Laboratoire de Traitement de l'Information Médicale
Laboratory of Medical Information Processing

Internship:

Adolescent scoliosis treatment: towards a deep-learning based decision making

Keywords:
Medical Image Analysis, Applied Deep-Learning, Spine modelling, Automatic implant design

Born from the complementarity between the field of health and communication sciences, the LaTIM is a research lab which leads multidisciplinary research driven by scientists, engineers, and physicians from the University of Brest, IMT Atlantique, INSERM and the University Hospital of Brest. Medical information is at the heart of our research projects; being by nature multimodal, complex, heterogeneous, shared and distributed, it is integrated into methodological solutions and transferred into the clinical community with the sole aim of improving the medical benefit.

Interested to be involved in a research project combining computer vision and medicine?

Context

Adolescent idiopathic scoliosis (AIS), although stable in terms of incidence, remains of unknown etiology despite extensive research. Posterior vertebral arthrodesis is still the gold standard for correcting deformity and stabilizing the spine through bone fusion using metal rods fixed at several vertebral levels. Surgeons must therefore (1) manually bend the rods during surgery which is time-consuming and (2) decide which vertebral segments to include in the fusion remains complex and controversial.

The proposed internship will be carried out between the LaTIM and the pediatric orthopedic department of the University Hospital of Brest. The objective will be thus to develop algorithms allowing both the automatic design of patient-specific rods from orthogonal bi-planar radiographs and a deep-learning based optimal assistance concerning the choice of the levels to fuse in adolescent idiopathic scoliosis from the analysis of pre- and post-operative, clinical and radiographic databases.

This work will be thus divided into 3 steps.

1. Carry out a state of the art on both spine 3d modelling from radiographs and machine-learning based surgical decision for the level to fuse.
2. Develop an automatic rod design method based on 3D vertebrae models
3. Develop the deep-learning based approach allowing the determination of the optimal levels to use.
4. Validate approach on both synthetic data and in a realistic preclinical environment through the PLaTIMed platform (www.platimed.fr)

Profile

- 5th-year student in Computer Science, Computer Vision and/or Machine Learning.
- C++/Python programming skills and experience with 3D modelling and Image processing.
- Ability to deliver documented code and present results to the team.
- Ability to read scientific articles and extract relevant information.

Conditions

Start date: February / March 2025
Duration: 6 months, indemnities
Localization: LATIM – University Hospital of Brest – 2, avenue Foch – 29200 BREST – France
Supervisors: Dual scientific/clinical supervision: Guillaume DARDENNE (INSERM) / Arthur POIRI, surgeon, CHU of Brest
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