



# Multi-Party HRI as a way of Establishing Trust In Support Groups Through SAR

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## Introduction

This summer, my lab partner, Ishaan Chandra, and I created an interactive setup for using the Nao robot (Figure 1) as a mediator within a middle school support group setting to create trust between participants. We worked under the guidance of our Ph.D. mentor Chris Birmingham, whose own research involves using Nao as a mediator in college support groups (Figure 2). We researched various different gestures, phrases and questions that could address common issues middle schoolers face and programmed them into the robot.

## Objective & Impact of Professor's Research

As head of the Interaction Lab, Professor Maja Mataric conducts research on Socially Assistive Robotics (SAR), a field which involves Human-Robot Interaction (HRI) on a social rather than physical level. The objective of SAR is to help people achieve a better quality of life through the use of robots. Dr. Mataric's work includes teaching cognitive abilities to children with autism spectrum disorder, aiding physical remediation for the elderly (Figure 3). In conducting these projects, the Interaction Lab researches aspects of both human and robot behavior and how to integrate them in a mutually beneficial way.



Figure 3. Dr. Mataric with the Bandit robot. Bandit is a robotic system that has been utilized in several projects including aiding the development of children with autism spectrum disorder and providing care to Alzheimer's patients.  
<<http://www-robotics.usc.edu/~maja/>>

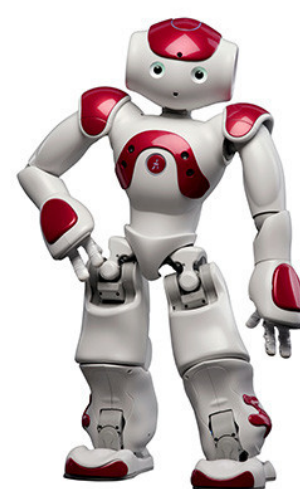


Figure 2. The visual here shows how Nao is set up to mediate a support group. PC: Chris Birmingham.



Figure 1. Nao. This is the robot we utilized throughout our research. Nao is a humanoid, bipedal robot with 25 degrees of freedom, 7 different sensors, and dual 2D cameras on its head that enable its many capabilities including facial recognition, speech recognition, and more.  
<<https://www.softbankrobotics.com/emea/en/nao>>

## Project Details

In our model for middle school support groups, we considered two specific issues: bullying and academic stress. We researched existing resolution methods and formed ideas on how to apply them to our robot while considering its limitations in order to come up with the most effective mediation strategy. Utilizing python and the NAOqi library, we programmed over 20 gestures and phrases into our robot (Figure 4) and implemented a facial recognition setting to allow the robot to recognize individual members of the group and adjust its responses accordingly (Figure 5).

