Medical Robotics

EDITORIAL

Artificial intelligence (AI) for minimally invasive robotics

Bogdan Maris*

Department of Computer Science, University of Verona, Strada Le Grazie 15, 37134 Verona, Italy

As we launch the first issue of the Artificial Intelligence (AI) for Minimally Invasive Robotics Special Issue journal, we are excited to bring together the latest research and insights from across the field of robotic surgery and AI. The integration of AI in minimally invasive procedures has the potential to revolutionize the field, improving surgical outcomes, reducing recovery times, and enhancing the overall patient experience.

With the rapid pace of technological advancements in AI, there are new opportunities for research and development in the field of minimally invasive robotics. AI is being used to enhance a wide range of medical procedures, from image analysis, segmentation, image registration and cancer targeting/scoring to motion planning and control, and real-time monitoring.[1,2] The use of AI in surgical navigation, simulation, and autonomous robotic systems is also growing, leading to more accurate and precise procedures.[3]

While the level of autonomy of robots in other fields (*e.g.* automotive, autonomous driving) is high, in the domain of minimally invasive procedures the growth of autonomy is slower and we envision it will be supported mostly by AI algorithms.[2,3]

In case of needle guidance robots (Figure 1), AI based algorithms can analyze real-time data from various sources such as imaging and sensor systems to enhance the accuracy and precision of needle placement, reducing the risk of complications and increasing the success rate of the procedure.[4] Additionally, AI algorithms can learn from previous procedures and adapt to new patient-specific conditions, enabling personalized and optimized needle placement.[5] The integration of AI algorithms can also enable the robots to make real-time decisions based on the analyzed data, optimizing the surgical outcome.[6]

Figure 1. PROST robot: A system based on AI for semi-autonomous minimally invasive prostate interventions (courtesy of Altair Laboratory, Department of Engineering for Innovation Medicine, Verona, Italy).

As we begin this journey of exploring AI for minimally invasive robotics, it is important to consider the potential benefits and challenges of this technology. While AI can improve surgical outcomes, it is important to ensure that it is used ethically, with a focus on patient safety and well-being.[7,8] It is also important to consider the potential impact of AI on the role of surgeons and other healthcare professionals, and to ensure that they are trained to work effectively through these technologies.[9]

The articles published in this journal will serve as a

***Corresponding Author:**
Bogdan Maris, Department of Computer Science, University of Verona, Strada Le Grazie 15, 37134 Verona, Italy. E-mail: bogdan.maris@univr.it. http://orcid.org/0000-0003-2771-3337

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valuable resource for researchers, engineers, and healthcare professionals working in minimally invasive surgery and robotics. Our aim is to foster collaboration and knowledge exchange, bringing together experts from academia, industry, and healthcare to advance the field of AI for minimally invasive robotics.

We invite contributions from researchers across the field of minimally invasive robotics, including original research articles, review articles, and technical notes. We encourage authors to share their insights and ideas on the latest developments and advancements in AI for minimally invasive robotics, and to consider the ethical and societal implications of these technologies.

In conclusion, we are excited to launch the AI for Minimally Invasive Robotics journal, and we look forward to publishing the latest research and insights from across the field. We hope that this journal will serve as a platform for collaboration and knowledge exchange, and we invite you to join us on this exciting journey.

DECLARATION

Conflicts of interest

The author declares no conflict of interest.

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