Postdoctoral position → 3D vision for arthroscopic surgery

MRI-to-video registration in orthopaedic surgery

AREAS & TIMC – GMCAO (CNRS / Université Grenoble Alpes)
Grenoble · Starting early 2027

🎓 The position

This postdoctoral position is part of a collaborative project on markerless navigation in arthroscopic surgery, funded by a Bpifrance "Pionniers de l'IA" grant. The project brings together AREAS, a Grenoble deep-tech company founded by orthopaedic surgeons, and the GMCAO team of the TIMC laboratory (CNRS/UGA), a pioneer in computer-assisted surgery. The position is co-supervised by both partners and based at the TIMC laboratory, within the GMCAO team, with regular exchanges with AREAS and visits to its offices.

🦵 The problem

Before ligament surgery, especially of the knee, an MRI is routinely performed, giving a detailed 3D view of the patient's joint. During surgery, the surgeon sees the joint only through the 2D video of the arthroscope. Bringing the two together means registering a 3D model onto a monocular video stream, in an environment that is anything but static: the femur and tibia move relative to each other as the knee flexes, soft tissue deforms, the joint is immersed in fluid, texture is sparse, and instruments keep occluding the view. Part of what the camera sees is non-rigid. Robust registration in that setting is still an open research question, and it is the question we'd like to work on with you.

🎯 What you'll do

- Develop 3D/3D registration between an MRI-derived 3D model and the 3D information recovered from the arthroscopic video.
- Extend it to 2D/3D registration of the 3D model directly onto the monocular arthroscopic video stream.
- Address the non-static, partly deformable nature of the scene, and evaluate the methods on unique real arthroscopic data.
- Contribute to the scientific direction of the project and to its publications.

✨ What you'll find here

- Joint supervision between industry and an academic lab.
- The chance to contribute to a first-of-its-kind medical device from its earliest research stages.

👩‍🔬 Who we're looking for

You hold, or are about to complete, a PhD in computer vision, 3D vision, medical image analysis, robotics or a related field. You have strong foundations in 3D geometry and camera models, hands-on experience with registration or pose estimation, and good Python skills. Experience with non-rigid or deformable registration, medical imaging (in particular MRI), 3D reconstruction from video, or endoscopic and surgical data is a plus.

🌱 The mindset that matters most

We are looking for a researcher who can take ownership of an open problem: autonomy, and the self-awareness to know what you don't know and to ask for help at the right time; openness to feedback; a critical eye on your own results, negative ones included; and the habit of treating a failed experiment as information.

Soft skills: good communicator, autonomous, proactive, with strong writing skills (good written English is essential).

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