Cooperative concept learning by means of a distributed GA

Filippo Neri
Marie Curie Fellow at Unilever Research Port Sunlight
Quarry Road East, Bebington, Wirral, CH363JW, UK, and
Researcher at University of Piemonte Orientale, Italy
email: neri@di.unito.it

1 Extended abstract

Two cooperative concept learning strategies are investigated with respect to the features of the found concept descriptions. The system REGAL is used as a experimental framework. The objective is to produce a more efficient learning system. A description about how to setup a suitable experimental setup is reported.

It is worthwhile to note that, in principle, these cooperative learning strategies could be applied to a pool of different learning systems.

REGAL [Neri and Saitta, 1996, Neri, 1997] learns relational disjunctive concept descriptions in a restricted form of First Order Logic by using cooperative evolution. REGAL's architecture is a network of N processes *GALearners*, coordinated by a *Supervisor* that imposes cooperation among the evolving populations. Each $GALearner_n$ tries to find a description for a subset of the learning instances LS_n by evolving its population. In addition, the *GALearners* may perform migration (exchange) of individuals. The *Supervisor* coordinates the distributed learning activity by periodically assigning different subsets of the learning instances to the *GALearners*. The composition of these subsets depends on the specific cooperative policy used. Two policies of cooperation have been investigated.

As no a priori information is available on what is a successful assignment of learning instances, we decided to develop two cooperative learning strategies based on different assumptions.

The first cooperative learning strategy, named Let Seed Expand, works as follows: when a learner find a description ψ, remove from its learning set all the instances covered by other already found descriptions and not covered by ψ, and let ψ improve. In some sense, this policy realizes a pool of "divide et impera" learners evolving in parallel.

The second form of cooperation, named Describe Those Still Uncovered, forces the learners in dealing as soon as possible with the instances difficult to cover. Essentially, as soon as a promising concept description emerges, the instances not covered by it are included into all the learning sets, whereas each covered instance is inserted into only one learning set.

The two cooperative strategies show different behaviors with respect to the features of the found concept descriptions. We believe that a (distributed genetic base) learner able to exploit both cooperative strategies may acquire satisfactory concept descriptions across a wide range of applications. Further research to investigate this claim is in progress.

References

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