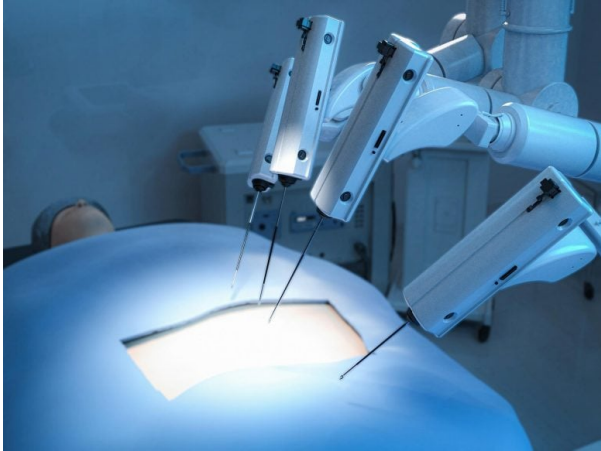


# Robot Operates With Human Level Skills After Watching Surgical Videos

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Courtesy of SynEvol  
Credit: Johns Hopkins University

By using a technique called imitation learning, the team from Stanford and Johns Hopkins Universities was able to teach the robot from a large collection of surgical footage without having to program every step. This strategy is a big step toward autonomous robotic surgery, which could improve operational precision and lower medical errors.

For the first time, a robot has learned to operate by viewing recordings of skilled surgeons, reaching a level of proficiency that is on par with that of human physicians.

Robots no longer need to be programmed with every single movement needed for a medical operation thanks to this advancement in imitation learning for surgical robots. Rather, by learning by doing, they can advance robotic surgery toward complete autonomy, which could eventually allow robots to do intricate procedures without assistance from humans.

According to Axel Krieger, the study's principal author, "having this model is truly magical. All we have to do is feed it camera input and it can predict the robotic movements needed for surgery." "We think this is a big step forward toward a new medical robotics frontier."

This week, the leading robotics and machine learning conference, the Conference on Robot Learning in Munich, is showcasing the research done by Johns Hopkins University.

The research team, which included collaborators from Stanford University, trained the da Vinci Surgical System robot in suturing, tissue lifting, and needle manipulation using imitation learning. Imitation learning and ChatGPT's sophisticated machine learning architecture are combined in this model. This robotic model uses kinematics, a mathematical language that converts robotic motion into exact angles and movements, as opposed to ChatGPT, which uses language.

Hundreds of films captured by wrist cameras mounted on the arms of da Vinci robots during surgery were incorporated into the model by the researchers. Surgeons from all over the world record these recordings, which are subsequently preserved after being used for post-operative analysis. With over 50,000 surgeons educated on the system and around 7,000 da Vinci robots in operation globally, a sizable data repository is created for robots to "imitate."

Despite its widespread use, academics claim that the da Vinci system is famously inaccurate. Nevertheless, the group managed to make the faulty input function. Training the model to execute relative movements instead of absolute actions—which are imprecise—was crucial.

According to principal author Ji Woong "Brian" Kim, "all we need is image input and then this AI system finds the right action." "We find that the model can learn the process and generalize to new environments it hasn't encountered even after a few hundred demos."

Three activities were taught to the robot by the team: suturing, lifting bodily tissue, and using a needle. In every instance, the robot that was trained using the team's model executed the same surgical techniques with the same level of proficiency as medical professionals.

Krieger remarked, "This model is really adept at learning things that we haven't taught it." It will automatically pick up the needle if it drops it and carry on. I didn't teach it how to do this.

According to the researchers, a robot might be swiftly trained to carry out any kind of surgery using the model. Now, the team is training a robot to carry out a complete surgery using imitation learning, rather than simply minor surgical procedures.

Prior to this development, every step of an operation had to be manually coded in order to program a robot to carry out even a basic task. According to Krieger, someone could try to imitate suturing for ten years. And that only applies to suturing for one kind of operation.

"It's really restrictive," Krieger remarked. "What's novel is that we can teach a robot to learn it in a few days by just collecting imitation learning of various techniques. It enables us to achieve more precise surgery, lower medical errors, and move closer to the goal of autonomy."

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