

A GLIMPSE INTO THE FUTURE

Moderators: Burhan Turksen and Masoud Nikravesh

Panelists: Janusz Kacprzyk, K. Hirota, Vesa Niskenan, Masoud Nikravesh, Henri Prade, Enric Trillas, Burhan Turksen, Ron Yager, Lotfi A. Zadeh

Predicting the future of fuzzy logic is difficult if fuzzy logic is interpreted in its wide sense, that is, a theory in which everything is or is allowed to be a matter of degree. But what is certain is that as we move further into the age of machine intelligence and mechanized decision-making, both theoretical and applied aspects of fuzzy logic will gain in visibility and importance. What will stand out is the unique capability of fuzzy logic to serve as a basis for reasoning and computation with information described in natural language. No other theory has this capability.



Moderator: Burhan Turksen: I.B. Türksen received the B.S. and M.S. degrees in Industrial Engineering and the Ph.D. degree in Systems Management and Operations Research all from the University of Pittsburgh, PA. He joined the Faculty of Applied Science and Engineering at the University of Toronto and became Full Professor in 1983. In 1984-1985 academic year, he was a Visiting Professor at the Middle East Technical University and Osaka Prefecture University. Since 1987, he has been Director of the Knowledge / Intelligence Systems Laboratory. During the 1991-1992 academic year, he was a Visiting Research Professor at LIFE Laboratory for International Fuzzy Engineering, and the Chair of Fuzzy Theory at Tokyo Institute of Technology. During 1996 academic year, he was Visiting Research Professor at the University of South Florida and Bilkent University. He is a member of the Editorial Boards of the following publications: Fuzzy Sets and Systems, Approximate Reasoning, Decision Support Systems Information Sciences, Fuzzy Economic Review, Expert Systems and its Applications, Journal of Advanced Computational Intelligence, Information Technology Management, Transactions on Operational Research, Fuzzy Logic Reports and Letters, Encyclopedia of Computer Science and Technology, Failures and Lessons Learned in Information Technology. He is the co-editor of NATO-ASI Proceedings on Soft Computing and Computational Intelligence, and Editor of NATO-ASI Proceedings on Computer Integrated Manufacturing. He is a Fellow of IFSA and IEEE, and a member of IIE, CSIE, CORS, IFSA, NAFIPS, APEO, APET, TORS, ACM, etc. He is the founding President of CSIE. He was Vice-President of IIE, General Conference Chairman for IIE International Conference, and for NAFIPS in 1990. He served as Co-Chairman of IFES'91 and Regional Chairman of World Congress on Expert Systems, WCES'91, WCES'94, WCES'96 and WCES'98, Director of NATO-ASI'87 on Computer Integrated Manufacturing and Co-Director of NATO-ASI'96 on Soft Computing and Computational Intelligence. He was General Conference Chairman for Intelligent Manufacturing Systems, IMS '98, IMS '01. He was the President during 1997- 2001 and Past President of IFSA, International Fuzzy Systems Association during 2001-2003. Currently, he is the President, CEO and CSO, of IIC, Information Intelligence Corporation. He received the outstanding paper award from NAFIPS in 1986, "L.A. Zadeh Best Paper Award" from Fuzzy Theory and Technology in 1995, "Science Award from Middle East Technical University, and an "Honorary Doctorate" from Sakarya University. He is a His current research interests centre on the foundations of fuzzy sets and logics, measurement of membership functions with experts, extraction of membership functions with fuzzy clustering and fuzzy system modeling. His contributions include, in particular, Type 2 fuzzy knowledge representation and

reasoning, fuzzy truth tables, fuzzy normal forms, T-formalism which is a modified and restricted Dempster's multi-valued mapping, and system modeling applications for intelligent manufacturing and processes, as well as for management decision support and intelligent control.



