HONOURS AND AWARDS

[02/2022]

Qualification to the profession of Robotics and Automation Engineer in section A, Information Engineering sector, class LM-32

Awarding institution: University of Florence
Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_39cf3b8589a94aa382b4558df3a12cc9.pdf

[30/06/2022]

Registration of Master Thesis in Italian Database PubbliTesi for recognition of one among best thesis

Awarding institution: PubbliTesi
Link: https://www.linkedin.com/feed/update/urn:li:activity:6948250431697395712/

NETWORKS AND MEMBERSHIPS

[Current] **IDA (Ingeniørforeningen i Danmark)** Denmark

The Danish Society of Engineers, IDA is a professional body and trade union for technical and scientific professionals.

Link: https://ida.dk/

[23/02/2022 – Current] **IEEE MEMBERSHIP**

IEEE (**Institute of Electrical and Electronics Engineers**) is the world's largest technical professional organization dedicated to advancing technology for the benefit of humanity.

Link: https://www.ieee.org/

[23/02/2022 – Current] **IEEE ROBOTICS & AUTOMATION SOCIETY (RAS) MEMBERSHIP**

The **IEEE Robotics and Automation Society**'s objectives are scientific, literary and educational in character.

The Society strives for the advancement of the theory and practice of robotics and automation engineering and science and of the allied arts and sciences, and for the maintenance of high professional standards among its members, all in consonance with the Constitution and Bylaws of the IEEE and with special attention to such aims within the Field of Interest of the Society.

Link: https://www.ieee-ras.org/

[23/02/2022 – Current]

TECHNICAL COMMITTEE FOR HUMAN-ROBOT INTERACTION & COORDINATION

The **IEEE-RAS Technical Committee on Human-Robot Interaction and Coordination** aims at providing a framework for discussion for the variety of issues related to the development of robots intended to interact with human beings.

Link: https://www.ieee-ras.org/human-robot-interaction-coordination

LANGUAGE SKILLS

Mother tongue(s): Italian

Other language(s):

English

LISTENING B2 **READING** C1 **WRITING** B2

SPOKEN PRODUCTION B2 **SPOKEN INTERACTION** B2

French

LISTENING A1 **READING** A1 **WRITING** A1

SPOKEN PRODUCTION A1 **SPOKEN INTERACTION** A1

DIGITAL SKILLS

Tools & Technologies

Anaconda | EMG Myo Armband | 3D printing | Jupyter Notebook | SolidWorks | Linux and Windows operative systems | C# | Oculus Rift | Coppeliasim - Vrep | Xsens | CyberGlove | Arduino | MATLAB | Monte Carlo Simulation | Robot Operating System(ROS) | GitHub | Emotive Epoc+ – 14 channels EEG | Latex | Maestro Servo Controller Pololu | C and C++ | OpenCV | IMU | Python | YOLO | Unity3D | Leap Motion | Optitrack Motive

Generic Skills

Digital Mindset | Digital Awareness | Knowledge Networking | Virtual Communication | Digital Team Working

Other skills and Applications

Computer Vision | Machine Learning | Deep Learning | Dynamic Programming | Multivariable Nonlinear and Robust Control | Automation | Advanced Robot Control and Learning | Network Optimization | Object Detection | Extended Kalman Filtering | Kalman Filtering | Robotics Grasping | Robot Vision | Virtual Reality (VR) | Artificial Intelligence | Haptics | Data Analysis | Reinforcement Learning | Teleoperation | Human-Robot Interaction | Robotics | Tracking

ORGANISATIONAL SKILLS

Organisational skills

- Team management
- Goal setting
- Decision-making skills
- Problem solving skills
- Strategic thinking and planning

COMMUNICATION AND INTERPERSONAL SKILLS

Communication and interpersonal skills

- Active listening
- Conflict resolution
- Good communication skills

- Emotional intelligence

DRIVING LICENCE

Cars: B

CERTIFICATIONS

[23/02/2022 – Current] **IEEE MEMBERSHIP**

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_1e7facd0acf146e2951572f410d9ba2d.pdf

[23/02/2022 – Current] **IEEE ROBOTICS & AUTOMATION SOCIETY (RAS) MEMBERSHIP**

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_a72c41eb9bd245a7bce65e6a5604d20c.pdf

FIRST

FIRST - University of Cambridge, 10 08 2021, Certificate Number: B6014466 - European Level: B2

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_b7ef89cc2c9d4016ac1b52f5f42035f0.pdf

PET

PET - University of Cambridge, 01 05 2014, Certificate Number: 0044043424 - European Level: B1

