

HI Comp 2024 - Hybrid Intelligence Center Consortium Meeting

Twente, 17 April 2024

Hybrid Intelligence (HI) is an emerging system design paradigm in which artificial intelligence (AI) augments human intelligence, as opposed to replacing it. Although there is an increasing emphasis on the idea of HI in the AI literature, there is a lack of systematic methods and metrics for developing HI systems.

The Hybrid Intelligence Competition (HI Comp) series aims to support the development of high-quality HI (Human-AI) teams, by exploring the possible benefits, risks, and consequences of collaboration between humans and AI systems.

HI Comp aims at pushing the state-of-the-art in Human-AI collaboration and teaming, and at generating a first repository of scenarios for researchers and practitioners to guide the development and evaluation of HI teams.

The theme of this first iteration of the HI Comp is: *fundamental qualities of HI teams*.

The main task for the participants of the competition is to formulate HI scenarios that yield best and worst quality HI teams.

Rules

- Participants form teams of two–three (preferably two, three as the exception).
- Participants are provided with a description of 4 HI use cases (**Section 1**)
- Participants are provided with a number of HI quality attributes characterizing properties of quality HI Teams (**Section 2**)
- Participants describe and submit two Usage Scenarios (Scenario 1 and Scenario 2) in a given format (**Section 3**).
 - For each scenario, participants choose one HI Use case from Section 1.
 - In Scenario 1, participants describe a *Best Case Scenario* highlighting the benefits for team collaboration stemming from *at least one* of the quality attributes from Section 2.
 - In Scenario 2, participants describe a *Worst Case Scenario* highlighting the risks and challenges stemming from the lack of *at least one* of the quality attributes from Section 2.
 - For each scenario, participants report, on a scale from 1 to 5, how much the quality attribute(s) affect the outcome of the described scenario.
- Participants present their scenarios during the competition day.
- Scenarios are evaluated based on the evaluation criteria (**Section 4**)

Submission deadline

Submission link and deadline on the [HI Comp website](#).

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1. HI Use Cases

T1. Research HI Team

Description. A HI team is formed within a pharmaceutical company. The team comprises a scientist, who spearheads the company's R&D, collaborating with an AI-driven virtual agent.

Objective. The overall objective of the HI team is to jointly navigate through the vast amount of online data, databases and literature to discover and develop new drugs and medications.

Task. Currently, the team is tasked with exploring the inhibitory effect of a compound on neurodegeneration. This requires analyzing findings from relevant papers, consulting other researchers and labs, and concluding whether the compound exhibits the inhibitory effect or not.

T2. Child Education Team

Description. A HI team is assembled in a next-generation school. The team consists of a remedial teacher, an educational therapist, and an assistive robot, collaboratively defining a targeted learning program for a child with learning difficulties.

Objective. The main objective of the team is to provide tailored learning support to the child by combining expertise from the human team members with advice that the assistive robot gives based on its own observations obtained during interactions with the child.

Task. Currently, the team is tasked with collaboratively designing a targeted learning program, monitoring progress, and providing encouragement for Alex, a child experiencing multiple learning difficulties, including difficulties to process auditory information and dyslexia.

T3. Healthcare Diagnosis Team

Description. A HI team pioneers a collaborative approach to healthcare diagnostics. The team comprises medical professionals working hand-in-hand with advanced AI algorithms.

Objective. The team aims to accurately diagnose complex medical conditions and expedite assessments by intertwining human expertise and intuition with AI's data-driven insights.

Task. Currently, the team is investigating Susan's case. She is a middle-aged woman who suffers from a range of symptoms that none of the many doctors she has visited so far could make sense of. Despite various previous treatment attempts, her condition has not improved, leading her now to schedule an appointment with the Healthcare Diagnosis Team.

T4. Cybersecurity Response Team

Description. An HI team plays a critical role in responding to cybersecurity threats. The team consists of human analysts collaborating with AI systems to detect, analyze, and counteract cyber threats.

Objective. The team's primary objective is to swiftly respond to evolving cybersecurity challenges, ensuring the security and integrity of digital systems. Human analysts bring their experience, intuition, and contextual understanding to the table, while AI systems contribute with rapid data processing, pattern recognition, and automated threat detection capabilities.

Task. The team is tasked with addressing an increasing series of denial-of-service attacks on governmental websites originating from countries outside of the jurisdiction of local authorities.

2. Quality Attributes

Quality attributes represent properties that are relevant for (engineering effective) HI teams. Below is a list of 16 quality attributes, grouped in 7 categories. Figure 1 provides a graphical overview of these quality attributes. More details can be found in [1].