Moderator: Dr. Masoud Nikravesh
BISC Executive Director and Program Manager

Dr. Nikravesh is the Executive Director of BISC (Berkeley Initiative in Soft Computing), the Computer Science Division at the University of California, Berkeley. BISC is a world-leading center for basic and applied research in soft computing, computing with words (CW), computational theory of perception (CTP), common senses and human reasoning, and precisiated natural language (PNL)-computation and reasoning with information presented in natural languages. Dr. Nikravesh's main focus has been on the development of computational intelligence within the framework of soft computing (evolutionary computing including GA and DNA coding, neural network, fuzzy logic, and probabilistic reasoning). The framework has been applied for data understanding and knowledge discovery from multiple scientific domains. Dr. Nikravesh is visiting Research Scientist in the Imaging and Informatics Group at, Lawrence Berkeley National Laboratory. He is the LBNL-NERSC (National Energy Research Scientific Computing Division) representative to the DiMI- UC Discovery Program and he is member of Executive Committee and member of research council-UC Discovery program. Dr. Nikravesh has published six books and over 150 papers and presentations on a wide range of topics in artificial intelligence and soft computing. He has led a team of scholars and interacted with private and Government funding institutions to develop strategic research plans. He has served as reviewer and has been on the board of several public and private IT centers of excellence. His credentials have led to front-page news at Lawrence Berkeley National Laboratory News and headline news at the Electronics Engineering Times.



Prof. Janusz Kacprzyk is Deputy Director for Scientific Affairs in Systems Research Institute, Polish Academy of Sciences. His research interests include Fuzzy logic, Fuzziness in database management systems, Intelligent decision support systems, Fuzzy and possibilistic approaches to knowledge representation and processing, Management of uncertainty in knowledge-based systems, Decision making and control under uncertainty and imprecision (fuzziness), Evolutionary programming, and its applications, Neural networks, and their applications. He has acted as a Treasurer of IFSA and at present he is the President-Elect of IFSA.



Short Bio: Kaoru HIROTA was born in Japan on January 6, 1950. He received the B.E., M.E., and Dr. E. degrees in electronics from Tokyo Institute of Technology, Tokyo, Japan, in 1974, 1976, and 1979, respectively. From 1979 to 1982 he was with the Sagami Institute of Technology, Fujisawa, Japan. From 1982 to 1995 he was with the College of Engineering, Hosei University, Tokyo. Since 1995, he has been with the Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology, Yokohama, Japan. He has experienced (twice) a department head professor of Department

of Computational Intelligence and Systems Science. His research interests include fuzzy systems, intelligent robot, image understanding, expert systems, hardware implementation and multimedia intelligent communication. Dr. Hirota is a member of IFSA (International Fuzzy Systems Association (Vice President 1991-1993, 2005-2007, Treasurer 1997-2001 secretary 2003-2005, Fellow awarded in 2003)), IEEE (Associate Editors of IEEE Transactions on Fuzzy Systems 1993-1995 and IEEE Transactions on Industrial Electronics 1996-2000, IEEE CIS Distinguished Lecturer) and SOFT (Japan Society for Fuzzy Theory and Systems (Vice President 1995-1997, President 2001-2003)), and he is an editor in chief of Int. J. of Advanced Computational Intelligence and Intelligent Informatics. A Banki Donat Medal, Henri Coanda Medal, Grigore MOISIL Award, SOFT best paper prize in 2002, and honorary professorship at de La Salle University were awarded to Dr. Hirota. He also organized many international conferences/symposiums as a general chair or a program chair such as FUZZ-IEEE'95, InTech2002, and SCIS2002 (more than 10 in total). He has been publishing more than 150 journal papers and more than 350 conference papers in the field of computational intelligence.