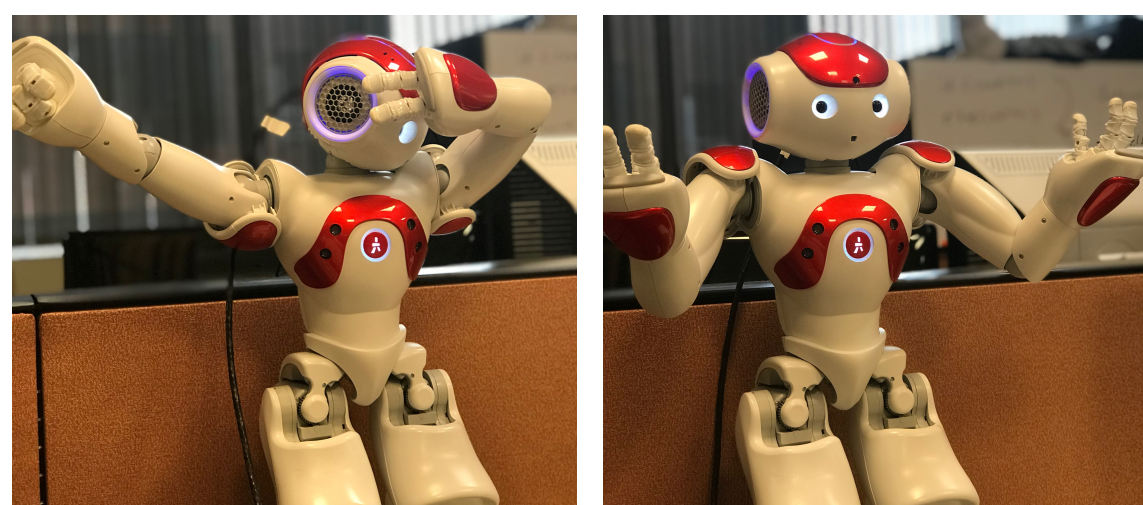


Figure 4. Examples of Nao's physical expressions. Nao's gestures are programmed to mediate a comfortable and engaging setting for participants. PC: Riya Ranjan.

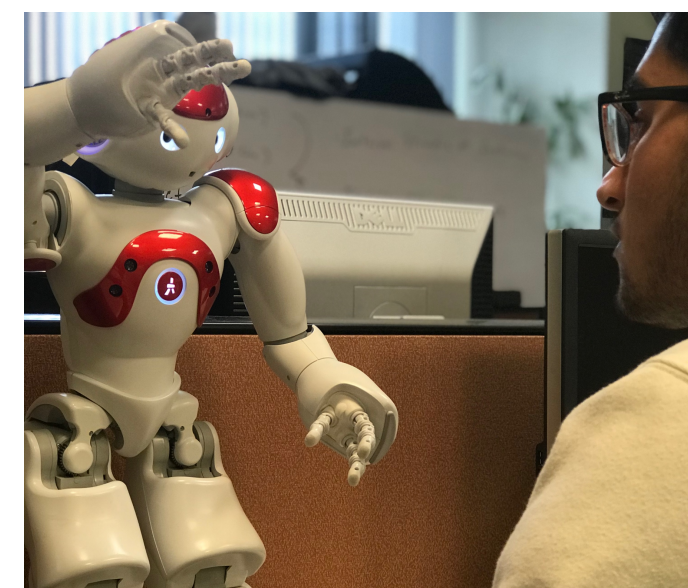


Figure 5. Image of Nao's face tracking feature in use. Here, Nao maintains eye contact with the user as it waves and tracks the user's movement with its head. PC: Riya Ranjan.

## Skills Learned

Through my time at the lab, concrete skills I have developed include:

- How to communicate with and program a robot through ROS and python.
- How to navigate the terminal effectively.
- How to use Github and git.
- How to control the Nao robot through employment of the NAOqi library.

As a researcher, I have learned:

- How to efficiently read and process information from academic papers.
- The importance of patience in research.
- The significance of having a purpose behind your work.

## Relation to STEM Coursework

The principles that I have learned from my computer science classes have translated into my lab work, specifically with the various python programs and algorithms I developed for this project. My experiences on my school's robotics team have also been beneficial, as my knowledge on motor control and robotic subsystems were helpful guides throughout this process. Similarly, the CS skills I have gained in the lab can be applied back to my STEM coursework as well.

## Next Steps

In the future, I hope to use the skills I have learned about both robotics and research as a whole to pursue further research within computer science that can have a real-world impact. Additionally, I have an avid interest in the medical field, so I hope to be able to develop technology that can have an impact on patient welfare. Through the rest of high school, I aim to continue research and pursue my passion for STEM related subjects through participation in various clubs and extracurriculars, such as FRC, APCS classes, research opportunities, and more.

## Advice for Future SHINE Students

Make sure that you take advantage of all of the opportunities SHINE offers — don't be afraid to ask for help or step out of your comfort zone: these weeks are going to pass by in a flash, and every moment can hold valuable experiences if you make the most of them.

## Acknowledgements

I would like to formally thank:

- |                    |                     |
|--------------------|---------------------|
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