

DC 3: Data-driven, adaptive, machine learning approaches for multispectral DOT.



Project Description: in recent years AI proved to be extremely successful in providing decision support within both the healthcare and biology sectors. Specifically in the context of medical images, new developments in the field of deep and reinforcement learning could bring further enhancements when applied to visible or near-infrared light (diffuse optical tomography DOT). This multidisciplinary project expects to cover multiple areas including the development of a hardware and software framework for data acquisition; developing a software for online data source management; research methodologies for information quantification in biological tissues; generate simulated data; research and develop deep-learning based strategies for image processing; research and design a data processing pipeline for applied AI. The candidate will collaborate with an international team and be exposed to the latest software development best practices and technologies.

Expected Results: Implementation and testing of strategies for image reconstruction on experimental data acquired with a system based on structured illumination and compress sensing. Devise an adaptive strategy using CS combined with deep-learning (aCS+DL) strategy for diffuse optical tomography aiming at reducing the amount of acquired data without information loss. Performance assessment and validation of the system will be carried out using dedicated phantoms mimicking the optical properties of biological tissues.

Requirements

- Have an internationally recognised Master-equivalent degree in fields of science or engineering related to optics or photonics. The degree must be completed by the start of the PhD.
- Advanced programming skills in commonly used languages (e.g. Matlab, Python, C/C++, R).
- Good knowledge of statistics, image processing, machine learning and deep learning.
- Familiar with software development tools and processes such as git, ssh, bash, sql, test-driven development.
- Ability to work both independently and in a team.
- Strong problem solving and reasoning skills
- English fluency* (Both written and oral). English fluency can be demonstrated by providing evidence of any of the following: TOEFL (CBT) – ≥ 210 ; TOEFL (iBT) – ≥ 78 ; TOEFL (PBT) – ≥ 547 ; TOEFL (ITP®) – ≥ 543 ; TOEIC – ≥ 720 ; IELTS – ≥ 6 ; Trinity College London – \geq ISE II.

*Exceptions for native speakers and applicants having completed a prior cycle of studies in English apply. [Click here to learn more about your specific requirements!](#)

Host Institution: DATRIX (Milan, Italy)

Supervisor: Dr. Matteo Bregonzio

Estimated gross allowance: 38,217 €/year

PhD awarding institution: POLIMI

Secondment 1

Partner: UEF
Supervisor: Prof. Tanja Tarvainen

Secondment 2

Partner: CNR
Supervisor: Dr. Andrea Farina

Secondment 3

Partner: UEF
Supervisor: Prof. Tanja Tarvainen

Planned Starting Date: 12/09/2023 or 01/11/2023 **Application Deadline:** 15/05/2023

Contact: matteo.bregonzio@datrixgroup.com