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Granular Computing: Pursuing New Avenues of Computational Intelligence

Speaker: Professor Witold Pedrycz, University of Alberta, IEEE CIS Distinguished Lecturer

Co-organized by: CI/SMC, CompSoc and RAS Ottawa Chapters

Where: SITE 5084, University of Ottawa, 800 King Edward Ave, Ottawa

When: Tuesday April 19th, 2016, 6:30 - 8:00 PM

Admission is free but registration is required via Eventbrite (https://www.eventbrite.ca/e/technical-talk-granular-computing-pursuing-new-avenues-of-computational-intelligence-tickets-24485023364**)**

Refreshments will be served

Abstract:

In numerous real-world problems including a broad range of modeling tasks, we are faced with a diversity of locally available distributed sources of data and expert knowledge, with which one has to interact, reconcile and form a global and user-oriented model of the system under consideration. While the technology of Computational Intelligence (CI) has been playing a vital role with this regard, there are still a number of challenges inherently manifesting in these problems.

To prudently address these challenges, in this talk, we introduce a concept of information granules embracing a plethora of formal constructs such as intervals (sets), fuzzy sets, rough sets, etc. We highlight an emergence of higher type and higher order information granules in the analysis and synthesis of granular models. The fundamental problem that becomes central to all investigations is concerned with the formation of information granules. We elaborate on the principle of justifiable granularity and discuss its role as a key design vehicle facilitating a construction of information granules realized on a basis of available experimental evidence (which could be either numeric or granular).

We elaborate on a number of conceptual and design issues of granular models. In particular, it is demonstrated that granular models developed on a basis of existing numeric models of CI lead to their substantial augmentations and result in interesting and comprehensive ways of evaluation of their performance. Two general approaches under investigation are associated with a formation of granular parameter spaces and granular output spaces. The proposed assessment of the quality of the model embraces two generic criteria, namely a coverage criterion of experimental data and a specificity criterion. It is shown that a hierarchy of information granules gives rise to granular models both of higher type and higher order.

The detailed investigations are focused on selected problems of rule-based models, building auto-encoders in architectures of deep learning, and evolution of information granules when describing dynamics of data streams.

Speaker biography:

Witold Pedrycz is Professor and Canada Research Chair (CRC) in Computational Intelligence in the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, Canada. He is also with the Systems Research Institute of the Polish Academy of Sciences, Warsaw, Poland. In 2009, Dr. Pedrycz was elected a foreign member of the Polish Academy of Sciences. In 2012 he was elected a Fellow of the Royal Society of Canada. Witold Pedrycz has been a member of numerous program committees of IEEE conferences in the area of fuzzy sets and neurocomputing. In 2007 he received a prestigious Norbert Wiener award from the IEEE Systems, Man, and Cybernetics Council. He is a recipient of the IEEE Canada Computer Engineering Medal 2008. In 2009 he has received a Cajastur Prize for Soft Computing from the European Centre for Soft Computing for "*pioneering and multifaceted contributions to Granular Computing*". In 2013 he was awarded a Killam Prize and received a Fuzzy Pioneer Award 2013 from the IEEE Computational Intelligence Society.

His main research directions involve Computational Intelligence, fuzzy modeling and Granular Computing, knowledge discovery and data mining, fuzzy control, pattern recognition, knowledge-based neural networks, relational computing, and Software Engineering. He has published numerous papers in this area. He is also an author of 15 research monographs covering various aspects of Computational Intelligence, data mining, and Software Engineering.

Dr. Pedrycz is intensively involved in editorial activities. He is an Editor-in-Chief of *Information Sciences*, Editor-in-Chief of *WIREs Data Mining and Knowledge Discovery* (Wiley) and Co-Editor-in Chief of *Granular Computing* (Springer). He also currently serves as an Associate Editor of *IEEE Transactions on Fuzzy Systems* and is a member of a number of editorial boards of a number of international journals in the area of Computational Intelligence and intelligent systems.