

PhD fellow in Sensor systems in soft robotics

IIT invites excellent candidates to apply to its PhD program organized in collaboration with the Open University; this international PhD program confers Doctorates in *Health, Sustainable and Human Technologies*.

In order to be admitted into the ARC program, the minimum requirements are

- i. a Masters-level degree, which broadly corresponds to a 4/5-year undergraduate MSc/MChem/Meng-style degree or to a postgraduate Masters in the British system, or to a second level University degree in Italy;
- ii. a grade corresponding to an upper second class (2.1) or a merit in the UK system or 100/110 in the Italian system. Candidates with lower grades but redeeming features (publications, specific expertise) are requested to contact the potential supervisors before applying;
- iii. where English is not the applicant's first language, a valid IELTS (International English Language Testing System) certificate. The minimum acceptable score is an overall 6.5, with no less than 6.0 in any of the four categories

One PhD fellow position **will be available from November 1st 2023** in the [Soft BioRobotics Perception research group](#) led by Dr. [Lucia Beccai](#).

Title of the project: 1. Distributed tactile sensing and proprioception for elephant-trunk inspired soft manipulators

Background: The elephant-trunk is an amazing organ that inspires the design and development of totally new versatile manipulators capable of both strong and delicate tasks in different environments, dry or wet. Currently, we are addressing the challenge to develop highly compliant, yet strong and reliable soft continuum grippers inspired from the trunk. In this endeavor sensing and perception are fundamental to enable the robots to both sense the outer world and to perceive their own movements in space. Tactile sensing is crucial for control in real-world scenarios; it needs to be distributed throughout the manipulator and operate while the robot performs large deformations in different directions. Moreover, tactile sensing is essential for skilled tasks (e.g., sorting of objects based on surface texture, object shape etc.), and interaction with humans and the environment. A variety of deformable sensing technologies are available today, but there is still a gap to develop distributed systems that: (i) can be fully integrated with the actuation strategy facilitating the robot movements; (ii) do not dramatically increase the complexity of the robot (with wiring and electronics); and (iii) are robust enough to cope with real and hostile environments keeping high deformability.

Description: The goal of this research is to develop: (i) distributed and deformable, yet tough tactile sensory systems integrated in a continuum trunk-like manipulator; (ii) proprioception in the continuum arm. The candidate will design, test and integrate the sensing systems in the robots. This research theme will be focused on solid developments on soft transducers embedded in actuated soft systems, and it will be based on recent studies of trunk biomechanics and skin. It will be also possible to collaborate with material scientists for the identification of the proper materials and tuning of ad-hoc technological processes.

Main Supervisor: [Lucia Beccai](#) ([Soft BioRobotics Perception](#))

Essential expertise:

- i. MSc degree in electrical or electronic engineering, nanotechnology, or equivalent
- ii. Engineering experience in the domain of soft robotics and soft sensing
- iii. Previous experience in tactile sensor and skin design
- iv. Previous experience in design and test of electronic systems for sensing signals' conditioning

Desirable expertise:

- i. Proved experience in CAD and FEM tools, in particular Comsol Multiphysics Previous knowledge of programming skills
- ii. Knowledge of main prototyping techniques with soft materials for sensing applications

iii. Previous experience in test of tactile soft sensors

How to apply. Prospective students must submit using the online form the following documents

- 1) 2-page CV, which includes studies, expertise and achievements.
- 2) 1-page research statement, which includes the choice of a project from the list above and a justification of the choice. Only if robustly justified, the student may signal their interest also for a second project, but there is no guarantee that this will be taken into account by the selection panel.
- 3) A transcript of undergraduate and postgraduate studies.
- 4) A valid IELTS certificate, obtained no more than two years before the proposed registration date.
- 5) Contact details of two referees.

Deadline for application: September 19th 2023

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Please note that the data that you provide will be used exclusively for the purpose of professional profiles' evaluation and selection, and in order to meet the requirements of Istituto Italiano di Tecnologia. Your data will be processed by Istituto Italiano di Tecnologia, based in Genoa, Via Morego 30, acting as Data Controller, in compliance with the rules on protection of personal data, including those related to data security.