
Editorial Introduction

In writing the Introduction to this special issue we feel both honored and glad. Honored, because *Evolutionary Computation* is a major reference in our research community and serving as guest editors is a great opportunity for us. Glad, because this special issue arrives at a time when learning classifier systems are experiencing a period of exciting developments and results. Two of us joined the area in the mid 1990s, when there was little ongoing research and few application areas where learning classifier systems appeared truly successful. Today, after five or six years, the situation has completely changed. There is a lot of new work on both theory and applications; we find presentations and tutorials on learning classifier systems in many important conferences; the related international workshop (IWLCS) has become a yearly event that attracts many researchers; and recently a commercial implementation of learning classifier systems has been developed.

What has most characterized the recent years of research in this area is the development of new models of learning classifier systems. These models have generally maintained Holland's original ideas while having simpler architectures and stronger connections to reinforcement learning. In particular, the advent of the accuracy-based learning classifier system XCS has positively modified the way researchers look at these paradigms. It has also stimulated debates in the community regarding accuracy-based and strength-based systems. The radical change in the field was clearly seen during the management of this special issue: most of the papers we received considered models of learning classifier systems developed in the late 1990s; and three of the four papers in the issue deal with XCS or with modifications of XCS.

This special issue comprises four papers. A fifth paper, by Tim Kovacs, was selected by the reviewers and will appear in the next Spring issue. In the first paper, Ester Bernardó-Mansilla and Josep Garrell-Guiu analyze the performance of two accuracy-based learning classifier systems in the context of supervised classification. One is XCS, the other, UCS, is a modification of XCS specifically designed for solving classification problems. The authors show that accuracy-based learning classifier systems perform competitively with other machine learning approaches and suggest that, although XCS represents a more general approach, UCS should be expected to perform better in supervised classification tasks. In the next paper, Martin Butz, David Goldberg, and Kurian Tharakunnel study different facets of the evolutionary pressure in XCS. The authors add tournament selection to XCS and study its effect on fitness pressure. They derive bounds on the population size that permit fitness pressure to be effective. Finally, they analyze a possible fitness dilemma and the influence of fitness pressure on the evolutionary process in general. Xavier Llorà and David Goldberg study the impact of noisy data on the performance of multiobjective *Pittsburgh-style* learning classifier systems. The authors start from a simple classification task involving artificially added noise. Then, they derive a theoretical model for predicting the minimal achievable error in noisy domains. Their measure also allowed them to bound the behavior of multiobjective learning classifier systems. In the last paper, Christopher Stone and Larry Bull discuss the use of interval-based representations with XCS for problems involving real

inputs. The authors analyze two representations introduced in the literature (i.e., the *center-spread* representation and the *ordered-bound* representation) together with their associated genetic operators and show evidence of considerable representational bias. An alternative interval-based representation, called *unordered-bound* representation, is introduced and its representational bias is studied.

We wish to thank Darrell Whitley, who first gave us the opportunity to organize this special issue, and Marc Schoenauer, who gave us his support when he succeeded Darrell Whitley as editor in chief. We also wish to thank the reviewers who worked hard to help us select the papers, and of course all the authors who submitted their work.

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