

Artificial Intelligence: Important and Applications of Soft Computing

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ABSTRACT

Soft computing differs from conventional (hard) computing in that, unlike hard computing, it is tolerant of imprecision, uncertainty and partial truth. In effect, the role model for soft computing is the human mind. The guiding principle of soft computing is: Exploit the tolerance for imprecision, uncertainty and partial truth to achieve tractability, robustness and low solution cost.

Keywords: Artificial Intelligence, Soft Computing, Neural Computing, Fuzzy Logic

I. INTRODUCTION

There were two different global approaches to Artificial Intelligence. First one deals with development of artificial intelligent system as a collection of rules or other knowledge structures given by men or partially self-learned, and a powerful inference engine, which could derive results similar to ones, which expert human being could produce. Alternative approach to AI suggests creation of relatively simple agents and their evolution to more complex and fittest structures, trying to reach the same goal-an intelligent machine. This distinction transformed later into symbolic and non-symbolic AI; into up-bottom and bottom-up approaches. New techniques emerged and were placed on one or another part. Soft Computing and Artificial Life are two relatively new areas of AI which are both growing fast and gaining acceptance. Both of them are representative of non-symbolic wing of AI and their unification practically covers this area as a whole. Some people feel that artificial life and soft computing are distinct areas with little overlap except when artificial life researchers occasionally use evolutionary computation techniques like genetic algorithms and fuzzy logic to control their artificial beings. It may also be well argued that Artificial Life and Soft Computing are very closely related fields.

Soft Computing (SC) are Fuzzy Logic (FL), Neural Computing (NC), Evolutionary Computation (EC) Machine Learning (ML) and Probabilistic Reasoning (PR). The complementarities of FL, NC, GC, and PR has an important consequence: in many cases a problem can be solved most effectively by using FL, NC, GC and PR in combination rather than exclusively. An example of a particularly effective combination is

what has come to be known as "neuro fuzzy systems." Such systems are becoming increasingly visible as consumer products ranging from air conditioners and washing machines to photocopiers and camcorders. Less visible but perhaps even more important are neurofuzzy systems in industrial applications. What is particularly significant is that in both consumer products and industrial systems, the employment of soft computing techniques leads to systems which have high MIQ (Machine Intelligence Quotient). In large measure, it is the high MIQ of SC-based systems that accounts for the rapid growth in the number and variety of applications of soft computing.

The conceptual structure of soft computing suggests that students should be trained not just in fuzzy logic, neuro-computing, genetic programming, or probabilistic reasoning but in all of the associated methodologies, though not necessarily to the same degree.

II. APPLICATIONS OF SOFT COMPUTING

In many cases a problem can be solved most effectively by using Fuzzy Logic, Neural Networks, Evolutionary Computation in combination rather than exclusively. A good example of a particularly effective combination is what has come to be known as neurofuzzy systems. The examples of SC application are the usage of Evolutionary Computation techniques, like Genetic Algorithms to evolve Neural Nets, Fuzzy/NeuroFuzzy Systems and Cellular Automata. When the problem is nearly decomposable, like structural and parametric learning in Neural Nets, it's more convenient to apply the techniques which better suit for particular sub-problem. For instance, GA and other

EC methods showed good results in development of network architecture, while other techniques like back propagation, well fit for parametric learning.

Soft Computing is dedicated to system solutions based on soft computing techniques. It provides rapid dissemination of important results in soft computing technologies, a fusion of research in evolutionary algorithms

and genetic programming, neural science and neural net systems, fuzzy set theory and fuzzy systems, and chaos theory and chaotic systems.

Soft Computing encourages the integration of soft computing techniques and tools into both every day and advanced applications. By linking the ideas and techniques of soft computing with other disciplines, as a unifying platform that fosters comparisons, extensions, and new applications.

III. CONSTITUENTS OF SOFT COMPUTING

“Basically, soft computing is not a homogeneous body of concepts and techniques. Rather, it is a partnership of distinct methods that in one way or another conform to its guiding principle. The dominant aim of soft computing is to exploit the tolerance for imprecision and uncertainty to achieve tractability, robustness and low solutions cost. The principal constituents of soft computing are fuzzy logic, neuro computing, and probabilistic reasoning, with the latter subsuming genetic algorithms, belief networks, chaotic systems, and parts of learning theory. In the partnership of fuzzy logic, neuro computing, and probabilistic reasoning, fuzzy logic is mainly concerned with imprecision and approximate reasoning; neuro computing with learning and curve-fitting; and probabilistic reasoning with uncertainty and belief propagation”.

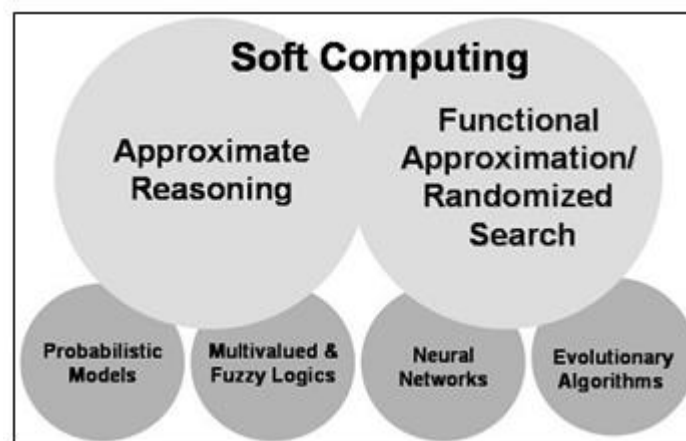


Fig. 1: Relationship in the Fields of Soft Computing

In the soft computing framework, the basic idea which has been developed so far has consisted in supposing that there is a set of resolving agents which are basically algorithms for solving combinatorial optimization problems, and to execute them cooperatively by means of a coordinating agent to solve the problem in question, taking the generality based on minimum knowledge of a problem as a fundamental premise. Each solving agent acts autonomously and only communicates with a coordinating agent to send it the solutions as it finds the mand to receive guidelines about how to proceed. The coordinating agent receives the solutions found by each solving agent for the problem, and following a fuzzy rule base to model its behavior, it creates the guidelines which it then sends to them, thereby taking total control of the strategy.

IV. CONCLUSION

Soft computing differs from conventional (hard) computing in that, unlike hard computing, it is tolerant of imprecision, uncertainty, partial truth, and approximation. Soft computing is likely to play an especially important role in science and engineering, but eventually its influence may extend much farther. In this paper we mainly discussed the human subjectivity, or even closeness to an ideal value, the best comparative way of modeling this type of situation is by means of fuzzy sets, or more generally with soft computing methodologies.

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