Practical Issues in Machine Learning for Robotic Surgery

Artificial Intelligence (AI) has the potential to improve robotic surgery by creating systems that provide context-aware assistance, prevent surgical errors, and autonomously perform tedious or difficult tasks. However, machine learning typically requires large amounts of training data, which are difficult to obtain from clinical systems, leaving simulators and research platforms as possible data sources. The existence of shared research platforms, such as the da Vinci Research Kit (dVRK) and Raven II, raises the possibility of a community effort to share phantoms, protocols and data for machine learning. We present our experience using a dVRK to perform a hysterectomy procedure on a realistic hydrogel phantom. In addition, we present preliminary efforts to improve the realism and performance of soft-tissue simulators, which have the potential to significantly add to the corpus of training data. We are currently organizing a simulation-based surgical robotics challenge, with plans to host future challenges using actual dVRK and Raven systems.