

# Multi-platform Autonomous Surgical Robotics From Simulation Using Reinforcement Learning

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One of our lab's focuses is on autonomous surgical robotics. Our project aims to perform autonomous surgical tasks using Reinforcement Learning. These tasks could help surgeons by replacing menial repetitive tasks that need to be performed in surgery. The challenge in this area is the lack of a simulation, which can help us learn autonomous agents without relying on expensive physical hardware. Our lab focuses on building a simulation and learning autonomous agents that we then execute on the real robot, with a high success rate.

Our demo is in two parts, we can demo the simulation itself, letting users control the simulated surgical scene. This is an example of how our simulation can be used for surgeon training without the need for expensive physical hardware. The second part of our demo is the execution of these agents on the real robot. We support two systems, the da Vinci Surgical System as well as a Franka Panda Arm. Our robots can execute simple tasks such as rope cutting, block manipulation, etc. using completely vision-based Reinforcement Learning, meaning they only require a camera input, no tracking, and no calibration required. Our Franka Panda setup is part of a line of work where we place surgical tools on an industrial robot, making surgical robotics more accessible for researchers. If we get accepted, we would like to bring one of these demos and show our applied research on autonomous surgical robotics.