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_db96ce0b8949475280806ce046801885.pdf

DELF A1

DELF - DELF, 26 11 2009 - European Level: A1

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_b0c55e801df345f7903d46b02269a3b4.pdf

ECDL CORE

ECDL CORE, AICA, 23-04-2010, N° IT 1526910

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_9975058b339a467c89d1134e5c705c34.pdf

ECDL ADVANCED AM4

ECDL ADVANCED MODULE AM4, AICA, 19-01-2012, N° ADV026100

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_32ffe3230edc479fa3a2003bf9e572c9.pdf

COURSE

Problem-Based Learning

Problem-Based Learning (PBL) is an instructional, learner centred approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_9f0a8f0b307942ddb6ca14233307850a.pdf

Academic Writing in English

Good Academic Writing is vital to the success of any academic who wants to further his or her career.

This course provides the skills to move forward confidently in English academic writing.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_74296c5533e249da9ac168e3b9df274c.pdf

Writing and Reviewing Scientific Papers

The aim is to improve the competence in writing and reviewing scientific papers.

The course takes a practical approach and focuses on the craftsmanship needed as a scientist.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_0ad760830eee4d728c7d721bb1f2f557.pdf

Management of Research and Development

The course provides insight in how to carry out R&D projects in an organizational context and how to manage own projects.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_733b2466c966484b9b6895c540e0fb4d.pdf

Applying the Danish Code of Conduct for Research Integrity to your Research

The course briefly introduces the principles of research integrity, dwell on the basic standards for conducting responsible research - from the planning phase to the dissemination of results, and also shortly introduces the current administration for misconducts.

The course is based on the Danish Code of Conduct for Research Integrity (Ministry of Higher Education and Science, 2014), that was accepted by all Danish Universities.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_6768b194139a455eb5d1d624c481d100.pdf

International Scientific Networking

- To learn that networking is important

- To learn how to get to know and how to get to be known

- To learn how to show interest and how to become interesting

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_3d11241b35664f1b8f14d9cb55a4e93b.pdf

Signal and Spectral Analysis extracting information from noisy data

- Signal modelling: Which models exist and what are their applicability and limitations?

- Spectral analysis: Why is signal analysis often performed as a function of frequency and how do you do it?

- Inference and parameter estimation: How do you estimate model parameters accurately and quantify how well you do?

KEYWORDS

Filtering, statistical signal processing, estimation theory, maximum likelihood, power spectral density estimation, modelling, least squares, autoregressive, nonnegative matrix factorizations, sparsity, periodic signals, Fourier analysis, line spectra.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_4cdfa6600eb54a7d992200e7a6b3be32.pdf

Deep Learning

- Machine learning fundamentals

- Deep learning concepts

- Deep learning methods including deep autoencoders, deep neural networks, long short-term memory recurrent neural networks, convolutional neural networks, and generative adversarial networks

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_8c2fd8c40d054f129506c4c059e295fa.pdf

Architecture of Machine Learning Systems

This course covers the architecture and essential concepts of modern Machine Learning systems.

These architectures include systems for data-parallel execution (e.g., Spark, Mahout, SystemML), Parameter Servers (e.g., TensorFlow, MXNet, PyTorch), Machine Learning lifecycle systems, and the integration of Machine Learning into database systems.

The covered topics focus primarily on a microscopic view of internal compilation, execution, and data management techniques, but also include a macroscopic view of entire Machine Learning pipelines.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_a2999cf1b607485baf3c06d5a6131e46.pdf

Data and Machine Learning Operations

The course covers central concepts, methods, techniques, and tools within DataOps and MLOps.

Topics include Data Augmentation, Labeling, Cleaning, Pre-processing, Quantifying the Data Quality, Lifecycle, machine learning model deployment, monitoring and maintenance (via updating with transfer learning OR retraining) in production, ensemble algorithms, and technical infrastructure.

Link: https://www.campagna-robotics.com/_files/ugd/1d4f1d_77f754ae9f3049dfb5350b148f939d96.pdf

PROJECTS

[15/01/2022 – 15/01/2025]

Automatic Assessment of Trust in Human-Robot Interaction

Trust has been shown to be a crucial factor in the efficient use of automation.

Trust in Human-Robot Interaction increases the level of complexity due to the physical embodiment of the robot that shares the same space of the operator.

Research in trust has so far been restricted to post-hoc measurements of whole interaction episodes. This is useful as an analytical tool to statically optimize the system design, but does not support trust adjustment during the interaction to ensure efficient task completion.