Boundedness

- **Q1. Team structure transparency**, the degree to which team members have shared knowledge about team composition, roles and hierarchy
- **Q2. Members identifiability**, the degree to which team members can identify each other

Interdependence

- **Q3. Mutual dependency**, the degree to which members depend on each other in achieving goals and tasks
- **Q4. Communication mechanisms**, the degree to which they rely on communication mechanisms
- **Q5. Coordination mechanisms**, the degree to which they rely on coordination mechanisms

Competency

- **Q6. Skills comprehensiveness**, the degree to which the pool of skills in the team covers the needs of the team goals and tasks
- **Q7. Strengths and weaknesses transparency**, the degree to which team members have shared knowledge about each other strengths, weaknesses, and knowledge

Purposefulness

- **Q8. Objectives consequentiality**, the degree to which the team purpose is significant for the human members and stakeholders
- **Q9. Objectives transparency**, the degree to which team members have shared knowledge about team objectives and the link between team tasks and objectives

Initiative

- **Q10. Autonomy**, the degree to which the structure of the team enables members to operate independently
- **Q11. Proactivity**, the degree to which the structure of the team enables members to exhibit self-motivated behavior toward the accomplishment of team objectives

Normativity

- **Q12. Norm transparency**, the degree to which team members have shared knowledge about team norms
- **Q13. Norm awareness**, the degree to which members reason about team norms and adjust their behavior accordingly

Effectiveness

- **Q14. Task performance**, the degree to which users of the team are satisfied with team's work
- **Q15. Quality of group processes**, the degree to which the team becomes increasingly effective over time
- **Q16. Members satisfaction**, the degree to which the team contributes to the learning, growth and satisfaction of its members

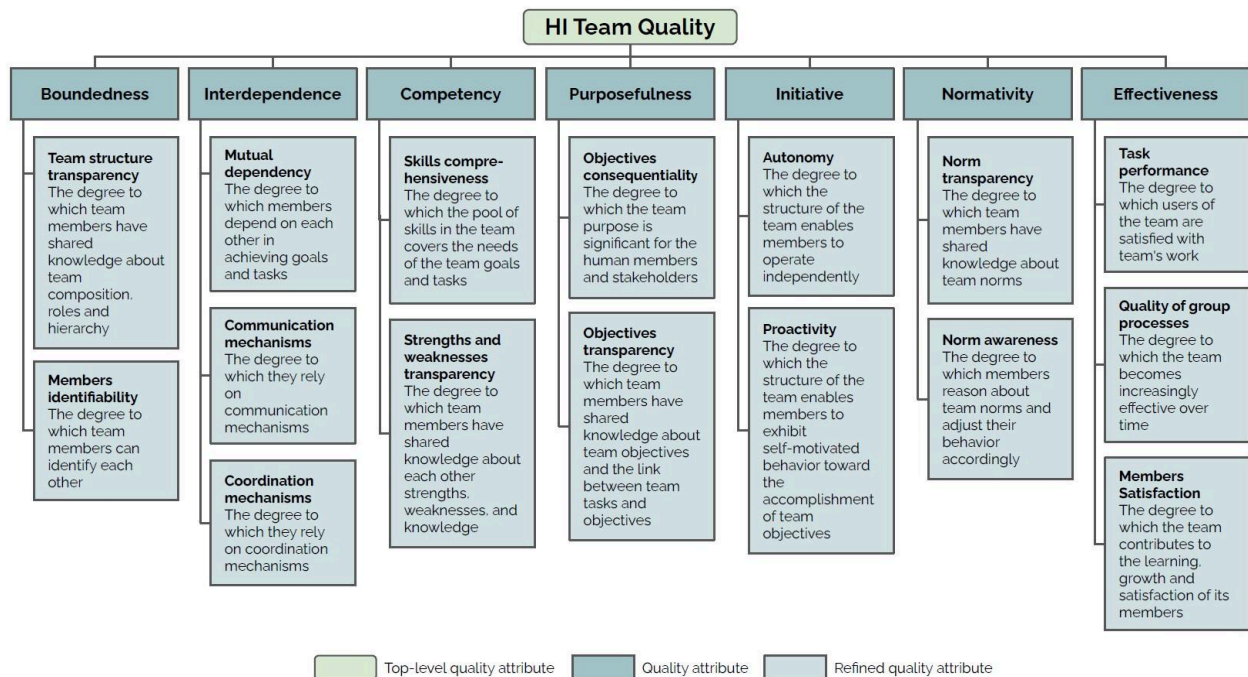


Figure 1. Quality attributes of HI Teams (From [1]).

