OPEN PHD POSITION ON COMPUTER-ASSISTED FOETAL SURGERY
Deep learning, simulation and augmented reality for surgical guidance

PROJECT

Foetal surgeries are among the most complex surgical interventions. The intrauterine environment poses important challenges in terms of limited range of motion and access to the surgical site, as well as extreme time constraints to limit the risk of the intervention. Recent advances in medical imaging techniques, artificial intelligence and augmented reality hold the promise for having a profound impact in how these surgeries are performed.

The student will work on: (1) the development of novel algorithms for the integration of multimodal medical imaging techniques such as MRI, US and endoscopic video feed to present the surgeon with an integrated view of the operating field inside the womb, (2) the creation of a 3D map of the target vessels from endoscopic view and their real-time localisation with respect to the anatomy of the mother and the current position of the surgical instruments (3) the improvement of our surgical navigation software targeted towards clinical use in classical and mixed reality visualizations. The student will use classical image analysis, registration and machine learning techniques as well as novel deep generative models and reinforcement learning approaches.

HOST INSTITUTION

The thesis will take place at the Department of Information and Communication Technologies of Universitat Pompeu Fabra (UPF) in Barcelona, Spain. According to The Times Higher Education ranking, UPF is the best university in Spain, globally and also particularly for engineering. The project will be carried out within the research unit BCN Medtech, with research interests in biomedical

engineering, medical image analysis, and computer-assisted surgical planning, simulation and navigation. The PhD will be supervised by ICREA Professor Miguel A. González Ballester and Dr. Mario Ceresa. The PhD will be performed in close collaboration with the Foetal and Perinatal Research Unit at Hospital Clinic in Barcelona. This unit, headed by Prof. Eduard Gratacós, is pioneer in foetal development research and in-utero surgical interventions. This PhD position is closely related to the Multimodality integrated imaging for foetal intervention (MIIFI) project, recently funded by the ATTRACT EU consortium.

REQUIREMENTS

The candidate should have an MEng/MSc degree in engineering, physics, mathematics, computer science or other relevant field, excellent computer programming skills (C++, python), and previous experience in medical image processing. Knowledge of VTK/ITK/MITK libraries and Keras/PyTorch will be highly valued). Fluency in English is required.

RELATED LINKS

https://attract-eu.com/selected-projects/miifi-multimodality-integrated-imaging-for-foetal-intervention/
https://www.upf.edu/web/doctorats/admissions
http://simbiosys.upf.edu

CONTACT

Please send your CV and any document of relevance to support your possible application to: ma.gonzalez@upf.edu and mario.ceresa@upf.edu

APPLICATION DEADLINE: 01 Sept 2019