Foreword

An "intelligent" machine embodies artificial intelligence in a general sense, and as a result displays intelligent behavior. The field of artificial intelligence evolved with the objective of developing computers that can think like humans. An intelligent machine relies on computational intelligence in generating its intelligent behavior. This requires a knowledge system in which representation and processing of knowledge are central functions.

Soft computing has effectively complemented conventional AI in the area of machine intelligence, and is widely used in knowledge representation and decision making associated with intelligent machines. It is an important branch of computational intelligence where fuzzy logic, probability theory, neural networks, and genetic algorithms are synergistically used to mimic reasoning and decision making of a human. In this context, fuzzy techniques attempt to approximate human knowledge and the associated reasoning process; neural networks are an artificial representation of the neuron structure of a brain; genetic algorithms follow procedures that are similar to the process of evolution in biological species; and uncertainty and the associated concept of probability are linked to approximation and are useful in representing the randomness in practical systems. Quite effective are the mixed or hybrid techniques, which exploit the advantages of two or more of these areas. In particular, fuzzy logic is useful in representing human knowledge in a specific domain of application and in reasoning with that knowledge to make useful inferences or actions. Artificial neural networks (NN) are massively connected networks of computational "neurons." Their computational power, learning capability, and the ability to approximate nonlinear functions are quite beneficial in intelligent systems. Genetic algorithms (GA) are derivative-free optimization techniques that can evolve analogous to biological evolution, and are applicable in machine intelligence, particularly when optimization is an objective.

As the field of soft computing matures into an engineering discipline, one needs to go from the development and enhancement of a sound analytical foundation to modeling, algorithm development, solution of benchmark problems, computer simulation, implementation in useful prototypes that are sufficiently complex, and rigorous testing and evaluation. The book, *Innovations in Intelligent Systems and Applications,* edited by Dr. Ajith Abraham, Dr. Lakhmi Jain, and Berend Jan van der Zwaag makes an important and valuable contribution towards this end. The editors are internationally recognized experts in the field, and this makes the work authoritative. Equally important is the fact that they have carefully chosen a set of contributions that highlight the state of the art of intelligent paradigms.

The book covers such important topics as intelligent multi-agent systems, data mining, case-based reasoning, Bayesian control, universal approximators, and rough sets, all of which are central to intelligent systems and applications. In fact, the investigated techniques like pattern recognition and classification, machine learning, natural language processing, grammar, evolutionary schemes, fuzzy-neural procedures, and intelligent vision are all essential to the development of intelligent machines. The applications given in the book are quite relevant, complementary, and practically useful. They range from medical diagnosis and technical/medical language translation, to power demand forecasting, manufacturing plants, and pedestrian monitoring. In view of the depth and breadth of the coverage and the usefulness of the techniques and applications, *Recent Advances in Intelligent Paradigms* will undoubtedly be a valuable reference for experts and students alike.

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