[1] Dell'Anna, D.; Murukannaiah, P. K.; Dudzik, B.; Grossi, D.; Jonker, C. M.; Oertel, C.; and Yolum, P. (2024) "Toward a Quality Model for Hybrid Intelligence Teams." In Proceedings of the 23rd International Conference on Autonomous Agents and MultiAgent Systems, AAMAS 2024. [Preprint](#)

3. Scenarios Templates

Participant Team

1. **Participants details:** Please provide the details of the individuals submitting the two scenarios for participation in the competition.
 - a. Participant teams must be composed of at least 2 participants
 - b. Each participant team must submit two scenarios (as below)

Best Case Scenario

2. **HI Team:** Indicate the id of the selected HI Team (one from T1-T4 from Section 1).
3. **Best Case Scenario:** Provide a detailed description of a best case scenario, illustrating how the use case's HI team excels in collaboration and teamwork thanks to at least one of the quality attributes from Section 2.
 - a. Description format: free text (max 500 words + extra non-textual elements)
 - b. Minimum requirements:
 - i. A textual description of the best case scenario
 - ii. An explanation of the relationship between the considered quality attributes and the best case scenario, i.e., why and how the best case scenario is the result of the team leveraging the quality attributes (and/or their combination)
 - c. Optional: Attach any supporting visuals or multimedia elements (incl. pictures, figures, diagrams, etc.) that you think would enhance the presentation, its clarity and realism.
4. **HI Quality Attributes:** Indicate (I) how much the outcome of the described scenario is affected by each of the quality attributes from Section 2, (II) relevant quality attributes, not mentioned in Section 2, if any.
 - a. Minimum requirements:
 - i. A scoring for at least one of the quality attributes from Section 2

Worst Case Scenario

5. **HI Team:** Indicate the id of the selected HI Team (one from T1-T4 from Section 1).
6. **Worst Case Scenario:** Provide a detailed description of a worst case scenario, illustrating how the use case's HI team, lacking at least one of the quality attributes from Section 2, results in risky and challenging situations during collaboration and teamwork.
 - a. Description format: free text (max 500 words + extra non-textual elements)
 - b. Minimum requirements:
 - i. A textual description of the best case scenario
 - ii. An explanation of the relationship between the considered quality attributes and the worst case scenario, i.e., why and how the worst case scenario is the result of the team lacking the quality attributes (and/or their combination)

- c. Optional: Attach any supporting visuals or multimedia elements (incl. pictures, figures, diagrams, etc.) that you think would enhance the presentation, its clarity and realism.
- 7. **HI Quality Attributes:** Indicate (I) how much the outcome of the described scenario is affected by each of the quality attributes from Section 2, (II) relevant quality attributes, not mentioned in Section2, if any.
 - a. Minimum requirements:
 - i. A scoring for at least one of the quality attributes from Section 2

4. Evaluation

Each scenario will be evaluated by a jury composed of the competition organizers, based on the following criteria.

Criteria	1 (Low)	2 (Basic)	3 (Moderate)	4 (High)	5 (Exceptional)
Creativity	The scenario relies on common and predictable concepts without any novel or imaginative elements.	Ideas in the scenario are conventional, resulting in a limited departure from existing concepts.	Introduces some innovative ideas, contributing a moderately fresh perspective to the use case.	The scenario is original and imaginative and significantly enhances the uniqueness and depth of the use case.	Showcases groundbreaking and pioneering ideas that transcend conventional thinking about the use case.
Complexity	The scenario lacks depth and sophistication, presenting superficial analysis with little consideration of the intricacies involved.	The scenario addresses only basic elements of the problem.	Moderate depth of analysis, incorporating some complexity into the scenario and presenting ideas with a reasonable level of sophistication.	In depth analysis and sophisticated descriptions that showcase the intricate aspects of the scenario and use case.	Incorporates advanced elements, and presents nuanced ideas about the intricate aspects of the scenario and use case.
Realism	Unrealistic, impractical scenario, showing little consideration for real-world constraints and challenges pertaining to the use case.	Limited consideration of real-world constraints for the use case, with some impractical elements that hinder the scenario's realism.	Showcases awareness of practical challenges and a clear understanding of real-world constraints concerning the use case.	Realistic scenario for the use case. Profound understanding of the constraints concerning the use case.	Exceptionally realistic and detailed scenario.
Potential Impact on the Use Case	The scenario demonstrates limited (positive or negative) impact of the considered quality attributes on the use case	There is an indication of potential impact, showing a basic connection between the quality attributes and the outcomes	The scenario effectively showcases the impact of the considered quality attributes on the use case, providing clear and adequate demonstration of their influence on outcomes.	The scenario illustrates significant effects of the quality attributes on the use case, showcasing a transformative impact.	The scenario goes beyond expectations, highlighting far reaching and profound consequences resulting from the considered quality attributes
Clarity of Presentation	Disorganized, unclear, numerous gaps	Some clarity issues, occasional confusion	Overall clear, some areas need improvement	Very clear, well-organized, effective	Exceptionally clear, outstanding organization