Dr. Jaeseok Kim
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SUMMARY

I am a researcher working on the area of service robotics. I have experienced with different robotic platforms such as **UR5**, **iCub**, **DoRo**, **Kinova Jaco arm, Care-O-bot 3,** and a **Universal robot** for different robotic applications especially cleaning and multi-object manipulation. I also experienced shared teleoperation of a vehicle. My key research interests are mobile manipulation, reinforcement learning, path planning, motion planning, teleoperation, learning from demonstration and deep learning.

EDUCATION

Scuola Superiore Sant'Anna,Italy Ph.D., The BioRobotics Institute **2014 - 2018**

Thesis: The development of the mobile manipulation tasks for the domestic environment (Supervisor Prof. Filippo Cavallo, Prof. Paolo Dario)

Korea University of Technology and Education, South Korea
M.A., Mechanical Engineering **Aug 14**

Thesis: Shared Teleoperation of a Vehicle with a Virtual Driving Interface (under Professor Jee-Hwan Ryu),

Thesis: Teleoperation of the Care-O-bot 3 with force feedback using the DLR-HMI (under Dr. Jordi Artigas Esclusa)

Korea University of Technology and Education, South Korea
B.A., Mechanical Engineering **Feb 11**

RESEARCH EXPERIENCES

Scuola Superiore Sant'Anna

Building person following robot in the hospital **Dec 22 – Present**

- Developing a structure for a person-following robot using mediapipe Pose and reinforcement learning. Specifically, we will implement this approach in PyBullet to transfer knowledge from a simulated environment to a real environment.

Building Parkinson diseases classification architecture with Transformer **Nov 22 – Present**

- Developing a classification system for Parkinson's disease using a combination of Transformer and Convolutional Neural Network (CNN) features to improve classification performance.

Built clothes classification architecture with Multiple Convolutional Neural Network (with MNIST-fashion dataset) **Nov 20 – Dec 22**

- Developed clothes classification using Multiple Convolutional Neural Network (MCNN) and compare the performance with state-of-the-art algorithm.

Built grasp detection architecture for grasping surgical instruments with Generative Grasping CNN **Jan 21 – Nov 22**

- Developed grasp detection algorithm with the structure of GG-CNN and vision transformer using our own surgical instruments dataset that expect increasing the performance the IOU evaluation

compared state-of-the-art algorithm.

Daily gesture recognition using vision and wearable systems **May 20 – Jun 21**

- Developed daily human gesture recognition using the fusion (vision and wearable) dataset. We built machine learning (Random Forest, K-Nearset, SVM) and deep learning (LSTM) architecture that could evaluate the performance of the dataset

Tactile-based object classification using deep learning. **Jun 20 – Mar 21**

- Improved the performance of Tactile-based object classification with data augmentation methods of time-series dataset and multiple neural network architectures MLP, LSTM, CNN, CNNLSTM, ConvLSTM, and deep CNN (D-CNN) were conducted for the evaluations the dataset.

Detecting and Grasping blood bags using Deep Learning and PCL approach. **Feb 19 – Dec 20**

- Developed *CORSA* (Congelamento Robotico sicuro di sacche di plasma) to detect blood bags using ***YOLOv3*** and find optimal grasp points for lift freezing blood bag using suction.

Building a new autonomous system for grasping, classifying, and inspecting surgical tools using Deep neural network **Feb 19 – Dec 20**

- Developed *CAPSULA* (Central Automated Process for Sterilization Units in a Lean Activity) to grasp and classify surgical tools (using GGCNN Algorithm). In addition, the development of new hybrid gripper design for grasping surgical and thin objects. Also, building new structure of neural network model for inspection of the surgical tools.

Applying the Deep Learning approach for Recycling Objects **Jul 18 – Jan 19**

- Integrated mobile manipulation task for detection, classification and grasping garbage in the domestic environment using mobile robot (simple mobile platform with UR5 arm).

