

# **Applied Psychology Seminar: Human-Robot Interaction**

M1308.001100-001 (co-class with 132.601-003)

Seoul National University, Fall 2019

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Instructor: Dr. Sowon Hahn

Email: [swhahn@snu.ac.kr](mailto:swhahn@snu.ac.kr)

Class Time: Thursday 2:00-5:00PM

Class Location: Building 16-M315

**Course Description:** Human-Robot Interaction is a field of study dedicated to understanding, designing, and evaluating robotics system used by humans. The field of Human-Robot Interaction (HRI) is rapidly expanding mostly in the technical disciplines such as mechanical and electrical engineering, computer science, and artificial intelligence. In this class, we will review papers that represent psychology / cognitive science perspectives of HRI in addition to those technical disciplines.

**Class Discussion:** Before each class, all students are expected to read assigned articles, write a short reaction paper (1-2 pages), and upload it to ETL (due by midnight the day before the class). Each student will select TWO articles throughout the semester to lead class discussion. A discussion leader is expected to prepare a presentation (15min) on the chosen article and review other students' reaction paper to plan the class discussion. All students are expected to participate in class discussion actively. Grading will be based on reaction papers (20%), two presentations (20%), class participation (30%) and final project (30%).

**Final Project:** Each student will choose a topic of his/her choice and write a research proposal. It will be most useful if you select the topic that can be applied for your research area. We will use the last class for final project presentations. (Depending on the number of students, we may choose to do poster presentations.) Students will also submit a written report by the end of the semester.

## **Tentative Schedule:**

### **Sep 5: Humans vs Machines**

- The Most Human Human: What Artificial Intelligence Teaches Us About Being Alive (by Brian Christian) <https://www.youtube.com/watch?v=8Zs-GQ-ECLs>
- Brooks, R. (2008). I, Rodney Brooks, am a robot. *IEEE Spectrum*, 45(6), 68-71.

### **Sep 12: National Holiday. No Class**

### **Sep 19: Current Issues in HRI**

- Kiesler, S. (2018). The science of human-robot interaction. *ACM Transactions on Human-Robot Interaction*, Vol. 7, No. 1, Article 9.
- Sheridan, T. B. (2016). Human–robot interaction: status and challenges. *Human factors*, 58(4), 525-532.
- Kiesler, S., & Hinds, P. (2004). Introduction to this special issue on human-robot interaction. *Human–Computer Interaction*, 19(1-2), 1-8.
- Brooks, R. A. (1991). New approaches to robotics. *Science*, 253(5025), 1227-1232.

### **Sep 26: Embodied Cognition**

- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic bulletin & review*, 9(4), 625-636.
- Wilson, A. D., & Golonka, S. (2013). Embodied cognition is not what you think it is. *Frontiers in psychology*, 4, 58.
- Fong, T., Nourbakhsh, I., & Dautenhahn, K. (2003). A survey of socially interactive robots. *Robotics and autonomous systems*, 42(3-4), 143-166.
- Breazeal, C., Gray, J., & Berlin, M. (2009). An embodied cognition approach to mindreading skills for socially intelligent robots. *The International Journal of Robotics Research*, 28(5), 656-680.

### **Oct 3: National Holiday. No Class**

### **Oct 10: Humanoid robots**

- Scassellati, B. (2002). Theory of mind for a humanoid robot. *Autonomous Robots*, 12(1), 13-24.
- Brooks, R. A., Breazeal, C., Marjanović, M., Scassellati, B., & Williamson, M. M. (1998, April). The Cog project: Building a humanoid robot. In *International Workshop on Computation for Metaphors, Analogy, and Agents* (pp. 52-87). Springer, Berlin, Heidelberg.
- Breazeal, C. (2003). Emotion and sociable humanoid robots. *International journal of human-computer studies*, 59(1-2), 119-155.
- Dautenhahn, K. (2007). Socially intelligent robots: dimensions of human–robot interaction. *Philosophical transactions of the royal society B: Biological sciences*, 362(1480), 679-704.

### **Oct 17: Robots for Therapy and Education**

- Scassellati, B., Admoni, H., & Matarić, M. (2012). Robots for use in autism research. *Annual review of biomedical engineering*, 14, 275-294.
- Belpaeme, T., Kennedy, J., Ramachandran, A., Scassellati, B., & Tanaka, F. (2018). Social robots for education: A review. *Science robotics*, 3(21), eaat5954.
- Cabibihan, J. J., Javed, H., Ang, M., & Aljunied, S. M. (2013). Why robots? A survey on the roles and benefits of social robots in the therapy of children with autism. *International journal of social robotics*, 5(4), 593-618.
- Shamsuddin, S., Yussof, H., Ismail, L., Hanapiah, F. A., Mohamed, S., Piah, H. A., & Zahari, N. I. (2012, March). Initial response of autistic children in human-robot interaction therapy with humanoid robot NAO. In *2012 IEEE 8th International Colloquium on Signal Processing and its Applications* (pp. 188-193). IEEE.

