

PhD fellow in Closed-loop high-resolution neuroelectronics

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 October 1st 2023** in the [Microtechnology for Neuroelectronics](#) research line led by Dr. [Luca Berdondini](#).

Title of the project: Development of implantable neuroelectronic sensing and actuating devices for closed-loop neuro-robotic prosthetics and electroceuticals

Background: Active dense implantable neural probes based on CMOS technology are an emerging neurotechnology that drastically enlarge the recording bandwidth of brain machine interfaces (BMIs). Current generations of these devices, however, miss the capacity to electrically stimulate neural activity. Implementing such bi-directionality in high-resolution neural interfacing devices, and developing closed-loop sensing and actuating systems would open innovative perspectives for neuroscience research and biomedical applications.

Description: The overall aim of this project is to develop a closed-loop neuroelectronic platform based on fully bi-directional active dense neural probes with hundreds to thousands of closely integrated electrode-pixels that can be flexibly configured for electrical recording and stimulation modalities. In tight collaboration with experienced researchers in CMOS circuit design, micro-/nano-structuring, neural data analysis and in-vivo electrophysiology, the student will realize and characterize a complete platform prototype and experimentally evaluate the neuromodulation efficacy of different open-/closed-loop electrical stimulation modalities.

External References:

[1] Angotzi GN, Boi F, Lecomte A, Miele E, Malerba M, Zucca S, Casile A, Berdondini L, SiNAPS: An implantable active pixel sensor CMOS-probe for simultaneous large-scale neural recordings, *Biosens Bioelectron.* 2019 Feb 1;126:355-364.

doi: 10.1016/j.bios.2018.10.032 .

[2] Boi F, Perentos N, Lecomte A, Schwesig G, Zordan S, Sirota A, Berdondini L, Angotzi GN, Multi-shanks SiNAPS Active Pixel Sensor CMOS probe: 1024 simultaneously recording channels for high-density intracortical brain mapping, *bioRxiv* 2019.

doi: doi.org/10.1101/749911.

Main Supervisor: [Luca Berdondini](#). ([Microtechnology for Neuroelectronics](#))

Essential expertise:

- i. MSc or equivalent degree in Electronic/Electrical Engineering, Bioengineering or in Physics.
- ii. Background in biophysics
- iii. Skills in programming with Matlab/Python/C++/C# or similar environments for data analysis
- iv. Experience in electronic hardware development

Desirable expertise:

- i. Background in neuroscience

- ii. Desirable expertise in FPGA programming
- iii. Background in biosensors and bioelectronics
- iv. Desirable expertise in neural data analysis

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.

For this position, ARC accepts candidatures on an ongoing basis (first-come, first-served).

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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.