

Research topics for graduate students for 2025

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Acceptable course(s)

- Master's Degree
- Doctoral Degree



Research Topics

The primary research topic is Biorobotics and Micro-nano Robotics. System integration using **MEMS** and **nanotechnology** is the base of our research. Under the design philosophy of the bionic approach, we create innovative systems and machines to understand the mechanisms of the living body, imitate its functions, and expand the capabilities of living things. Applications include minimally invasive surgery, regenerative medicine, intelligent robotics, and advanced measurement systems. Following are a few research topics.



1. Bio-inspired robotics: Systems inspired by living things

Biorobotics is the core of our research. The innovative robots will be applied in surgery and micro-assembly [1].

2. Micro-nano Robotics: System integration using micro-nanofabrication and MEMS devices

On-chip Robotics is one of our major research works originated from our lab. Robotics integrated with microfluidics provides innovation in biomedical science and engineering [2].

3. Bio-medical applications: Sensors & actuators for emerging functions and intelligence

The bionic humanoid is a patient simulator for surgical training and the evaluation of medical robotic systems. We have developed several Bionic humanoids integrated with sensors and actuators using MEMS technology [3].

Articles Related to Research Topics

- [1] H. Sugiura et al., Characterization of the variable stiffness actuator fabricated of SMA/SMP and MWCNT/IL: PDMS strain-sensitive heater electrode, *IEEE Robotics and Automation Letters*, (2022).
[DOI: 10.1109/LRA.2022.3194875], <https://ieeexplore.ieee.org/document/9844826>
- [2] N. Nitta et al., Intelligent Image-Activated Cell Sorting, *Cell*, (2018).
[DOI: <https://doi.org/10.1016/j.cell.2018.08.028>], <https://doi.org/10.1016/j.cell.2018.08.028>
- [3] Y. Taniguchi et al., A Force Measurement Platform for a Vitreoretinal Surgical Simulator, Using an Artificial Eye Module Integrated with a Quartz Crystal Resonator, *Microsystems & Nanoengineering*, (2022).
[DOI: <https://doi.org/10.1038/s41378-022-00417-8>], <https://www.nature.com/articles/s41378-022-00417-8>

Lab. Web page: <http://www.biorobotics.t.u-tokyo.ac.jp/index.html>