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Unifying Terminologies Toward a Shared HHAI Vocabulary

Maaike H. T. DE BOER [a,1], Myrthe L. TIELMAN [b], Ilaria TIDDI [c], Victor DE BOER [c], Davide DELL'ANNA [g] Stephanie KRAMER [d], Janin KOCH [e], André MEYER-VITALI [f], Chiara NATALI [c], Michel OEY [d], Janet RAFNER [i], Jacob SHERSON [h], Francesca URGESE [c], Michael VAN BEKKUM [a] and Thomas SCHMID [j]

[a] *TNO, The Netherlands*
[b] *TU Delft, The Netherlands*
[c] *Vrije Universiteit Amsterdam, The Netherlands*
[d] *Amsterdam University of Applied Sciences, The Netherlands*
[e] *Univ. Lille, Inria, CNRS, France*
[f] *DFKI, Saarbrücken, Germany*
[g] *Utrecht University, The Netherlands*
[h] *Center for Hybrid Intelligence, Aarhus University, Denmark*
[i] *University of Southern Denmark, Denmark*
[j] *Martin Luther University Halle-Wittenberg, Medical Faculty, Halle (Saale), Germany; Martin Luther University Halle-Wittenberg, Institute of Computer Science, Halle (Saale), Germany; University Hospital Halle, Research Center Data Analytics, Halle (Saale), Germany; Lancaster University Leipzig, Leipzig, Germany; Lancaster University, Data Science and AI Institute, Lancaster, United Kingdom*

Abstract. As the field of Hybrid Human-Artificial Intelligence (HHAI) grows, various efforts have emerged to define its core terminology. This poster presents initial results from an interactive, international workshop aimed at consolidating these efforts into a cohesive, unified vocabulary. We present the key elements of this vocabulary, i.e. (i) actors and teams, (ii) processes and tasks, (iii) methods and metrics, and discuss the implications of this terminology for the design of human-AI (HI) systems. We believe that a well-defined shared vocabulary will serve in the long-run as a catalyst for exchange and collaboration across the research community.

Keywords. Hybrid Human-Artificial Intelligence, Terminology, Unified Vocabulary

1. Introduction

Various efforts to establishing the core terms to design collaborative human-AI (HI) systems have been proposed in the Hybrid Human-Artificial Intelligence (HHAI) community [1,2,3,4,5,6]. We brought together these disjoint efforts and worked toward a cohesive, unified vocabulary to be shared among the HHAI community. This poster reports the results of the interactive workshop where this vocabulary was consolidated.

[1] Corresponding Author: Maaike H.T. de Boer, maaike.deboer@tno.nl.

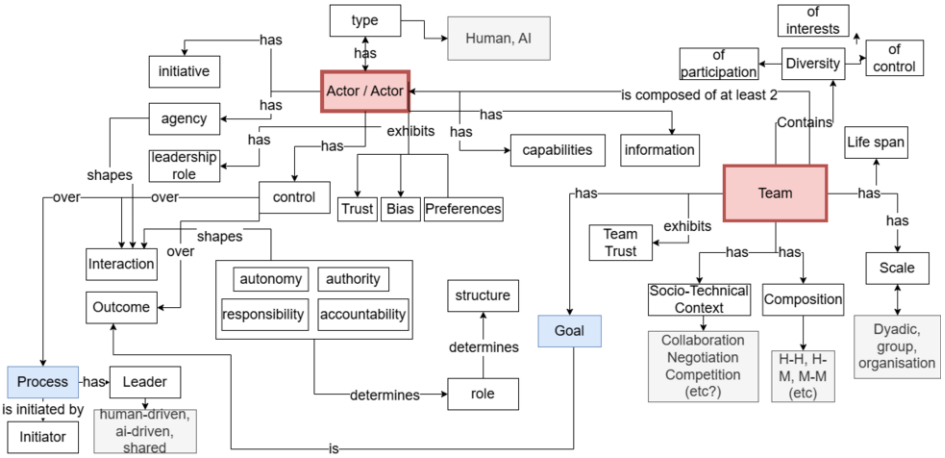


Figure 1. Overview of HI Actors ans Teams. Red boxes indicate the core concepts (actors & teams). The blue concepts overlap with those in Processes & Tasks in Figure 2, grey boxes give examples of instantiations of concepts.

