Research internship (Master 2 / PFE) → CIFRE PhD

Monocular navigation in orthopaedic surgery

AREAS & TIMC – GMCAO (CNRS / Université Grenoble Alpes)
Grenoble · 6 months · Starting early 2027

🎓 The internship

This 6-month end-of-studies research internship is designed as **the first step toward a CIFRE PhD** on navigation in dynamic arthroscopic environments. It 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 internship 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

Most vision-based navigation methods assume the world stands still. Inside a knee during arthroscopy, almost nothing does. 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. Localising the arthroscope in real time from its monocular video, in such a non-static and semi-deformable environment, is still an open research question, and it is the question we'd like to work on with you.

🎯 What you'll do

- Evaluate existing monocular navigation approaches, designed for static and non-static scenes, on unique real arthroscopic data.
- Characterise where and why they break down in this setting.
- Identify the most promising research directions, which will shape the PhD that follows.

✨ What you'll find here

- A clear path to a CIFRE PhD, continuing the research started during the internship.
- 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're in the final year of an engineering school or a Master 2 in computer vision, robotics, applied mathematics or AI, and you genuinely want to do a PhD. You have solid foundations in computer vision (camera models, feature matching, multi-view geometry) and good Python skills. A course or project on visual odometry, 3D reconstruction or visual localisation, or exposure to deformable reconstruction or medical imaging, is a plus, but no prior expertise in navigation is required.

🌱 The mindset that matters most

What we care about above all is the mindset of a future researcher: 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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