

Background:

Rough set theory and its applications form the pivot of my research work. The major tools that I have used in my work come from the areas of modal logics and algebras, and very recently, my interests have extended to cognitive reasoning. My association with rough set theory dates back to my PhD thesis (1995). During my Ph.D. years, I had the good fortune and privilege to interact with Prof. Pawlak, when he invited me for several research visits to his institute in Warsaw. Boosted by immense encouragement from Prof. Mihir Chakraborty (my thesis supervisor), Prof. Pawlak and Prof. Skowron, mine was the first Ph.D. thesis in India on rough set theory. I was awarded the Indian National Science Academy (INSA) Medal for Young Scientists, for work on rough sets based on our proposed concept of ‘topological quasi-Boolean algebras’, research related to which was subsequently taken up by many and is still ongoing. After my Ph.D., I worked on applications of rough sets with Profs. Sankar K. Pal and Sushmita Mitra at the Machine Intelligence Unit, Indian Statistical Institute, Kolkata. The two groups at University of Calcutta and Indian Statistical Institute pioneered work on rough set theory and its applications in India. Later, at the Indian Institute of Technology (IIT) Kanpur (my workplace), I collaborated with Prof. Amitabha Mukerjee, a well-known name in AI, on introducing rough sets in the context of communicative approximations as used in language. Work with Prof. Yiyu Yao led to the proposal of a category-theoretic study of granular computing. With Prof. Shier Ju, we proposed applications of rough sets in studying open world models. Collaboration with Prof. Didier Dubois, led to the exploration and proposal of fundamental relationships between possibilistic logics and modal logics of belief and knowledge, in particular that of logics of rough sets.

At IIT Kanpur, I have supervised and am supervising Ph.D. and Masters theses, all on various facets of rough sets. Rough set theory is also part of a course in the curriculum of our department. During my research career, one of my prime intentions has been to show the mainstream community in mathematical logic and algebra, that some beautiful mathematics can emerge from rough set theory. I have tried to do this by (i) publishing our work in their journals, (ii) including rough sets as a focus area at logic conferences wherever I have had a say as organizer – e.g. in ICLA and ISLA, the flagship events of the Association for Logic in India, or (iii) through my students’ or my research visits – for instance, I designed and taught a course on rough set theory at the Institute of Logic and Cognition (ILC), China. For us in India, a source of great support and a platform for presenting and exchanging ideas on rough sets and logic, has been the Calcutta Logic Circle (CLC) that is spearheaded by Prof. Mihir Chakraborty. At CLC, we regularly organize sessions on non-classical theories including rough sets and invite stalwarts working in the areas. Over the years, this has served to greatly enthuse many to take up studies on rough sets.

Vision for IRSS:

The world of research on rough set theory and its applications has come a long way since the inception of the theory by Prof. Pawlak. He was a great visionary, having foreseen far-reaching applications of rough sets in a variety of domains. The vision has come true, and rough sets are indeed being applied in a number of areas, successfully. The marvel lies in the basic concepts for rough sets that Prof. Pawlak proposed. These concepts and their generalizations have led to and are still leading to novel and neat theoretical work on rough sets in areas such as those related to category theory, algebras and logics.

Having noted the above, one must stress that it is time to re-visit foundational issues, both in theory and applications. When there is proliferation of work in an area for a substantial period of time, it is a good idea to pause, reflect and assimilate, and then move on, re-invigorated. It was with this idea that we have organized special sessions on foundations in rough set conferences like IJCRS or (earlier) RSFDGrC. A related need of the hour, is a dialogue between researchers working in theory and applications. Having a background in both theory and applications of rough sets as outlined above, I can very much appreciate the need for this dialogue. In the session on foundations of rough sets recently organised by us in IJCRS, apart from theoretical contributions on logical and other structures, much-needed summaries were provided about the theory behind different attribute reduction criteria, and the applicability of rough sets as a whole. I hope that further such common ground would be created through IRSS activities for researchers in both directions, so that they can appreciate each other's work, and some may go on to strike collaborations as well.

A couple more of points that appear important to me are as follows. There is a lack of text books in English, on rough set theory and applications. This needs to be addressed for the theory to have a wider reach amongst student communities of countries such as India, where English serves as the primary language of communication in higher education. Rough set theory has gone past the stage when it met with resistance by classicists – those who are naturally sceptical towards the advent of any non-classical theory. My experience with logicians from India and abroad, corroborates this. We now have several people in India, doing serious work on rough sets in both theory and applications, and this community needs to be further consolidated. Such serious work could be encouraged and strengthened by more (frequent) interactions amongst the researchers, with the help of IRSS.

I do hope to serve in the IRSS, in furthering these activities with my academic and organizational experience.

<http://home.iitk.ac.in/~mohua/profact.htm>

<http://home.iitk.ac.in/~mohua/res.htm>