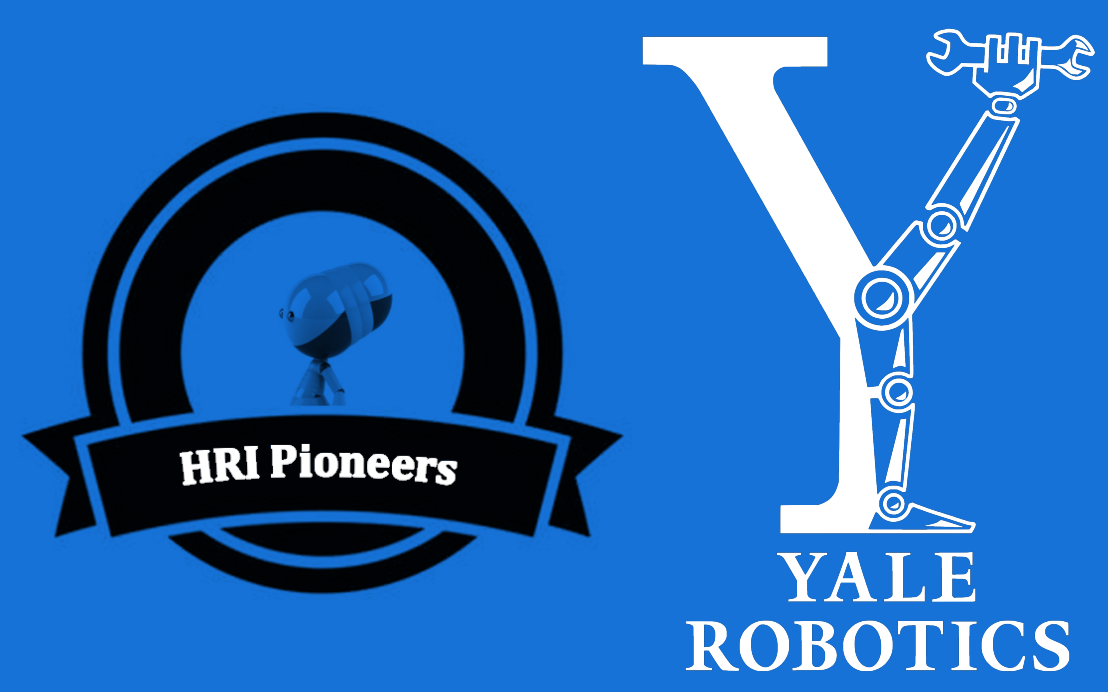




Enhancing Human-Human Collaboration with a Social Robot


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Social robots that can intelligently and autonomously influence interaction dynamics on teams with humans will increase team productivity and synergy.

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Which verbal and nonverbal features do we need to sense in order to perceive relevant user states and interaction dynamics between people?
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How do we model individuals in the interaction and the dynamics between them? Which characteristics should be included in this model?
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From perceived verbal and nonverbal behaviors, how do we determine the quality of team interaction dynamics and areas of growth?
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What are the most effective communication strategies that a social robot can use to shape team interaction dynamics?

