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# Abstract

The stupefying success of Artificial Intelligence (AI) for *specific* problems, from recommender systems to self-driving cars, has not yet been matched with a similar progress in *general* AI systems, coping with a variety of problems. This dissertation deals with the long-standing problem of creating more general AI systems, through the analysis of their development and the evaluation of their cognitive abilities.

Firstly, this thesis contributes with a general-purpose learning system that meets several desirable characteristics in terms of expressiveness, comprehensibility and versatility. The system works with approaches that are inherently general: inductive programming and reinforcement learning. The system does not rely on a fixed library of learning operators, but can be endowed with new ones, so being able to operate in a wide variety of contexts. This flexibility, jointly with its declarative character, makes it possible to use the system as an instrument for better understanding the role (and difficulty) of the constructs that each task requires. The learning process is also overhauled with a new developmental and lifelong approach for knowledge acquisition, consolidation and forgetting, which is necessary when bounded resources (memory and time) are considered.

Secondly, this thesis analyses whether the use of intelligence tests for AI evaluation is a much better alternative to most task-oriented evaluation approaches in AI. Accordingly, we make a review of what has been done when AI systems have been confronted against tasks taken from intelligence tests. In this regard, we scrutinise what intelligence tests measure in machines, whether they are useful to evaluate AI systems, whether they are really challenging problems, and whether they are useful to understand (human) intelligence. Finally, the analysis of the concepts of development and incremental learning in AI systems is done at the conceptual level but also through several of these intelligence tests, providing further insight for the understanding and construction of general-purpose developing AI systems.

**Keywords:** artificial intelligence, general-purpose learning systems, inductive programming, reinforcement learning, forgetting, task difficulty, cognitive development, evaluation of artificial systems, intelligence tests.