The project was developed to achieve three objectives: (i) identification of trust indicators in industrial Human-Robot Collaboration scenario, (ii) sensorial data collection and training of machine learning models for dynamic real-time trust prediction, (iii) adapting robot behavior according to the level of trust predicted and thus ensuring efficient use of the robotic system.

[05/2020 – 07/2020] **Cooperation Robots**

In a company, daily work activities are carried out through an interaction between robots and humans. In particular, two robots take care of transporting objects from one location to another, leaving humans with less mechanical tasks. The task of the two robots is, therefore, to transport an object from an initial position to a final position trying to avoid collisions with any objects and machinery in the company. Furthermore, in order to have correct grasping on the object so that it does not slide, the robots must stay at a desired distance.

Unfortunately, one of the two robots sometimes does not work properly and there are small deviations in the direction of movement. In particular, with probability 0.7 the robot maintains the desired direction, with probability 0.2 deviates to the left side and with probability 0.1 deviates to the right side.

To visualize better the situation, suppose there is a grid of hexagonal cells that represents the environment. Suppose that at the initial position we have the two robots that are distant one cell and between them there is the object. This is the desired setup that should be kept. At each time instant each robot can perform a move in six different directions since for each cell we have attached six other cells.

Cost function will consider not only the time steps that passes, but also time spent when there are collisions between robots and obstacles. In particular the cost function will take account also cost related to the distance between the robots. It should be remembered that if the malfunctioning robot collides against an obstacle, it will stay put for a time step (one second).

The goal is to determine an optimal policy so that the time required to complete the task is minimized.

Assume that we are in 2D dimensions.

For simplicity, suppose that the object cannot collide with obstacles and assume that the two robots can be on the same cell but this is not considered a collision.

Link: https://www.campagna-robotics.com/

[05/2020 – 07/2020] **Lin Kernighan Algorithm**

The traveling salesman problem (TSP) is one of the most widely studied problems in combinatorial optimization. Given a collection of cities and the cost of travel between each pair of them, the traveling salesman problem is to find the cheapest way of visiting all of the cities and returning to the starting point.

TSP may also be stated as the problem of finding a Hamiltonian cycle (tour) of minimum weight in an edge-weighted graph.

The Lin-Kernighan algorithm belongs to the class of so-called local search algorithms.

A local search algorithm starts at some location in the search space and subsequently moves from the present location to a neighboring location.

The algorithm is specified in exchanges that can convert one candidate solution into another.

Given a feasible TSP tour, the algorithm repeatedly performs exchanges that reduce the length of the current tour, until a tour is reached for which no exchange yields an improvement. This process may be repeated many times from initial tours generated in some randomized way.

The Lin-Kernighan algorithm (LK) performs so-called k-opt moves on tours. A k-opt move changes a tour by replacing k edges from the tour by k edges in such a way that a shorter tour is achieved.

Link: https://www.campagna-robotics.com/

[09/2019 – 04/2020] **Shape-Based Grasping Techniques with Eye Tracking Device**

The loss of one hand can significantly affect the level of autonomy and the capability of performing daily living, working and social activities. The current prosthetic solutions contribute in a poor way to overcome these problems due to limitations in the interfaces adopted for controlling the prosthesis and to the lack of force or tactile feedback, thus limiting hand grasping capabilities.

To address this problem, a system was developed to be used with a prosthetic hand. It consisted of an algorithm that allows an adaptive grasping based on the shape of the object. First of all, this system extracted the user's intention to grab an object through EMG signals (EMG Myo Armband device). In addition, the system was equipped with visual feedback through the use of an Eye Tracking Device and YOLO, a real-time object recognition algorithm. Finally, ROS was used as a framework to gather both EMG signals and visual feedback to guarantee suitable grasping.

Links: https://www.linkedin.com/in/giulio-campagna-7505881a4/ | https://www.campagna-robotics.com/

[02/2020 – 03/2020] **Robothon: Beach Clean Up Challenge**

The protection of the planet from pollution is one of the most pressing challenges.

Regarding this topic, cleaning up coastal lines is a very important and challenging task that has to be carried out manually by workers.

Thanks to the Technical University of Munich (TUM), I had the possibility to participate at Robothon competition whose subject was to implement a robotic platform to help cleaning the beaches.

The task was to autonomously sort various objects by first identifying the object, classifying where it belongs and finally placing it in the right container.

Links: https://www.linkedin.com/in/giulio-campagna-7505881a4/ | https://www.campagna-robotics.com/

[10/2018 – 02/2019] **Atari Breakout and Self-Supervised Learning**

A self-supervised algorithm applied to the famous game Atari Breakout.

Link: https://www.linkedin.com/in/giulio-campagna-7505881a4/