

## The concept of AI paradigm

The question that we are asking in this paper is how we conceptualize AI paradigms. AI paradigms invite a variety of definitions to the extent that the term has become almost meaningless. Without some rational ground on which to evaluate AI paradigms and their claims we are prone to misjudgment and false expectations. Clearly defined concepts allow us to make distinctions where it matters. On the other hand, poorly defined ones show the distinctions where there are none.

As we said, the term “AI paradigm” is used in many AI-related papers, discussions, and articles, with it carrying various meanings, so there is no agreement about what it should precisely denote. In principle, authors simply define a “paradigm” in a way that suits their narrative. As an example Shopman (1986) suggests that AI has not developed a specific paradigm, claiming that “...no computational paradigm has yet been produced: there is no single generally accepted way to do AI” (Shopman 1987:6). Caplinskas (1998), however, defines three AI paradigms: the behaviorist paradigm, the agent paradigm, and the artificial life paradigm. Norvig (1992, 2002), meanwhile, associates the term with Lisp programming to express the paradigm of Artificial Intelligence Programming as being equivalent to a programming approach. Next, Cristianini (2014) distinguishes four AI paradigms: data-driven AI, statistical AI, knowledge-driven AI, and reasoning-and-search-based AI. Without much explanation as to why, Leary (2017) claims that the new Google AI paradigm is machine learning, while in a blog post titled “The AI Paradigm Shift,” Richardson (2018) refers broadly to the AI paradigm as an approach to engineering AI systems, such as deep learning (DL), machine learning (ML), natural language processing (NLP), and robotics. Hernandez-Orallo (2020), meanwhile, claims that the concepts of AI paradigms have been used to denote “broad families of technical or conceptual approaches: ‘symbolic’ vs ‘connectionist’, reasoning vs learning, expert systems vs agents.” Many more examples of AI paradigm definitions can be cited (e.g., Cole 2020, Bader and Hitzer 2005, Garcez et al. 2019, Garcez and Lamb 2020, Harvey 2013, Kautz 2022, Mitchell 2020, Neapolitan and Jiang 2018, Russell and Norvig 2022, Searle 1998, Smith 2018, Wooldridge 2020).

We propose that the term “AI paradigm” is to denote a broad, conceptual construct that underlies AI systems. The definition allows for multiple implementations, formal data structures, representations, languages, hardware platforms, programming methods, and processing algorithms,<sup>1</sup> with these all belonging to a single paradigm. Such general definition will be applicable to different areas of AI technology at different levels of generalization. For AI systems aiming at human-level intelligence (AGI) capacity we propose that the AI paradigm definition could be based on ontological commitment of AI design. Such a criterion will separate real technological innovations from “emperor new cloths” claims. In the presentation this proposal is expanded and explained in more details.

References available on request.

---

<sup>1</sup> We use the term algorithm in the general sense of a procedure that can be conceptualized and implemented in a computer. This follows Knuth’s definition of “A procedure that has all of the characteristics of an algorithm except that it possibly lacks finiteness may be called a computational method” (Knuth 1997:5-6).