Transfer learning for cleaning tasks using Learning from Demonstration and Deep neural network **Dec 17 – Jun 18**

- Developed Domestic Robot (**DoRo**) and **iCub** for cleaning a table using learning from demonstration and deep neural network (Generated a dataset with data augmentation and a virtual image from the camera image).

Learning from Demonstration and Deep neural network for Mobile Manipulation tasks **Jun 17 – Nov 17**

- Developed **iCub** for cleaning a table using learning from demonstration and deep neural network.

Reinforcement Learning for Mobile Manipulation **Oct 16 – May 17**

- Developed dexterous manipulation as opening a box using reinforcement learning.

Shared Autonomy System using Service Robot at SSSA **Nov 14 – Sep 16**

- Developed assistive mobile manipulation with three strategies using Domestic Robot (**DoRo**).

German Aerospace Center (DLR)

Service Robot Teleoperation at DLR **Oct 13 – Jun 14**

- Developed HMI based Telepresence Control of **Care-O-bot 3** over Internet.

Korea University of Technology and Education

Manipulator Teleoperation with Phantom Omni **Jul 13 – Oct 13**

- Developed Teleoperation with Schunk **LWA3** (7 DOF).

Shared Autonomy System for Vehicles Teleoperation **Jul 12 – Jun 13**

- Developed interaction between human and vehicle.

JOURNAL PUBLICATIONS

- **Kim, Jaeseok***, Olivia Nocentini*, Muhammad Zain Bashir, and Filippo Cavallo. "Grasping Complex-Shaped and Thin Objects Using a Generative Grasping Convolutional Neural Network."

Robotics 12, no. 2 (2023): 41.

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- Nocentini, Olivia*****, **Jaeseok Kim***, Muhammad Zain Bashir, and Filippo Cavallo. "Image Classification Using Multiple Convolutional Neural Networks on the Fashion-MNIST Dataset." *Sensors* 22, no. 23 (2022): 9544.

- Nocentini, Olivia, **Jaeseok Kim**, Zain Muhammad Bashir, and Filippo Cavallo. "Learning-based control approaches for service robots on cloth manipulation and dressing assistance: a comprehensive review." *Journal of NeuroEngineering and Rehabilitation* 19, no. 1 (2022): 1-25.

- **Kim, Jaeseok***, Anand Kumar Mishra*****, Lorenzo Radi, Muhammad Zain Bashir, Olivia Nocentini, and Filippo Cavallo. "SurgGrip: a compliant 3D printed gripper for vision-based grasping of surgical thin instruments." *Meccanica* (2022): 1-16.
- Maus, Philip*****, **Jaeseok Kim***, Olivia Nocentini, Muhammad Zain Bashir, and Filippo Cavallo. "The Impact of Data Augmentation on Tactile-Based Object Classification Using Deep Learning Approach." *IEEE Sensors Journal* 22, no. 14 (2022): 14574-14583.
- Muhammad Zain Bashir, **Kim, Jaeseok**, Olivia Nocentini, Filippo Cavallo, "Grasp Pose Estimation for Pick and Place of Frozen BloodBags based on Point Cloud processing and Deep Learning Strategies using Vacuum Grippers", *SN Applied Sciences*, 2022 (submission)
- Fiorini, Laura, Federica G. Cornacchia Loizzo, Alessandra Sorrentino, **Kim, Jaeseok**, Erika Rovini, Alessandro Di Nuovo, and Filippo Cavallo. "Daily gesture recognition during human-robot interaction combining vision and wearable systems." *IEEE Sensors Journal* 21, no. 20 (2021): 23568-23577.

CONFERENCE PUBLICATIONS

- **Kim, Jaeseok**, Nino Cauli, Pedro Vicente, Bruno Damas, Alexandre Bernardino, JoséSantos-Victor and Filippo Cavallo, "Cleaning tasks knowledge transfer between heterogeneous robots: a deep learning approach." In IROS workshop on Open-Ended Learning for Object Perception and Grasping: Current Successes and Future Challenges, 2019 (IROS 2019).

