

DAEHYUNG PARK

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US Permanent resident

CURRENT POSITION

Postdoctoral Associate, Massachusetts Institute of Technology April 2018-Present
Computer Science and Artificial Intelligence Laboratory (CSAIL), Prof. Nicholas Roy

- Developing an inverse constraint learning algorithm, which enables robots to learn task constraints from a demonstration
- Developing semantic knowledge estimation algorithms to carry out language instructions in human-robot team scenarios, working in close collaboration with roboticists in the Robotics Collaborative Technology Alliance (RCTA) program
- Managing projects from RCTA, Lockheed Martin Co., Toyota Research Institute, etc.
- Helping with writing research proposals such as DARPA's Machine Common Sense (MCS)

EDUCATION

Ph.D. in Robotics, the School of Interactive Computing 2012-2018
Georgia Institute of Technology, Atlanta, Georgia
Thesis: "A Multimodal Execution Monitor for Assistive Robots"
Committee Members:

- Dr. Charles C. Kemp, Dept. of Biomedical Engineering, Georgia Tech (Advisor)
- Dr. Byron Boots, School of Interactive Computing, Georgia Tech
- Dr. Sonia Chernova, School of Interactive Computing, Georgia Tech
- Dr. James M. Rehg, School of Interactive Computing, Georgia Tech
- Dr. Randy Trumbower, Harvard Medical School, Harvard University

M.S. in Computer Science, Concentration in Computer Science Intelligent Robotics (CSIR) May 2008
University of Southern California, Los Angeles, California
Research: "Movement reproduction and obstacle avoidance with dynamic movement primitives and potential fields"
Advisor: Prof. Stefan Schaal

B.E. in Systems Science, Concentration in Systems Science and Applied Informatics March 2006
Osaka University, Osaka, Japan
Thesis: "Dynamic Turning Control for A Humanoid Robot HRP-2"
Advisor: Prof. Tatsuo Arai

RESEARCH EXPERIENCE

Graduate Research Assistant, Georgia Tech 2012- 2018
Institute for Robotics and Intelligent Machines, Dr. Charles C. Kemp

- Developed a multimodal execution monitoring system that is capable of detecting and classifying subtle/complex anomalies by modeling multimodal sensory signals via hidden Markov models and deep neural networks. Using this system, we have shown that robots can intelligently recover from potential anomalies during robotic manipulation tasks
- Developed a robot-assisted feeding system using a general-purpose mobile manipulator. We have extensively evaluated various end-user groups, including people with motor impairments.
- Developed a haptically-guided system in which a manipulator reaches into clutter with whole-arm tactile sensing
- Resulted in 15 publications in AURO, RA-L, ICRA, IROS, etc. and collaborated with Prof. Wendy Rogers at UIUC

- Research Engineer**, Samsung Electronics, Suwon, Republic of Korea 2008-2012
 Mechatronics R&D Center
- Developed and deployed industrial articulated manipulators and SCARA robots for assembly and transfer tasks
 - Developed planning and control algorithms as well as user applications for Samsung Robot Controller (SRC)
 - Resulted in 4 patents in USA and Korea
- Graduate Research Assistant**, University of Southern California 2007-2008
 Department of Computer Science, Dr. Stefan Schaal
- Researched dynamic movement primitives for online obstacle avoidance
 - Developed 3-DoF manipulation for a DSC System (joint project with Jet Propulsion Laboratory)
 - Resulted in 3 publications in ICRA, Humanoids, and AMAM
- Research Assistant**, Osaka University Spring 2006
 Department of System Innovation, Dr. Koh Hosoda
- Researched a linear control system of pneumatic muscles for a humanoid robot
- Research Assistant**, Osaka University 2005-2006
 Department of Systems Science, Dr. Tatsuo Arai
- Developed a dynamic turning control method for a humanoid robot, HRP-2
 - Resulted in an undergraduate thesis and was funded through Japanese and Korean government-sponsored scholarship

SCHOLARSHIPS & AWARDS

- IEEE Student Travel Grant, IEEE Robotics & Automation Society September 2014
 Academic Achievement Award (for student over 3.9/4.0 GPA), University of Southern California May 2008
 Government-sponsored full scholarship by Japanese and Korean governments 2001-2006

