

Back to the Future: Learning Classifier Systems as Cognitive Systems

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ABSTRACT

Cognitive System One (CS-1) was the first Learning Classifier System (LCS) that was introduced nearly four decades ago. Subsequently, LCSs have been substantially developed to be powerful classification systems that have unique abilities in terms of their ability to represent a problem, generalise, divide and conquer, learn and capitalise on discovered knowledge, which is unsurpassed in a single approach.

However, they have moved away from being a cognitive system, which will ultimately place a limit on the classification ability due to lack of scalability and difficulties in transferring their learning to related domains. A cognitive system is one that can perceive, represent, reason, learn and act in a given environment, where traditional LCSs (and many evolutionary computation techniques) operate in single, self-enclosed domains. This presentation describes 20 years of work motivated by the observation that to solve certain problems, patterns of knowledge are needed that are not present immediately in the data. The ability to abstract

patterns, scale knowledge and reuse/transfer knowledge from one related domain to another is often needed to solve complex problems in a practical timeframe. LCSs with their roots as cognitive systems are ideally placed to gain these abilities, with work in abstraction, scaling and transfer learning utilising LCSs to be presented. The consequences of such systems in terms of computational requirements, methods for efficiency and a fundamental change in how LCSs need to be implemented will be discussed. The opportunities for future research that the cognitive systems approach to LCSs represents will be outlined.

Categories and Subject Descriptors

F.1.1 [Models of Computation]: Genetics-Based Machine Learning, Learning Classifier Systems

Keywords

Pattern classification, Learning Classifier Systems, Cognitive systems.

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