**REAL-TIME SURGICAL ASSISTANT FOR DISSECTION GUIDANCE**

**Laboratory** : Team Epione, Inria Côte d'Azur

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**Short description**: Our project is to develop a real-time surgical assistant that leverages AI and augmented reality to provide precise dissection guidance, enhancing surgical accuracy.

**Detailed description**: Surgery has evolved from open surgery to minimally invasive and robot-assisted surgery. Today, cutting-edge technologies such as connected operating rooms, digital twins, AI, and augmented reality (AR) are revolutionizing surgical care. These innovations promise more precise surgery with anticipated post-operative results. Thanks to the massive acquisition of video data from operations, it is becoming possible to analyze interventions in distinct phases and gestures, carrying the potential to offer real-time interpretation and contextual feedback to the surgeon.

In parallel, advanced computer vision methods have shown impressive performance in object detection, segmentation, tracking, and action recognition, thanks to machine learning on vast databases. However, these models do not generalize well to surgical videos. More recently, foundation models have enjoyed great success in a variety of tasks, but the difference in distribution between Internet videos and surgical videos remains a challenge. This project aims to adapt Transformer-based methods and foundation models for surgical videos.

We aim to develop a surgical assistant providing real-time dissection advice via AR. Using AI to recognize anatomical structures, instruments, and phases of the procedure, our system will project a precise dissection plan onto the surgical field, functioning as a "GPS for surgeons". In particular, the system will :

- Track surgical instruments to ensure precise tissue interactions.
- Recognize and classify anatomical structures to guide dissection.
- Analyze surgical phases and provide contextual feedback.
- Project AR guidance for intuitive visual cues.

The ideal candidate will have skills in image processing and neural networks, master read, spoken and written English, and be adept at Python, TensorFlow, PyTorch, etc. This innovative project will offer direct interaction with the medical and surgical world, Inria Côte d'Azur, and start-up Caranx Medical. Presentations at conferences (medical and scientific) and scientific publications in peer-reviewed journals will be requested. Last but not least, the project may be combined with robotic development, with a view to future automatization of the surgical gesture.

Please send a detailed CV + motivation letter at these 5 e-mail addresses: francois.bremond@inria.fr ; nicholas.ayache@inria.fr ; herve.delingette@inria.fr ; frey.s@chu-nice.fr ; pierre.berthet-rayne@caranx-medical.com