Internship Subject: Does surgeons have individual kinematic behavior during robotic assisted surgeries?

Localization: Laboratoire Traitement du Signal et de l'Image (LTSI), MediCIS Team
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Context
We all have our own habits that depend on our past. For example, some people take a shower when they wake up, while others prefer to take a shower before going to sleep. Although all surgical procedures are unique because of the patient's anatomical characteristics, they do not escape to this rule because of the habits and experience of the surgical team. On previous study, we have demonstrated the existence of such preferences on the procedural aspect [1,2]. In these studies, we have highlighted sequence of activities specific to the level of experience and also specific to each surgeon individually.

The state of the art has demonstrated the existence of patterns on the movement of surgical instrument specific to the level of expertise [3]. However, at the best of our knowledge, it was not demonstrated at the individual level.

[1]   A. Huaulmé, S. Voros, L. Riffaud, G. Forestier, A. Moreau-Gaudry, and P. Jannin, "Distinguishing surgical behavior by sequential pattern discovery," *J. Biomed. Inform.*, vol. 67, pp. 34–41, May 2017.
[2]   A. Huaulmé, K. Harada, G. Forestier, M. Mitsuishi, and P. Jannin, "Sequential surgical signatures in micro-suturing task," *Int. J. Comput. Assist. Radiol. Surg.*, vol. 13, no. 9, pp. 1419–1428, May 2018.
[3]   G. Forestier *et al.*, "Surgical motion analysis using discriminative interpretable patterns," *Artif. Intell. Med.*, vol. 91, pp. 3–11, Nov. 2018.

Objective of the internship
The objective of this work is to studying the existence of expertise level and individual behavior on the motion of surgical instruments during robotic assisted hysterectomy. To achieve this goal, the internship will be divided into multiples steps:
- Help of the data extraction from the DV logger of the DaVinci robot;
- Develop a deep learning-based method to classifying surgery by individual surgeon;
- Study the explicability of the model implemented in order to identifying and understood specific behavior.

Profile researched
The candidate must have knowledge in deep learning, data analysis, and computer science.

Salary or allowance
Standard internship allowances