2. A Unified Terminology for HHAI

We describe three key components to design a collaborative human-AI (hybrid intelligence, or HI) system: (i) actors and teams, (ii) processes and tasks, (iii) methods and metrics.

Actors and Teams. At its core, a HI system includes a joint team of interacting humans and artificial agents [7,8]. *Actors* in a HI system include at least one human and one AI agent. Among them, there needs to be some form of meaningful interaction or collaboration for it to be considered as a team. A *HI team* is then a group of actors gathered around a shared (short-term) project or objective. This terms allows to incorporate the various team concepts found in the literature, including e.g. individual (one actor), dyad (two actors), and team (more than two actors) [1,2,3,4,5,6].

Figure 1 provides an overview that describes actors and teams within the HHAI literature. Actors have a type, capabilities, and access to certain information. In addition, there are different terms to describe how they interact with other actors. Initiative, agency and leadership role, as well as autonomy, authority, responsibility and accountability all influence the interaction, and are related to the actor's role. Actors exhibit trust, bias and preferences [9]. Meanwhile, teams have a life span, scale, composition and context, and contain diversity.

Note that many terms that we use here originate from philosophy, psychology, or sociology and aimed at describing human concepts and behaviours. It is clear that human and artificial intelligences are of different kinds and qualities. Similarly, concepts such as agency, autonomy, knowledge, trust, beliefs, desires, or intentions are different. Nevertheless, it may be necessary to either re-define or extend these terms, highlighting the differences while facilitating the discussion of symmetrical relationships.

Processes and Tasks. Figure 2 shows processes and tasks summarizing previous work [1,2,3]. A *task* as a set of goals or objectives. Tasks may have inputs, outputs, restrictions (constraints), and potential subtasks. A *process* is a series of actions which implements

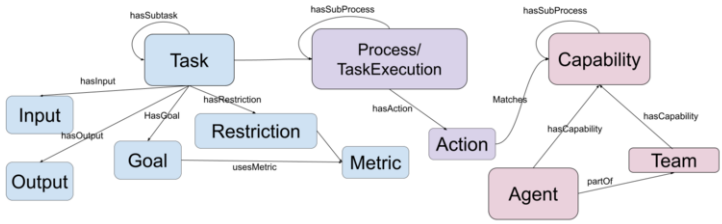


Figure 2. Overview of HI tasks and processes. Rectangles indicate the main terms. Arrows indicate relations between the terms.

tasks. Agents have capabilities, which are linked to possible tasks [3], as is further explained. Tasks include generation, training, engineering, transformation, reasoning, inference, induction, deduction, abduction, classification, predication, recognition, regression, action, perception, decision making, knowledge aid and movement [1,3]. Each task can be executed by multiple processes.

It is good to note that there is some overlap between how we characterize actors, especially in how they interact with other actors, and the processes they are involved in. For instance, leadership structures originate from roles of actors, but influence the process of decision making.

Methods and Metrics. Methods for HI systems can be roughly divided into design, building, and evaluation methods. *Design methods* allow to conceptualize and design of a system. These include e.g. boxologies, ontologies, co-active design, co-design frameworks, participatory design methods. *Building/Implementation Methods* allow to implement AI components or team interactions. These range from control-oriented (formal, normative, and constraining) to appropriation-oriented (heuristic, flexible, and user-centric). *Evaluation methods* measure the success of the HI system as a whole. All methods can be further characterized by their scope (component-specific or holistic) and the level of stakeholder involvement (human or machine).

Success criteria for HI systems include qualitative and quantitative metrics. These are divided into three categories: *Component-based metrics* focus on the individual actors of the HI system. Human metrics include behavioural, cognitive, and physical features, knowledge of AI, and attitude towards AI. AI metrics include statistical performance, sample efficiency and anthropomorphism. *Interaction-based* metrics focus on measuring the collaboration, interaction and processes within the team, including interdependency/competency metrics, initiative/co-creation metrics and collaborative effectiveness/performance metrics. *Holistic* metrics are situated and long term. They focus on the broader socio-economic effects of the HI system once situated and deployed in the operative environment. Metrics include ethics-based, governance-based and long-term appropriation.

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