#### **Oct 24: Rescue and Search Robots**

- Nourbakhsh, I. R., Sycara, K., Koes, M., Yong, M., Lewis, M., & Burion, S. (2005). Human-robot teaming for search and rescue. *IEEE Pervasive Computing*, 4(1), 72-79.
- Murphy, R. R. (2004). Human-robot interaction in rescue robotics. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 34(2), 138-153.
- Dole, L., & Ju, W. (2019, April). Face and Ecological Validity in Simulations: Lessons from Search-and-Rescue HRI. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (p. 451). ACM.
- Murphy, R. R. (2004). Human-robot interaction in rescue robotics. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 34(2), 138-153.

#### **Oct 31: Healthcare Robots**

- Forlizzi, J., DiSalvo, C., & Gemperle, F. (2004). Assistive robotics and an ecology of elders living independently in their homes. *Human-Computer Interaction*, 19(1), 25-59.
- Kidd, C. D., & Breazeal, C. (2008, September). Robots at home: Understanding long-term human-robot interaction. In *2008 IEEE/RSJ International Conference on Intelligent Robots and Systems* (pp. 3230-3235). IEEE.

- Fasola, J., & Mataric, M. J. (2012). Using socially assistive human–robot interaction to motivate physical exercise for older adults. *Proceedings of the IEEE*, 100(8), 2512-2526.
- Rabbitt, S. M., Kazdin, A. E., & Scassellati, B. (2015). Integrating socially assistive robotics into mental healthcare interventions: Applications and recommendations for expanded use. *Clinical psychology review*, 35, 35-46.

## **Nov 7: Design Issues**

- De Santis, A., Siciliano, B., De Luca, A., & Bicchi, A. (2008). An atlas of physical human–robot interaction. *Mechanism and Machine Theory*, 43(3), 253-270.
- Scholl, B., & Tremoulet, P. D. (2000). Perceptual causality and animacy. *Trends in Cognitive Sciences*, 4(8), 299-309.
- Seyama, J. I., & Nagayama, R. S. (2007). The uncanny valley: Effect of realism on the impression of artificial human faces. *Presence: Teleoperators and virtual environments*, 16(4), 337-351.
- Duffy, B. R. (2003). Anthropomorphism and the social robot. *Robotics and autonomous systems*, 42(3-4), 177-190.

## **Nov 14: No Class**

## **Nov 21: Human Robot Collaboration**

- Koo, J., Kwac, J., Ju, W., Steinert, M., Leifer, L., & Nass, C. (2015). Why did my car just do that? Explaining semi-autonomous driving actions to improve driver understanding, trust, and performance. *International Journal on Interactive Design and Manufacturing (IJIDeM)*, 9(4), 269-275.
- Hinds, P. J., Roberts, T. L., & Jones, H. (2004). Whose job is it anyway? A study of human-robot interaction in a collaborative task. *Human-Computer Interaction*, 19(1), 151-181.
- Mumm, J., & Mutlu, B. (2011, March). Human-robot proxemics: physical and psychological distancing in human-robot interaction. In *Proceedings of the 6th international conference on Human-robot interaction* (pp. 331-338). ACM.
- Cherubini, A., Passama, R., Crosnier, A., Lasnier, A., & Fraisse, P. (2016). Collaborative manufacturing with physical human–robot interaction. *Robotics and Computer-Integrated Manufacturing*, 40, 1-13.

## **Nov 28: Technology and Society**

- Sharkey, N. (2008). The ethical frontiers of robotics. *Science*, 322(5909), 1800-1801.
- Lemaignan, S., Warnier, M., Sisbot, E. A., Clodic, A., & Alami, R. (2017). Artificial cognition for social human–robot interaction: An implementation. *Artificial Intelligence*, 247, 45-69.
- Rainie, L., Kiesler, S., Kang, R., Madden, M., Duggan, M., Brown, S., & Dabbish, L. (2013). Anonymity, privacy, and security online. *Pew Research Center*, 5.
- Goodrich, M. A., & Schultz, A. C. (2008). Human–robot interaction: a survey. *Foundations and Trends® in Human–Computer Interaction*, 1(3), 203-275.

#### **Dec 5: Final Project Presentations**

#### **Dec 12: Final Project Presentations**