



## **ICIRA 2024 Special Session Proposal**

**Title of the Proposal: Advanced actuation and intelligent control in medical robotics**

### **Technical Outline of the Session and Topics:**

Robot-assisted medical service is becoming increasingly common for its advantages of greater stability, precision, and flexibility for complex procedures. However, in order to effectively employ and exploit medical robots, numerous technical challenges need to be addressed. Among these, actuators and controllers play a vital role. Smart materials-based actuators (piezoelectric, magnetic, magnetostrictive, electroactive polymers, magnetoactive polymers, shape memory alloys, magnetic shape memory alloys, thermally active materials, etc.) have been proven effective to handle with this issue in recent decades. Control methods considering environmental features of medical applications, such as complex unmodeled dynamics, physiological disturbances, high stability and security, etc., have been developed in recent years. However, several new challenges still exist which require innovative techniques and solutions. Optimal designs, accurate modelling, intelligent control strategies as well as performance maintenance in medical environments are not fully exploited for reliable applications.

The main objective of this special session is to bring together researchers from both academia and industry areas to present new techniques, technologies, results, principles and surveys for advanced actuation and intelligent control in medical robotics. The session provided an opportunity for researchers and practitioners to present their most recent accomplishments, challenges, advances in this area, and we also encourage future research directions in the field.

We invite authors to submit their original contributions of synthesizing advanced actuators and intelligent controllers into a variety of medical robot applications. Potential topics include, but are not limited to the following:

- Smart materials-based actuators in medical robotics
- Compliant actuators with variable stiffness in medical robotics
- MRI-guided actuators in medical robotics
- Nonlinearity compensation and control strategies in medical robotics
- Artificial intelligence-based control in medical robotics
- Vision-assisted control in medical robotics

### **Contact details of the Session Organizers**

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