

Evaluating Emotional Responses to a Robot Through Wearables and Questionnaires



PRESENTER:
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BACKGROUND

The effectiveness of Human Robot Interaction (HRI) for research and real-world applications will depend upon the user’s perception of the robot. This study focused on the initial impressions of college-age adults to a NAO robot when the motion and voice were varied slightly to determine the most appropriate type of behavior the robot should display for maximum rates of user acceptance.

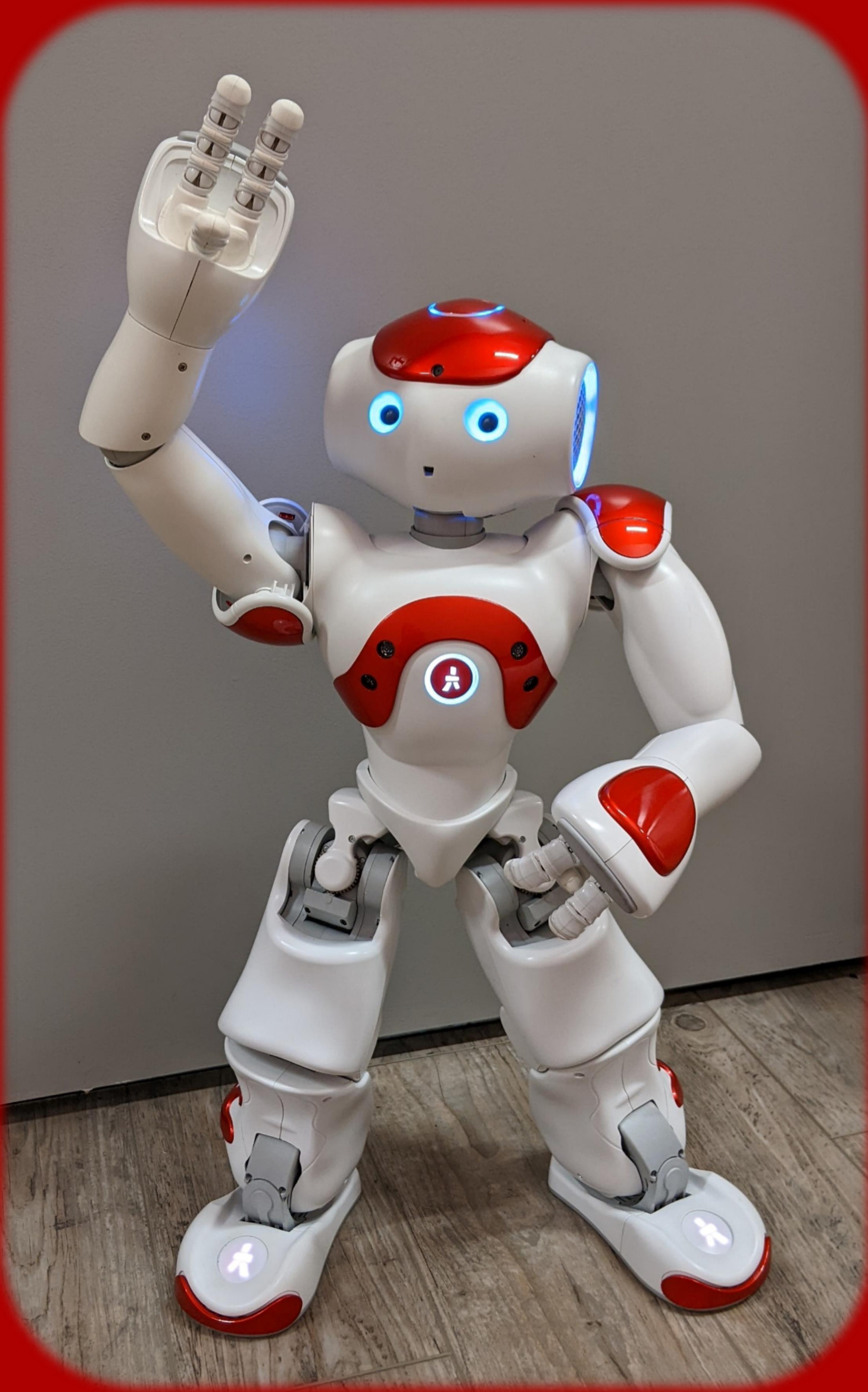
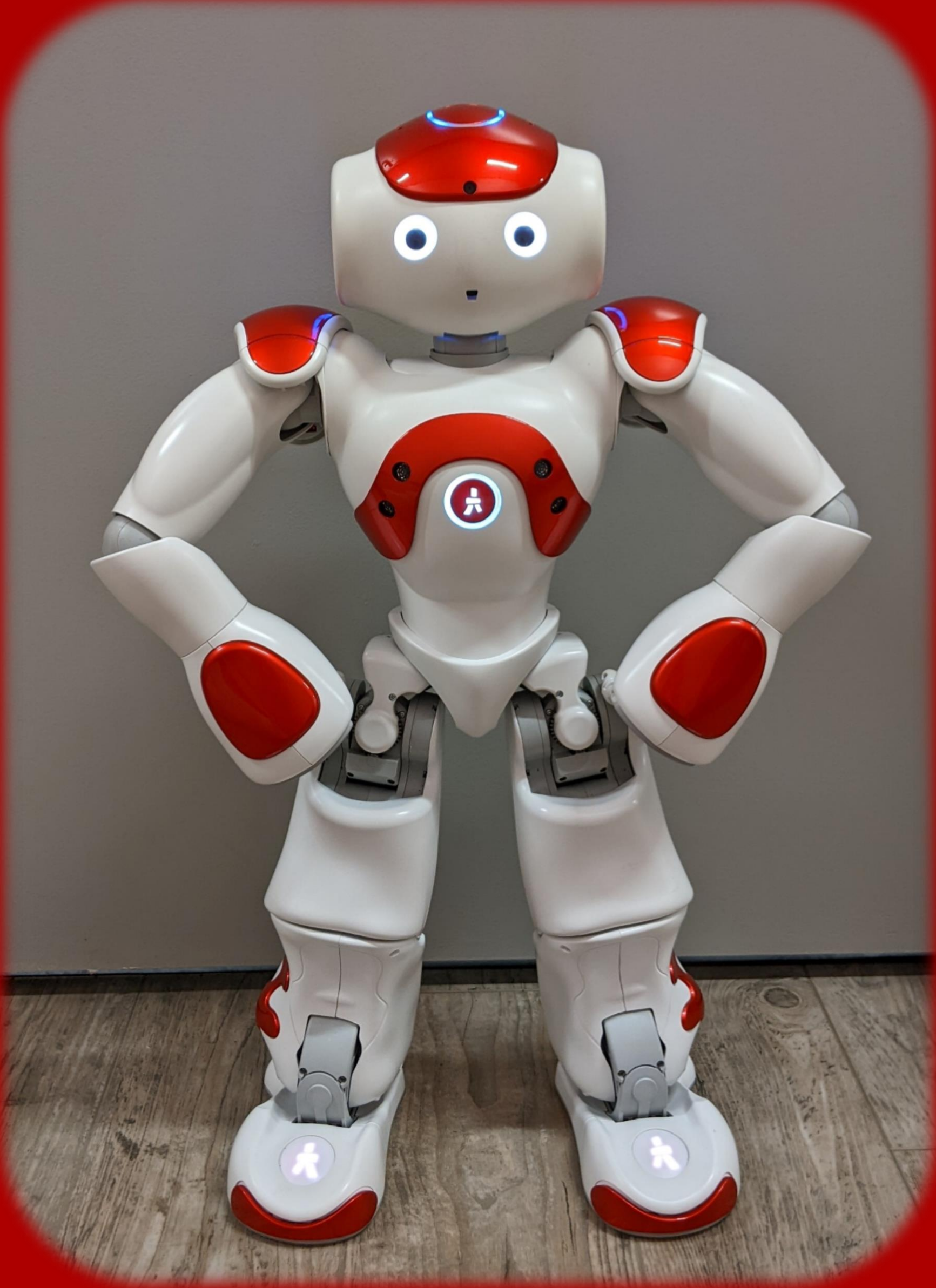
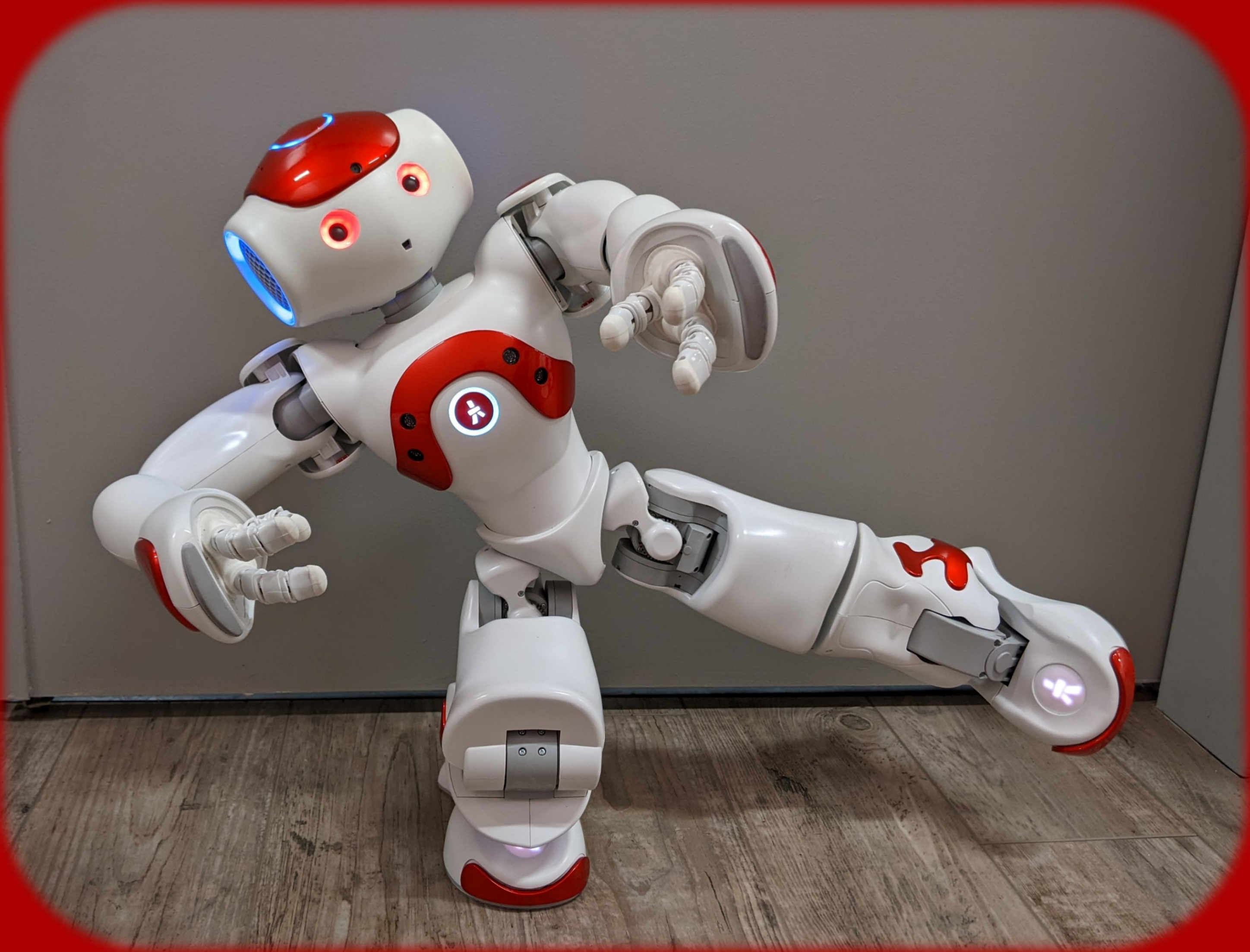
METHODS

