

# HISASHI ISHIDA

+1 667-910-2558 ◊ [hishida3@jhu.edu](mailto:hishida3@jhu.edu) ◊ [Personal website](#) ◊ [LinkedIn](#) ◊ [Youtube](#)

## EDUCATION

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**Johns Hopkins University, Baltimore, MD, USA** August 2021 - Present  
Ph.D. student in Computer Science advised by Dr. Peter Kazanzides and Dr. Russell H. Taylor

**Johns Hopkins University, Baltimore, MD, USA** August 2021 - May 2023  
Master of Science in Engineering, advised by Dr. Peter Kazanzides and Dr. Russell H. Taylor

**The University of Tokyo, Tokyo, Japan** April 2021 - August 2021  
Ph.D. student in Mechanical Engineering advised by Dr. Harada Kanako

**The University of Tokyo, Tokyo, Japan** April 2019 - March 2021  
Master of Science in Mechanical Engineering advised by Dr. Mamoru Mitsuishi

**Massachusetts Institute of Technology, Massachusetts, U.S.A.** February 2017 - May 2017  
Special Student Program, Mechanical Engineering

**The University of Tokyo, Tokyo, Japan** April 2015 - March 2019  
Bachelor of Science in Mechanical Engineering advised by Dr. Mamoru Mitsuishi

## PROJECTS

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**Digital Twin-based Assistance for Improving Situational Awareness for Skull-base Surgery.**  
Johns Hopkins University January 2023 - Present

- Developed digital twin pipeline, which accurately represents the real-world robot motion and the preoperatively CT in the simulation within the millimeter accuracy.
- Implemented SDF-based haptic feedback to avoid collision with critical structures.
- Demonstrated the system's feasibility and effectiveness through initial experiments using dental stone phantoms and cadaveric temporal bones.

**SDF-based Guidance Modalities for Mastoidectomy Procedures.**  
Johns Hopkins University January 2022 - May 2023

- Developed a multimodal navigation system for a mastoidectomy VR simulation to identify the effect of different modalities (visual, audio, and haptic) on performance and mental demands.
- Implemented visual, audio, and haptic feedback using Signed Distance Field (SDF).
- Evaluated system with expert otolaryngology surgeons and shown that the system improved procedural safety without no additional time or workload.

**Semi-autonomous Assistance for Telesurgery under Communication Loss.**  
Johns Hopkins University November 2021 - March 2023

- Proposed a telesurgery simulation framework that models an environment incorporating local and remote sites which can be applicable to provide high-quality surgery to medically underserved areas.
- Analyzed human behavior when there is a communication loss using the developed simulation and modeled the behavior using Kalman Filter.
- Provided different forms of assistance both under communication failure and when communication is restored.

**Combined Segmentation Method for Harmonic scalpel using ResUnet and Classifier.**  
Japan Society of Computer Aided Surgery AI Challenge September 2020 - November 2020

- Implemented semantic segmentation architecture (ResUnet) for the active blade of the harmonic scalpel and classification method for identifying the model of the scalpel.
- Adopted data augmentation methods to prevent over-fitting to dataset and improved accuracy to 90.6%.

## Virtual Fixture Assistance for Suturing in Robot-Aided Pediatric Endoscopic Surgery.

Master Thesis, the University of Tokyo

March 2021.

- Proposed guidance virtual fixtures to enhance the performance and the safety of suturing while generating the required task constraints using constrained optimization and Cartesian force feedback.
- Tested in simulations (CoppeliaSim) and experiments with a physical robot (DENSO VS050).

