

Advancing Human-Robot Interaction (HRI) Frameworks

In the context of Human-Robot Interaction (HRI), gaze serves as a pivotal channel for rapid nonverbal communication, fundamentally enhancing the intuitive collaboration between humans and robotic agents. Therefore, these gaze-based communication dynamics need to be systematically investigated. During the internship, a framework for evaluating the gaze recognition in HRI will be implemented by expanding and conceptually realigning an existing empirical research framework with transitioning its core focus toward the dynamic field of HRI.

The core responsibilities will be centred on the adaptation of a complex, multi-modal gaze-tracking paradigm. A dyadic interaction study will be augmented by effectively replacing one human participant with an autonomous robotic agent. A comprehensive architectural review and redesign of the experimental protocols will be necessitated to ensure the seamless integration of the robot while maintaining the validity of the foundational research design. The original baseline study, which involves a sophisticated setup where two human participants engage in a structured, face-to-face visual attention task, will be utilized as the foundation. In this baseline setup, a spatial grid of symbols as stimuli is displayed on a monitor behind Participant A, with a large mirror positioned behind Participant B. While Participant A receives auditory cues directing visual attention to specific coordinates within the grid via the mirror, Participant B is tasked with accurately estimating Participant A's gaze target. The experimental design, which incorporates varying degrees of cognitive load and temporal constraints, will be maintained. The overarching goal will be to evaluate not only the physiological accuracy of gaze estimation but also underlying psychological dimensions, such as the estimator's confidence levels, and the learning curve associated with continuous feedback mechanisms.

A key contribution will be the strategic translation of this complex human-human interaction model into a robust human-robot interaction scenario. Precise conceptual engineering will be required to calibrate the robotic agent's behaviour and responsiveness to mirror the intricacies of the original human counterpart, thereby creating a viable testing environment for HRI dynamics.

Furthermore, the execution and validation of a pilot phase designed to empirically test the newly integrated HRI framework will be implemented. The end-to-end management of a preliminary validation study will be undertaken, serving as a critical proof-of-concept for the adapted experimental architecture. Actionable insights into the efficacy of the modified paradigm will be generated by this pilot study, specifically by probing the accuracy and reliability of gaze estimation within the novel human-robot context. Additionally, exploratory investigations of psychological variables related to user experience and cognitive perception when interacting with a non-human entity in a task demanding high visual and interpersonal coordination will be facilitated by the pilot phase. Essential baseline data for future, large-scale investigations into the nuances of human-robot communication and collaboration will be provided by the deployment of this validation phase.