

## Research topics for graduate students for 2023

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Acceptable course(s)

- Master's Degree
- Doctoral Degree



#### Research Topics

The main topic of research is **Biorobotics** and **Micro-nano Robotics**. System integration using **MEMS** and **nanotechnology** is the base of our research. Under the design thought of bionic approach, we create the innovative systems and machines to know the mechanism of the living body, to imitate the function of the living things, and to expand the ability of the living things. Applications are, minimally invasive surgery, regenerative medicine, an intelligent robot, an advanced measurement system, etc. Following are a few research topics.



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

Biorobotics is core of our research. The innovative robots will be applied for surgery, micro-assembly [1], etc.

#### 2. Micro-nano robotics: System integration using micro-nano fabrication and MEMS devices

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

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

Bionic humanoid is a patient simulator for surgical training and 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>