

## Research topics for graduate students for 2023

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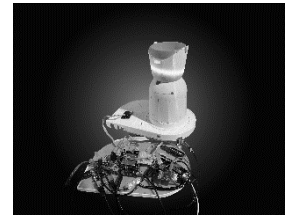
Acceptable course(s)

- Master's Degree
- Doctoral Degree



#### Research Topics

Our lab conducts research in the field of robotics for a sustainable and fair society. Our research activities take three main axes: human motion science, intelligent control, and life with robots. We welcome candidates with a diverse background interested in tackling contemporary and future issues, curious and who want to pioneer in robotics.



#### 1. Human motion science: motion analysis from ground force reaction

The way we interact with our environment through forces is rich in information. It contains information about movement, individuals and expressivity. This research projects builds on our past work [1,2] and will investigate further the richness of ground reaction forces.

#### 2. Intelligent control: Expressive inverse and direct optimal control

Enabling robots to use non-verbal communication could be paramount for applications where verbal communication is not possible. Inspired by humans we are developing expressive controllers [2]. Here we propose to use inverse and direct optimal control to control robots' expressive movements with a fast calculation method based on the latent space manipulation of deep learning methods.

#### 3. Living with robots: Slow technology and life-long robots

What about building a robot using sustainable materials and that you can keep your all life because it evolves and adapts with time? Using the concept of slow technology and renewable materials from biomass this project explores the possibilities to create machine intelligence for the super-long time interaction and design robots for a lifetime.

#### Articles Related to Research Topics

- [1] V. Hernandez, D. Kulic, G. Venture, Adversarial autoencoder for visualization and classification of human activity: application to Wii Balance Board, J. of Biomechanics, 2020.
- [2] S. Ishida, T. Harada, P. Carreno, D. Kulic, G. Venture, Human Motion Imitation using Optimal Control with Time - Varying Weights, Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems, 2021.
- [3] S. Capy, P. Osorio, S. Hagane, C. Aznar, D. Garcin, E. Coronado, D. Deuff and G. Venture, Yokobo: A Robot to Generate Links Between Users, Machines, Vol. 10, Issue 8, 2022.]

Lab. Web page: <http://www.gvlab.jp>