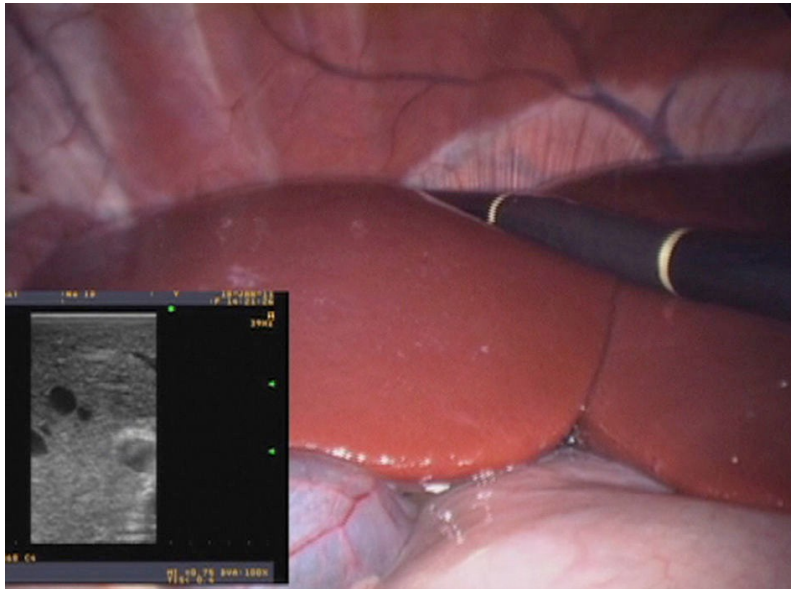


# Stage 2018 Project: Automatic Vessel Segmentation in Ultrasound Images using Deep Learning

Ultrasound (US) is a widely used, safe and relatively cheap imaging modality for diagnostic and therapeutic internal medicine. In the abdominal region US is used frequently for needle guidance in percutaneous surgery, and in laparoscopic surgery to help locate hidden structures including major vessels and tumours (figure 1). The main limitation of US is that the images can be difficult to interpret, have high signal to noise and its effectiveness is very operator dependent. An exciting new area of research is to develop deep learning systems for the automatic interpretation of US images [1,2,3]. This has the potential to be an important tool for computer-assisted surgery. A significant barrier for developing such systems is the need for a large amount of annotated training data. The main objectives of this project are twofold : firstly to develop an automated tool for providing vessel annotations for a large number of training images (e.g. hundreds of thousands of images), and secondly the training and comparison of state-of-the-art deep learning networks for automatic and real-time vessel segmentation. This is an excellent opportunity for a top student to become involved an exciting and growing research field and to gain important industrial experience within IRCAD's research and development team.



*Illustration 1: Ultrasound used in laparoscopic hepatic surgery*

- [1] Vessel Detection in Ultrasound Images Using Deep Convolutional Neural Networks, Smistad [Email](#) et al., DLMIA 2016
- [2] <http://www.cudl.ai/>
- [3] <https://www.kaggle.com/c/ultrasound-nerve-segmentation>

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**Rémunération :** 1100 € brut/mois - BAC+5/Master2

**Durée du stage :** 6 mois

**Date de début du stage :** Durant le 1er trimestre 2018

**Lieu du stage :** IRCAD - Strasbourg - Centre-ville

**Développement :**

Linux/Windows  
C++