

## **Humanoid robotics as a tool to understand human social interaction**

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Effective social interaction hinges on understanding and anticipating others, often relying on the exchange of non-verbal information conveyed by subtle modulations of how the partner moves. Identifying the relevant cues and quantifying their impact during a real multimodal and dynamic interaction is often impossible due to the difficulty of controlling the phenomenon while preserving the naturalness of the interaction. Investigations based on video stimuli allow complete controllability. Still, they lack the possibility of contingent reaction. In contrast, virtual reality provides a certain degree of action contingency but forces the participant to be immersed in a different reality from their everyday experience. The application of a robot to the investigation of social interaction goes beyond these limitations. The tangible benefits include adding to the research the controllability of every single aspect of interaction, a property well beyond the possibilities of a human actor. Indeed, not only can each detail of the robot's motion be precisely planned in a repeatable way, but also how the robot perceives (e.g., which sensory cues it will process) and how it will react are aspects under the experimenter's control. At the same time, this approach preserves genuine reciprocity and involvement, also in terms of space and tools. This approach has been proven effective within the ERC Starting Grant wHiSPER (investigating human shared perception with robots - <https://whisperproject.eu/>), where the humanoid iCub has served as a tool to investigate how human perceptual mechanisms change when involved in an interaction. Beyond providing a novel tool for psychology, neuroscience, and cognitive science, the research outcomes could also lead to better and more collaborative technologies, with robots able to reveal their attitudes and goals, even with their motion alone. Hence deepening our understanding of human-human interaction will allow us also to build better, more interpretable robots.