- **Kim, Jaeseok**, Nino Cauli, Pedro Vicente, Bruno Damas, Alexandre Bernardino, JoséSantos-Victor and Filippo Cavallo, "Cleaning tasks knowledge transfer between heterogeneous robots: a deep learning approach." In IROS workshop on Open-Ended Learning for Object Perception and Grasping: Current Successes and Future Challenges, 2019 (IROS 2019).

- **Kim, Jaeseok**, Olivia Nocentini, Marco Scafuro, Raffaele Limosani, Alessandro Manzi, Paolo Dario, Filippo Cavallo "An Innovative Automated Robotic System based on Deep Learning approach for Recycling Objects." In: 16th International Conference on Informatics in Control, Automation and Robotics (ICINCO 2019).

- **Kim, Jaeseok**, Raffaele Limosani, and Filippo Cavallo. "Integration of an Autonomous System with Human-in-the-Loop for Grasping an Unreachable Object in the Domestic Environment." In *ICINCO (2)*, pp. 306-315. 2019.

- Nino Cauli, Pedro Vicente, **Kim, Jaeseok**, Bruno Damas, Filippo Cavallo, and José Santos-Victor, "Autonomous table-cleaning from kinesthetic demonstrations using deep learning." In: Joint IEEE International Conference on Development and Learning (ICDL) and Epigenetic Robotics (EpiRob), IEEE (2018).

- **Kim, Jaeseok**, Nino Cauli, Pedro Vicente, Bruno Damas, Filippo Cavallo, and José Santos-Victor. “iCub, clean the table!” A robot learning from demonstration approach using Deep Neural Networks." The 18th IEEE International Conference on Autonomous Robot Systems and Competitions, ICARSC 2018 (**Best paper in ICARSC 2018**).

- **Kim, JaeSeok**, and JeeHwan Ryu. "Shared teleoperation of a vehicle with a virtual driving interface." In *2013 13th International Conference on Control, Automation and Systems (ICCAS 2013)*, pp. 851-857. IEEE, 2013.

WORKSHOPS & SUMMER SCHOOLS

DISC Summer School, “a Systems and Control Perspective in Human-Robot Interaction”, Centerparcs Zandvoort, the Netherlands (June 2016).

TECHNICAL SKILLS

Modeling and analysis: SolidWorks
Programming: C, C++, Python, Pytorch, Caffe, ROS, MATLAB, Simulink, OpenCV, PCL, AVR Studio. Gazebo, Pybullet

TEACHING SKILLS

ROS introduction, at the BioRobotics Institute / Scuola Superiore Sant'Anna, Italy (2019).

C Programing, at the Mechanical Engineering department / Korea University of Technology and Education, South Korea (2011).

SCHOLARSHIPS & AWARDS

Korea University of Technology and Education
- Scholarship to Excellent for grades/score – Full Tuitions Received. 2009 - 2010
- Award fourth prize in **Autonomous Vehicle Competition** (by HYUNDAI-KIA MOTORS)

Scuola Superiore Sant’Anna
- Research Grant Scholarship for Ph.D. 2014-2018
- Erasmus program for period abroad 2016
- Best paper award in **ICRASC 2018** 2018
- TERRINet project fund for period abroad 2020

REFERENCES

- Professor Filippo Cavallo, Associate Professor, Department of Industrial Engineering, University of Florence. Email: filippo.cavallo@unifi.it
- Professor Paolo Dario, full professor, The BioRobotics Institute, Scuola Superiore Sant'Anna. Email: paolo.dario@santannapisa.it
- Professor José Santos-Victor, full professor, Institute for Systems and Robotics (ISR/IST), LARSyS, Instituto Superior Técnico, Univ Lisboa. Email: jasv@isr.tecnico.ulisboa.pt
- Professor Jee-Hwan Ryu, Associate Professor, Department of Civil and Environmental Engineering, KAIST, Email: jhryu@kaist.ac.kr