



International Research Symposium on Advancements in Precision Healthcare Robotics and Assistive Technology



Organized by

**CoE of Telemedicine and Robotics
Gangwal School of Medical Science and Technology
IIT Kanpur, India**

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In recent years, healthcare robotics has emerged as a transformative force in medical technology, offering new possibilities for high precision surgery, individual patient care, and therapeutic interventions. This focused symposium seeks to address the challenges by disseminating the state of the arts in five specific channels: (a) Integration of cutting-edge smart materials, (b) Wearable Intelligent Devices and Flexible Electronics (c) Application of AI and Advanced Control (d) Bio-inspired metastructures and compliant mechanisms (e) Ambient Assisted Living Technology.

Smart Materials in Precision Healthcare Robotics

Smart materials are transforming the landscape of precision healthcare robotics by enabling devices that can dynamically adapt to their environment and respond to real-time stimuli. These materials, which include shape-memory alloys, piezoelectric materials, and electroactive polymers, offer unprecedented capabilities in enhancing the functionality and precision of medical robots.

Wearable Intelligent Devices using Flexible Electronics

Flexible electronics can be seamlessly embedded into medical robots to create devices that are both more adaptable and ergonomically efficient which is crucial for applications requiring intimate interaction with the human body, such as wearable health monitors or robotic surgical instruments. Their integration enables the creation of highly sensitive wearable biosensors that can detect minute physiological changes.

Application of AI and Advanced Control

Application of artificial intelligence (AI) is pushing the boundaries of healthcare robotics today. AI-driven control systems are capable of learning from vast amounts of data, optimizing robotic performance, and predicting patient outcomes with greater accuracy. Advanced control systems play a crucial role in telemedicine and remote surgeries. By utilizing high-bandwidth communication and robust control algorithms, it enable surgeons to perform procedures remotely with high precision.

Bio-inspired metastructures and compliant mechanisms

Metastructures, by engineering material micro-structure to possess properties not found in natural materials, have the potential to transform healthcare robotics in near future. The symposium will explore how meta-materials can be leveraged to enhance the performance of healthcare robots, including their impact on manipulation accuracy, sensory integration, and overall system resilience. Compliant Mechanisms, characterized by link flexibility and ability to adapt to dynamic environments, also play a crucial role in advancing robotic precision. The symposium will highlight recent innovations in compliant design, focusing on how these mechanisms can improve the dexterity, safety, and effectiveness of medical robots.

Ambient Assisted Living Technology

Ambient Assisted Living (AAL) technology refers to a set of systems and solutions designed to improve the quality of life for elderly or disabled individuals by integrating smart environments with personalized care. These technologies use sensors, IoT devices, and artificial intelligence to monitor health, ensure safety, and aid in daily tasks, allowing users to maintain independence in their own homes.

The event will feature a diverse array of presentations, including keynote addresses from leading experts, panel discussions on interdisciplinary challenges and opportunities, and technical sessions showcasing the latest research and developments. Attendees will gain insights into the practical applications of these technologies through real-world case studies and demonstrations, illustrating their impact on surgical practices, rehabilitation, and other healthcare settings.