TEACHING EXPERIENCE

- Guest Lecturer**, College of Information & Communication Engineering at Sungkyunkwan Univ. Oct. 2018
 Course: IT Technology Seminar for 130 graduate students
- Invited to teach one lecture to graduate-level audience
- Graduate Teaching Assistant**, Georgia Tech 2015,2016
 Course: Deep Learning (CS8803DL)
- Collaborated with Dr. Zsolt Kira on developing course materials and assignments
 - Taught labs and graded assignments for 50 students
 - Developed new course curriculum
- Guest Lecturer**, Robot Winter School at the 3rd Korean Open Society for Robotics (KOS-Robot) 2015
 Course: Manipulation - Fundamentals of Manipulation System
- Invited to teach one lecture to undergraduate and Master-level audience
 - Developed and delivered 1 hour lecture for audience of 150
- Graduate Teaching Assistant**, University of Southern California 2008
 Course: Robotics (CSCI545)
- Collaborated with a faculty member on teaching labs
 - Graded assignments and exams for 50 students

MENTORING EXPERIENCE

Student Mentor, Georgia Tech

2013-2018

Guided undergraduate and Master students who have conducted research in Dr. Kemp's Lab, Georgia Tech

- Michael Park, Master in Electrical and Computer Engineering, Fall 2017 – MS course in Georgia Tech
- Yuuna Hoshi, Undergraduate in College of Computing, 2017 to 2018
- Hokeun Kim, Undergraduate in College of Computing, 2016 to 2018
- Chansu Kim, Undergraduate in Biomedical Engineering, Spring 2016
- You-Keun Kim, Undergraduate in Biomedical Engineering, 2013 to 2016 – MS course in Johns Hopkins Univ.
- Zackory Erickson, Undergraduate from University of Wisconsin-La Crosse, Summer 2015 – Ph.D course in Georgia Tech
- Hyder Hasnain, Undergraduate in Biomedical Engineering, 2015

PRESENTATIONS

Presentations:

- “Learning for Human-Centered Robotic Manipulation,” *Int'l Workshop on Intelligent Robot Teammates for Complex Missions in Unstructured Environments IIT Delhi*, 2020
- “Learning for Human-Centered Robotic Manipulation,” *KAIST*, 2019
- “Assistive Manipulation: A Multimodal Execution Monitor,” IT Tech. Seminar, *Sungkyunkwan University*, 2018
- “Assistive Manipulation: How to Provide Safe Assistance,” *Dankook University*, 2018
- “A Multimodal Execution Monitor for Assistive Robots,” *Korea University*, 2018
- “A Multimodal Execution Monitor for Assistive Robots,” *Distributed Robotics Laboratory MIT*, 2018
- “A Multimodal Execution Monitor for Assistive Robots,” *Robust Robotics Group MIT*, 2018
- “Multimodal Execution Monitoring for Assistive Robots,” *Hyundai Global Top Talent Forum*, 2017

PROFESSIONAL SERVICE & OUTREACH

Interview & Media

- Generation Robot, *Mouser.com*, USA March 2018
- IEEE Spectrum's Video Friday Sept. 2017
- Documentary for robotics and artificial intelligence, *SBS*, South Korea May 2014

Reviewing Service

- Workshops
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2014-2016
 - IEEE International Workshop on Advanced Robotics and its Social Impacts (ARSO)* 2017
- Conferences
 - IEEE International Conference on Automation Science and Engineering (CASE)* 2019
 - IEEE/RSJ International Conference on Humanoid Robots (Humanoids)* 2016
 - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2016,2018
 - IEEE International Conference on Robotics and Automation (ICRA)* 2008-2020
 - IEEE International Conference on Ubiquitous Robots (UR)* 2018
 - IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)* 2015-2019
 - Conference on Robot Learning (CoRL)* 2018
 - The International Symposium on Robotics Research (ISRR)* 2019
- Journals
 - Autonomous Robots (AURO)* 2017,2019
 - Journal of Intelligent and Robotic Systems* 2015
 - IEEE Transactions on Industrial Informatics* 2017-2018
 - International Journal of Robotics and Research (IJRR)* 2018-2020

Exhibition

- Mini soccer system for “Eco-Be! League,” *Robocup*, Japan May 2006

PROFESSIONAL AFFILIATIONS

Member, IEEE Robotics and Automation Society

2014-Present

SKILLS

Robot Tech: Experience: Installation of industrial robots in various factories
Techniques: Vision, Servo Tuning, and Use of diverse sensor devices
Software: Program Language – Python, C, C++, Java
Deep Learning Library – Keras, PyTorch, Tensorflow
Tool - ROS, MATLAB, Github, CVS
Multilingual: Korean (native), Japanese (fluency), and English (fluency)

