Preface

Intelligent systems have the general ability to cope successfully with a complex and changing environment. Regardless of how intelligent behaviour is achieved, intelligent systems are built on some common underlying principles derived from research in artificial intelligence conducted over the past four decades. These include: (1) representation and search, (2) management of uncertainty, (3) learning ability, and (4) problem solving. The most representative and important areas of research and development in intelligent systems are: (1) natural language processing systems, (2) intelligent decision support systems, (3) intelligent tutoring systems, (4) machine learning systems, (5) intelligent robotic systems, and (6) expert systems. In the last few years, systems based on multiple intelligent agents have become a popular area of study. These agents are designed to possess some of the following characteristics such as rationality, autonomy, social ability, mobility, pro-activeness, selectivity and robustness. These software robots perform such varying functions as intelligent assistants to specialist consultants in distributed systems. So, naturally, scientists from several disciplines such as computer science, psychology, philosophy, logic, linguistics, and neuro-biology have contributed to the growth of this area. As a consequence, neural networks and genetic algorithms have emerged as independent disciplines coming under machine intelligence. Intelligent systems have been developed for a variety of applications including medical diagnosis, geological exploration, chemical data interpretation, financial decision making, equipment fault diagnosis, and computer configuration. Some of the major projects in this area are: (1) engineering and operation of spacecraft, (2) intelligent multimedia/multi-modal (M4) systems, (3) monitoring patients in intensive care units, (4) management and accounting information systems, and (5) intelligent information retrieval systems.

The *Journal of the Indian Institute of Science* publishes research papers in both science and engineering. During 1990, two special issues of this journal dealing with the contributions of artificial intelligence research community of the Indian Institute of Science were brought out. Stimulated by the response of the research community to these special issues, it was proposed to bring out special issues of this journal on a related and very important topic of intelligent systems. Further, it was felt that a richer collection of papers can be obtained if contributions are solicited from researchers in this area all over the country. Totally, 16 papers are selected for publication in two special issues.

The first issue has eight papers dealing with several basic and applied issues of knowledge-based systems. The paper by Srinivas, *et al.* deals with a cognitive experiment for belief propagation. The paper by Mathur considers a cross-entropy measure for precedent case selection in case-based reasoning. The paper by Uma and Siva Perraju describes a distributed problem-solving system. The remaining five papers in this issue deal with various applications. The paper by Mahabala *et al.* considers a knowledge-based range safety advisor. The paper by Kamalini *et al.* describes a knowledge-based

design environment for spacecraft. The paper by Basu *et al.* deals with a knowledge engineering tool for scene recognition. Veena Vani *et al.* consider an automatic map-understanding system. The paper by Prem Kumar and Venkataram deals with the application of fault and performance management in communication networks.

The second issue has eight papers dealing with foundational and applied issues of machine learning. The paper by Subudhi and Swain deals with a fuzzy logic controller designed using genetic algorithms. The paper by Rajaraman and Sastry deals with a parallel stochastic algorithm for learning logic expressions under noise. The paper by Thathachar and Arvind describes solution of Goore game using modules of stochastic learning automata. Swain and Subudhi consider a parameter estimation scheme using an artificial neural network. The paper by Srinivasan *et al.* considers indirect adaptive control of periodic time-varying systems using neural networks. The paper by Prakash and Murty deals with feature selection using genetic algorithms. The paper by Nagabhushana and Chandrasekharaiah considers adaptive fault diagnosis of large power networks using genetic algorithms. The final paper of this issue considers the application of time-series forecasting of electric load.

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Guest Editors