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Research Internship: Surgical Large Language Models for Robotic assisted Hysterectomies

Localization: Laboratoire Traitement du Signal et de l'Image (LTSI), MediCIS Team, Université de Rennes, Rennes, France
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Keywords: Surgical robotic; Deep Learning; Large Language Model.

Context

In recent years, there has been an unprecedented surge of interest and excitement surrounding Large Language Models (LLMs) in the field of artificial intelligence. LLMs have various applications, such as natural language understanding and content generation (used in chatbots like ChatGPT). They have also been applied in healthcare, where LLMs assist in diagnosing diseases, comprehending complex medical texts, and even predicting potential outbreaks by analyzing extensive healthcare data [1,2], as well as providing solutions for medical Visual Question Answering [3]

We aim to study the use of LLMs in the context of robotic-assisted hysterectomies for both surgical training and decision-making support. Through a collaboration with a prominent company specializing in surgical robots and the Obstetrical Surgery Department of Rennes University Hospital, we have gained access to a substantial and rare dataset comprising over 80 annotated hysterectomies. This dataset includes surgical videos, descriptions of the surgical workflow, and textual dataset.

Objective of the internship

The objective of this work is to train an LLM using this dataset to answer questions related to the surgical workflow, such as the following phases or the estimated remaining time. To accomplish this goal, the internship will be divided into four steps:

- Study the state of the art on LLM applied in medical and surgical field;
- Create the train database with other text modalities;
- Develop and train an LLM
- Performed a qualitative evaluation.

Profile researched

The candidate must have knowledge in deep learning, data analysis, computer science and programming (python).

Duration: 5 to 6 months

Salary or allowance: Standard internship allowances

[1] Singhal, K., Azizi, S., Tu, T. *et al.* Large language models encode clinical knowledge. *Nature* **620**, 172–180 (2023). https://doi.org/10.1038/s41586-023-06291-2
[2] Bombieri, M., Rospocher, M., Ponzetto, S.P. et al. Surgicberta: a pre-trained language model for procedural surgical language. Int J Data Sci Anal (2023). https://doi.org/10.1007/s41060-023-00433-5
[3] van Sonsbeek, T., Derakhshani, M.M., Najdenkoska, I., Snoek, C.G.M., Worring, M. (2023). Open-Ended Medical Visual Question Answering Through Prefix Tuning of Language Models. In: Greenspan, H., et al. Medical Image Computing and Computer Assisted Intervention – MICCAI 2023. MICCAI 2023. Lecture Notes in Computer Science, vol 14224. Springer, Cham. https://doi.org/10.1007/978-3-031-43904-9_70