Sankar K. Pal - IRSS Fellow Plenary Speaker

Indian Statistical Institute, Kolkata, India

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Title of the talk: 50+ Years of Fuzzy Sets: Data to Knowledge

Abstract: The theory of fuzzy sets (FS) was first explained in 1965 by Lotfi A. Zadeh, University of California, Berkeley. The theory has been explored as a model of uncertainty analysis during the last fifty years by scientists over the globe for developing methodologies for decision-making problems of various kinds. The successful application areas and systems developed broadly include: fuzzy logic control based systems, fuzzy expert systems, and fuzzy pattern recognition and image processing systems. While the aims were to emulate and replace human operators and human expertise respectively in the first two categories, generalization and uncertainty handling were the objectives in the other.

The talk addresses the characteristic features of fuzzy pattern recognition and image processing systems, mentioning the growth and evolution of the discipline. It highlights the contributions made towards this from Indian Statistical Institute, Kolkata since early 1975. The talk starts with the concept of membership function, impact on different disciplines, relevance of FS to pattern recognition problems, and explains with examples the significance of multi-valued recognition systems and the notion of embedding. Data mining and knowledge discovery from pattern recognition perspectives is explained. Then follows the objective of synergistic integrations of FS with artificial neural networks, genetic algorithms and rough sets, among others, in soft computing for improved performance, computational intelligence and decision-making. Emergence of granular mining in rough-fuzzy framework is explained along with the concepts of f-information granules and rough knowledge encoding, as well as the perception granules and Z-numbers. All these features are demonstrated through example experimental results in various domains ranging from speech recognition, image and video analysis, to bio-informatics and social networks.

The talk concludes with future directions of research and relevance to CTP (computational theory of perceptions), natural computing and Big data analysis.

Biography: Sankar Kumar Pal is a distinguished Scientist and former Director of the Indian Statistical Institute, Kolkata, India. He is a Computer Scientist with an International reputation on Fuzzy Neural network, Soft Computing, and Machine Intelligence. He is the founder President of the Indian National Academy of Engineering, Kolkata.

Prof. Pal founded the Machine Intelligence Unit in 1993, and in 2004 a National Facility Centre for Soft Computing Research at the ISI. He was awarded Padma Shri in Science and Engineering on 5 April 2013 by the President of India, Mr. Pranab Mukherjee in recognition for his work in Machine Intelligence. Prof. Pal is widely recognized across the world for his pioneering and extraordinary contributions in Machine Intelligence, Fuzzy Logic, Soft Computing and Pattern Recognition. This has also made India a leader in these disciplines in international scenarios.

His areas of research interests include Fuzzy sets and uncertainty analysis, Artificial Neural Networks for Machine Intelligence, Pattern recognition, Image processing, Data Mining, Genetic algorithms, Rough sets, and Soft computing. He has pioneered Hybrid Intelligent systems like neuro fuzzy and rough fuzzy hybridization.

He is a co-author of seventeen books and has more than 400 Research Publications. Prof .Pal is also a world renowned Editor of 20 International Scientific Journals published in Computer Science and Engineering in the world.