LEADERSHIP & VOLUNTEERING

Representative, Korean Researchers in Robotics/Vision, Georgia Tech 2013-2016
Volunteer Interpreter, Suwon Hwaseong Tourist Guide, Suwon, South Korea August 2011-December 2011
Volunteer, International Conference on Robotics and Automation 2008, Pasadena, California May 2008
Department Representative, Korean Student Association, Osaka University Spring 2006

PUBLICATIONS

Journal Articles:

- [5] **D. Park***, **J. Arkin***, S. Roy, M. R. Walter, N. Roy, T. M. Howard, and R. Paul. "Multi-Modal Estimation and Communication of Latent Semantic Knowledge for Robust Execution of Robot Instructions," *The International Journal of Robotics Research* (IF: 6.134), 2020 (*- **authors contributed equally**) [Accepted]
- [4] **D. Park**, Y. Hoshi, H. P. Mahajan, H. Kim, Z. Erickson, W. A. Rogers, and C. C. Kemp. "Active Robot-Assisted Feeding with a General-Purpose Mobile Manipulator: Design, Evaluation, and Lessons Learned," *Robotics and Autonomous Systems* (IF: 2.928), 2019
- [3] A. Kapusta, P. Grice, H. Clever, Y. Chitalia, **D. Park**, and Charles C. Kemp. "A System for Bedside Assistance that Integrates a Robotic Bed and a Mobile Manipulator," *PLOS One* (IF: 2.78), 2019
- [2] **D. Park**, Y. Hoshi, and C. C. Kemp. "A Multimodal Anomaly Detector for Robot-Assisted Feeding Using LSTM-based Variational Autoencoder," *IEEE Robotics and Automation Letters (RA-L)*, 2018. [Presentation at *IEEE ICRA 2018*]
- [1] **D. Park**, H. Kim, and C. C. Kemp. "Multimodal Anomaly Detection for Assistive Robots," *Autonomous Robots* (IF: 3.634), 2018.

Conference Articles:

- [14] **D. Park**, M. Noseworthy, R. Paul, S. Roy, and N. Roy, "Inferring Task Goals and Constraints using Bayesian Nonparametric Inverse Reinforcement Learning," *Conference on Robot Learning (CoRL2019)* [**Oral Presentation, 5% Oral Acceptance Rate**]
- [13] M. Noseworthy, R. Paul, S. Roy, **D. Park**, and N. Roy, "Task-Conditioned Variational Autoencoders for Learning Movement Primitives," *Conference on Robot Learning (CoRL2019)* [27.6% Acceptance Rate]
- [12] S. Roy, M. Noseworthy, R. Paul, **D. Park** and N. Roy. "Leveraging Past References for Robust Language Grounding", *Conference on Computational Natural Language Learning (CoNLL 2019)*
- [11] D. Nyga, S. Roy, R. Paul, **D. Park**, M. Pomarlan, M. Beetz, and N. Roy. "Grounding Robot Plans from Natural Language Instructions with Incomplete World Knowledge", *Conference on Robot Learning (CoRL2018)* [31% Acceptance Rate]
- [10] J. Arkin, R. Paul, **D. Park**, S. Roy, N. Roy and T. M. Howard. "Real-Time Human-Robot Communication for Manipulation Tasks in Partially Observed Environments", *International Symposium on Experimental Robotics (ISER2018)*
- [9] H. M. Clever, A. Kapusta, **D. Park**, Z. Erickson, Y. Chitalia, and C. C. Kemp. "3D Human Pose Estimation on a Configurable Bed from a Pressure Image", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2018)*.

