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

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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-, per-, 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@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.

General Information
- **Theme/Domain**: Vision, perception and multimedia interpretation
  
  Scientific computing (BAP E)
- **Town/city**: Montbonnot
- **Inria Center**: CRI Grenoble - Rhône-Alpes
- **Starting date**: 2018-10-01
- **Duration of contract**: 3 years
- **Deadline to apply**: 2018-09-15

Contacts
- **Inria Team**: MORPHEO
- **Recruiter**:
  
  Pansiot Julien / julien.pansiot@inria.fr

About Inria
Inria, the French National Institute for computer science and applied mathematics, promotes “scientific excellence for technology transfer and society”. Graduates from the world’s top universities, Inria’s 2,700 employees rise to the challenges of digital sciences. With its open, agile model, Inria is able to explore original approaches with its partners in industry and academia and provide an efficient response to the multidisciplinary and application challenges of the digital transformation. Inria is the source of many innovations that add value and create jobs.

Conditions for application

**Defence Security**: This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy**: As part of its diversity policy, all Inria positions are accessible to people with disabilities.

**Warning**: you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.