Preliminary Work



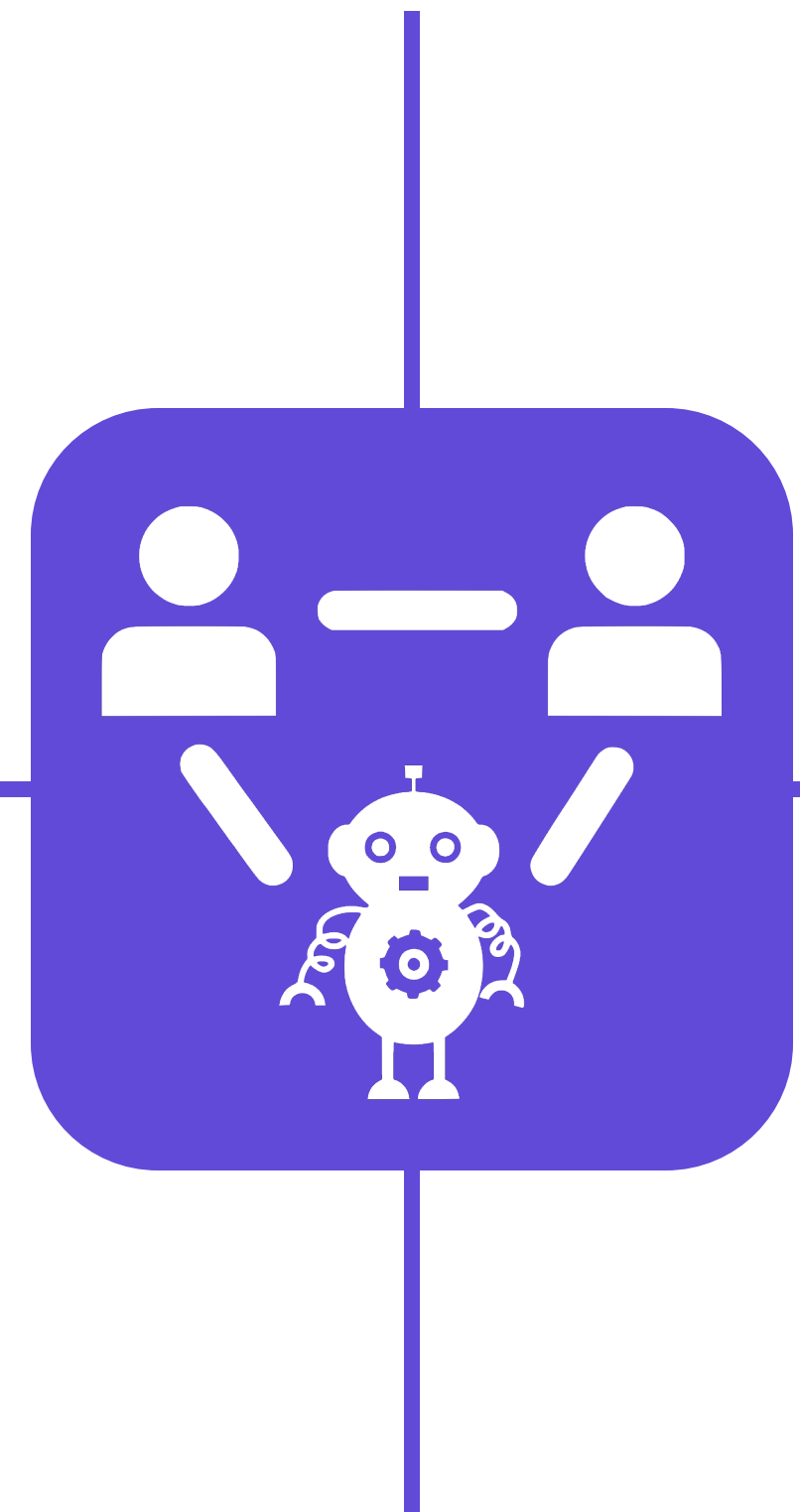
Study
We conducted a between-subjects study where pairs of children play a collaborative game with a social robot. During pauses in the game, the robot either (1) asks the children questions to better focus the participants on the task they are working on, (2) asks the children questions that are targeted at developing and reinforcing the relationship between the participants, or (3) doesn't ask any questions.

- Observations**
- Participants who were asked task-focused questions had higher performance scores in the collaborative game than the other groups.
 - Participants who were asked relationally-focused questions had a lower perception of their performance than the participants who were asked task-focused questions.
 - There were many factors influencing the interaction dynamics between the participants: age, participant gender, dyad gender composition, participant personalities, affect, and environment.

Future Work

- Perception**
- Determine current state-of-the-art sensing technologies for detecting affect and engagement.
 - Explore methods for extracting particularly harmful behaviors for interpersonal interaction from video and audio data: contempt, criticism, stonewalling, and defensiveness.

- Identifying Areas of Growth**
- Obtain a labeled data set of group interactions where the labels indicate the quality of the teamwork.
 - Through the use of machine learning and statistical correlation approaches, determine which behavioral features correlate with low quality and high quality collaboration.



- Individual and Interaction Modeling**
- Ascertain which features of individuals are valuable to model (e.g. affect, engagement, and strategy).
 - Represent these features in a user model and also represent the interaction between each person.
 - Use these model representations to inform intervention strategies.

- Communication**
- Run a human-subjects study where a social robot employs different communication strategies, using a reinforcement learning approach, to improve interaction dynamics. Strategies may include humor, encouragement, and exposition of harmful behavior.
 - Measure participants responses to the robots interventions.