- [8] **D. Park**, H. Kim, Y. Hoshi, Z. Erickson, A. Kapusta, and C. C. Kemp. "A Multimodal Execution Monitor with Anomaly Classification for Robot-Assisted Feeding", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2017)*.
- [7] **D. Park**, Z. Erickson, T. Bhattacharjee, and C. Kemp. "Multimodal Execution Monitoring for Anomaly Detection During Robot Manipulation," *IEEE International Conference on Robotics and Automation (ICRA2016)*.
- [6] T. Bhattacharjee, A. A. Sheno, **D. Park**, J. Rehg, and C. Kemp. "Combining Tactile Sensing and Vision for Rapid Haptic Mapping," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2015)*.
- [5] A. Kapusta, **D. Park**, and C. Kemp, "Task-Centric Selection of Robot and Environment Initial Configurations to Perform Assistive Tasks," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2015)*.
- [4] **D. Park**, A. Kapusta, J. Hawke, and C. Kemp. "Interleaving Planning and Control for Efficient Haptically-guided Reaching in Unknown Environments," *IEEE-RAS International Conference on Humanoid Robots (Humanoids 2014)*.
- [3] **D. Park**, A. Kapusta, Y. Kim, J. Rehg, and C. Kemp. "Learning to Reach into the Unknown: Selecting Initial Conditions When Reaching in Clutter," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS2014)*.
- [2] H. Hoffmann, P. Pastor, **D. Park**, and S. Schaal. "Biologically-inspired dynamical systems for movement generation: Automatic real-time goal adaptation and obstacle avoidance," *IEEE International Conference on Robotics and Automation*, 2009.
- [1] **D. Park**, H. Hoffmann, P. Pastor, and S. Schaal. "Movement reproduction and obstacle avoidance with dynamic movement primitives and potential fields," *IEEE-RAS International Conference on Humanoid Robots*, 2008. [**Oral presentation**]

Workshop Papers, Abstracts, Posters:

- [7] **D. Park**, M. Noseworthy, R. Paul, S. Roy, and N. Roy, "Joint Goal and Constraint Inference using Bayesian Nonparametric Inverse Reinforcement Learning," The 4th Multidisciplinary Conference on Reinforcement Learning and Decision Making, 2019
- [6] **D. Park**, Y. Hoshi, H. Kim, H. P. Mahajan, W. Rogers, and C. C. Kemp, "Active Feeding System using a General-purpose Manipulator," *IEEE International Symposium on Medical Robotics (ISMR)*, 2018
- [5] **D. Park** and C. C. Kemp, "Multimodal Execution Monitoring for Robot-Assisted Feeding," *TechSage State of the Science Conference*, 2017
- [4] A. Kapusta, Y. Chitalia, **D. Park**, and C. C. Kemp. "Collaboration Between a Robotic Bed and a Mobile Manipulator May Improve Physical Assistance for People with Disabilities," *IEEE ROMAN workshop on Behavior, Adaptation and Learning for Assistive Robotics" (BAILAR)*, 2016
- [3] **D. Park**, Y. Kim, Z. Erickson, and C. C. Kemp. "Towards Assistive Feeding with a General-Purpose Mobile Manipulator", *ICRA2016 workshop on Human-Robot Interfaces for Enhanced Physical Interactions*, 2016
- [2] **T. Bhattacharjee***, **P. M. Grice***, **A. Kapusta***, **M. D. Killpack***, **D. Park***, and C. C. Kemp. "A System for Reaching in Unknown Clutter that Integrates Model Predictive Control, Learning, Haptic Mapping, and Planning," *IROS2014 Workshop on Robots In Clutter (*- authors contributed equally)*
- [1] **D. Park**, H. Hoffmann, and S. Schaal. "Combining dynamic movement primitives and potential fields for online obstacle avoidance," *Adaptive Motion of Animals and Machines (AMAM)*, 2008.

Patents:

- [4] K. Lee, Y. Hong, C. An, and **D. Park**. "Motor control apparatus and motor control method thereof." US 2011/0181223 A1, Jul. 28, 2011.
- [3] **D. Park**, K. Lee, C. An, and Y. Hong. "Teaching and playback method based on control of redundancy resolution for robot and computer-readable medium controlling the same." US 2011/0093119 A1, Apr. 21, 2011.
- [2] K. Lee, Y. Hong, C. An, and **D. Park**. "모터 제어장치 및 모터 제어 방법(MOTOR CONTROL APPARATUS AND CONTROL METHOD THE SAME)," KR Patent App. 1,020,100,006,682, Aug. 2, 2011
- [1] **D. Park**, K. Lee, C. An, and Y. Hong. "여유자유도 제어를 이용한 로봇의 교시 및 재현 방법 (TEACHING AND PLAYBACK METHOD USING REDUNDANCY RESOLUTION CONTROL FOR MANIPULATOR)," KR Patent App. 1,020,090,099,003, Apr. 22, 2011

REFERENCES

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