## PUBLICATION

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- **Hisashi Ishida\***, Deepa Galaiya, Nimesh Nagururu, Francis Creighton, Peter Kazanzides, Russell Taylor, Manish Sahu\*. “Beyond the Manual Touch: Situational-aware Force Control for Increased Safety in Robot-assisted Skullbase Surgery” Submitted to the 15th International Conference on Information Processing in Computer-Assisted Interventions (IPCAI). Under Review (\*equal contributions)
- **Hisashi Ishida\***, Manish Sahu\*, Adnan Munawar, Nimesh Nagururu, Deepa Galaiya, Peter Kazanzides, Francis X. Creighton, and Russell H. Taylor. “Haptic-Assisted Collaborative Robot Framework for Improved Situational Awareness in Skull Base Surgery” Submitted to 2024 IEEE International Conference on Robotics and Automation (ICRA). Under Review (\*equal contributions)
- **Hisashi Ishida\***, Juan Antonio Barragan\*, Adnan Munawar, Zhaoshuo Li, Peter Kazanzides, Danielle Trakimas, Francis X. Creighton, and Russell H. Taylor. “Improving Surgical Situational Awareness with Signed Distance Field: A Pilot Study in Virtual Reality” 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).(\*equal contributions)
- **Hisashi Ishida**, Adnan Munawar, Russell H. Taylor, Peter Kazanzides. “Semi-autonomous Assistance for Telesurgery under Communication Loss.” 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS).
- **Hisashi Ishida**, Murilo M. Marinho, Kanako Harada, Mamoru Mitsuishi. “Preliminary Study on Looping Trajectory Classification for Robot-assisted Suturing in Pediatric Endoscopic Surgery.” 16th Asian Conference on Computer Aided Surgery (ACCAS), Tokyo, Japan, November 2020. Excellent Paper Award.
- Risa Oikawa, Murilo M. Marinho, **Hisashi Ishida**, Kanako Harada, Mamoru Mitsuishi. “Towards the Semi-Automation of Looping in Robot Assisted Pediatric Endoscopic Surgery.” 16th Asian Conference on Computer Aided Surgery (ACCAS), Tokyo, Japan, November 2020.
- Murilo M. Marinho\*, **Hisashi Ishida\***, Kanako Harada, Kyoichi Deie, and Mamoru Mitsuishi. “Virtual Fixture Assistance for Suturing in Robot-Aided Pediatric Endoscopic Surgery.” IEEE Robotics and Automation Letters (RA-L), 5(2): 524–531, April 2020. Also presented at 2020 IEEE International Conference on Robotics and Automation (ICRA). (\*equal contributions)
- **Hisashi Ishida**, Murilo M. Marinho, Kanako Harada, Jian Gao, Mamoru Mitsuishi. “Virtual-Fixtures for Robotic-Assisted Bi-Manual Cutting Using Vector-Field Inequalities.” Proceedings of the 2020 IEEE/SICE International Symposium on System Integration (SII): 395-400, January 2020.
- **Hisashi Ishida**, Murilo M. Marinho, Kanako Harada, Mamoru Mitsuishi. “Virtual Fixtures for Suturing in Robot-Aided Pediatric Endoscopic Surgery.” Proceedings of the 14th Asian Conference on Computer Aided Surgery (ACCAS): 50-51, November 2018.

## AWARDS AND HONORS

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- **Honorable Mention** April 2022  
EN601.682 Machine Learning: Deep Learning course project Title: “Surgical Gesture Recognition in Videos and Kinematic Data.” Johns Hopkins University
- **Dean’s Award** March 2021  
Awarded as the top graduate from Mechanical Engineering department. The University of Tokyo.
- **Excellent Paper Award** November 2020  
16th Asian Conference on Computer Aided Surgery

- **Silver Award** November 2020  
Surgical tool segmentation competition. Japan Society of Computer Aided Surgery AI Challenge.
- **Silver Award and Audience Award** March 2019  
Sony-University of Tokyo Startup Idea Competition
- **Best Design Award** (Mechanical Engineering Practice Modules 2 Course), March 2018  
Department of Mechanical Engineering, The University of Tokyo

## SKILLS

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**Programming skills:** C++, C, Python, OpenGL, OpenMP, MATLAB

**Hardware:** Arduino, Raspberry Pi

**Robot system design:** ROS, URDF

**Simulation:** AMBF, Rviz, CoppeliaSim, Gazebo

**Deep learning framework:** PyTorch

## FELLOWSHIPS

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- **Ito Foundation fellowship** 2021 - 2023  
Awarded 2-year fellowship (\$50,000/year) for Ph.D. study in the US.
- **JSPS DC1 fellowship** 2021 - 2021  
Research fellowship(\$8,000 for research grant and \$2,000 for stipends) for young doctoral students from Japan Society for the Promotion of Science (JSPS).
- **Global Leader Program for Social Design and Management** 2019 - 2021  
Awarded monthly fellowship (\$2,000 for stipends) for graduate study, The University of Tokyo.
- **World-leading Innovative Graduate Study Program Co-Designing Future Society** 2019 - 2021  
Awarded monthly fellowship (\$2,000 for stipends) for graduate study, The University of Tokyo.