2018-00859 - PhD position: Deep learning for low-dose CBCT reconstruction and registration

Level of qualifications required: Graduate degree or equivalent
Function: PhD Position

About the research centre or Inria department
Grenoble Rhône-Alpes Research Center groups together a few less than 800 people in 35 research teams and 9 research support departments.

Staff is localized on 5 campuses in Grenoble and Lyon, in close collaboration with labs, research and higher education institutions in Grenoble and Lyon, but also with the economic players in these areas.

Present in the fields of software, high-performance computing, Internet of things, image and data, but also simulation in oceanography and biology, it participates at the best level of international scientific achievements and collaborations in both Europe and the rest of the world.

Context

The Morpheo team is working on the capture and modelling of moving shapes using visual cues. Recent activities in the team are considering the combination of video cameras with X-ray imaging in order to enable combined surface and inside shape modelling. These activities build on the Kinovis platform that enables the simultaneous acquisition of colour and X-ray image sequences. The PhD proposal is part of this effort and funded by the Spine-PDCA research project that involves two medical imaging manufacturers (EOS Imaging, Surgivisio) and two hospitals (CHU Grenoble, APHP Paris). The main objective of the project is to design and produce a complete surgical platform system for pre-, peri-, and post-operative imaging and navigation in the context of minimally invasive surgery.

PhD Objectives
The overall objective of this PhD project is to investigate novel tools to perform a number of operations involving 2D (fluoroscopy) and 3D (CBCT) data in a challenging context. In particular, the project will be conducted under strict ALARA (As Low As Reasonable Achievable) radiation dose constraints, i.e. with a limited number of projections and potentially low signal-to-noise ratios.

The candidate will research methods to alleviate these issues by combining well-studied X-ray image formation models with deep learning approaches in order to reach the accuracy required by the surgeons for different tasks, e.g. 2D/3D registration of X-ray projection with CBCT data and CBCT reconstruction.

Informal inquiries can be addressed to edmond.boyer@inria.fr and julien.pansiot@inria.fr. Please upload your application, quoting the project Spine-PDCA, on the team website: https://team.inria.fr/morpheo/job-applications/

References

Assignment
The PhD candidate will carry research within Morpheo and in collaboration with the industrial and academic partners.

Main activities
The PhD candidate will perform some hands-on experiments, develop novel software, and write high-impact publications.

Skills
The PhD candidate should hold a master’s degree in computer science. Very good background in computer vision, 3D modelling, or medical imaging are expected. The candidate will be co-supervised by Edmond Boyer and Julien Pansiot at Inria Grenoble, France.

Benefits package
- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration
Gross income: 1982€ the 1st and 2nd year; 2085€ the 3rd year.