- 1. The NAO robot presented four programmed behaviors:
A – Default voice and smooth motions
B – Polly Justin voice and smooth motions
C – Default voice and jerky motions
D – Polly Justin voice and jerky motions
- 2. Physiological data was collected using an Empatica E4 wearable device along with ratings on two questionnaires.
- 3. Features from the E4 data are processed and fed into machine learning algorithms.
- 4. Results compare ratings on questionnaires per statistical tests and which algorithm produced the highest F1-scores and accuracy.

QUESTIONNAIRE RESULTS

Factor	Ranking	Test Value	Significant Relationship
Perceived Safety	B>A>D>C	19.5	B and C
Anthropomorphism	B>A>D>C	9.54	B and C
Discomfort	D>C>A>B	10.5	B and D

Differences in a robot’s voice and motion provoke different physiological responses and ratings on surveys from humans.



Questionnaires



E4 Wearable



Machine Learning

Gradient Boosting Model Results	
F1-score A	0.81
F1-score B	0.71
F1-score C	0.72
F1-score D	0.75
Accuracy	0.75

RESEARCH THRUST RT-3:

- OBJECTIVE 3.2.1. Select performance metrics for human-in-the-loop utilizing multi-modal sensors for robots or human-machine interfaces.
- Natalie Warning, Karla Conn Welch, Rohit Narayanan, Prasad Nethala, Ha Do, Saipruthvi Vanaparthi, Shaye Allen, and Sabrina Daisey



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