Dr. Vesa A. Niskanen has studied fuzzy systems since the 1970's mainly from philosophical, logical and methodological standpoint. He completed his Licentiate's thesis on fuzzy logic in 1980 and Doctoral thesis on fuzzy linguistic models in 1986 in the Dept. of Philosophy at the University of Helsinki. Since 1980's he has focused his research on fuzzified theory of truthlikeness, philosophical aspects of Soft Computing and fuzzy linguistic cognitive maps. Dr. Niskanen acted as the Secretary of IFSA in 1999-2003. He is the Chair of BISC SIG in Philosophy of Soft Computing, Secretary of the IFSA Society NSAIS, and Chair of the IFSA Information Committee. Today Dr. Niskanen acts as a Docent and University Lecturer in the Dept.

of Economics & Management at the University of Helsinki. In this position he is also responsible for organizing instruction in informatics for the students in the Faculty of Forestry and Agriculture. Website: www.helsinki.fi/~niskanen



Henri Prade: Didier Dubois and Henri Prade are Research Advisors at IRIT, the Computer Science Department of Paul Sabatier University in Toulouse, France and belong to the French National Centre for Scientific Research (CNRS). They both received their Doctor-Engineer degree from ENSAE, Toulouse in 1977, and the "Habilitation" in 1986 from Toulouse University. They jointly wrote two monographs on fuzzy sets and possibility theory published by Academic Press (1980) and Plenum Press (1988) respectively. They have contributed many joint technical papers on uncertainty modeling and applications. They co-edited with Ronald Yager a volume entitled "Fuzzy Information Engineering: A Guided Tour of Applications" to be published by Wiley in 1996. More

recently they edited the "Handbooks of Fuzzy Sets Series" (Kluwer, 7 volumes 1998-2000). They are Editors in Chief of Fuzzy Sets and Systems and are member of the Editorial Board of several technical journals related to fuzzy sets including IEEE Transactions on Fuzzy Systems, Fuzzy Sets and Systems, the Inter. J. of Approximate Reasoning, Information Sciences, Soft Computing, Transactions on Rough Sets among others. They are both IFSA fellows and jointly received the Pioneer Award of the IEEE Neural Network Society. Their current research interests are in uncertainty modeling, non-classical logics, approximate and plausible reasoning with applications to Artificial Intelligence Decision Analysis, and Information Systems.



Short Bio: Enric Trillas (Barcelona, 1940) is full professor in the Technical University of Madrid, Department of Artificial Intelligence. Formerly, he was full professor at the Technical University of Barcelona. He was president of the Spanish High Council for Scientific Research, director general of the National Institute for Aerospace Technologies, and Secretary General of the Government's Committee for Science and Technology.

He graduated and obtained a Ph. D. from the University of Barcelona. He serves on the editorial board of a number of journals. He introduced fuzzy logic into Spain, and can be considered the "scientific father" of many fuzzy logic Spanish researchers. He has published over 200 articles and 5 books.

In addition to his pioneering work in Generalized Metric Spaces, from 1979 he has made contributions in Fuzzy Logic, with the study of fuzzy connectives, introducing t-norms, t-

conorms, negations, etc., and he has made contributions in approximate reasoning, with the study of implications and inference. In the last time he is doing researches on conjectural reasoning in the framework of ortholattices and standard theories of fuzzy sets, as well as in the revision of the grounds of fuzzy logic. Fellow of IFSA, in 1999 was awarded with the "European Pioneer Award" by the European Society of Fuzzy Logic and Technologies, and in 2005 awarded with the "Fuzzy Systems Pioneer" by IEEE-CIA.



Prof. Ronald R. Yager

Ronald R. Yager has published over 500 papers and fifteen books. A complete list of his publications can be found at <http://www.panix.com/~yager/HP/pubs.html>. He has made considerable contributions in fuzzy sets technology. He was the recent recipient of the IEEE Computational Intelligence Society Pioneer Award in Fuzzy Systems. Dr. Yager is a fellow of the IEEE, the New York Academy of Sciences and the Fuzzy Systems Association. He has served at the National Science Foundation as program director in the Information Sciences program. He was a

NASA/Stanford visiting fellow and a research associate at the University of California, Berkeley. He has served as a lecturer at NATO Advanced Study Institutes. He received his undergraduate degree from the City College of New York and his Ph. D. from the Polytechnic University of New York. Currently, he is Director of the Machine Intelligence Institute and Professor of Information and Decision Technologies at Iona College. He is editor and chief of the International Journal of Intelligent Systems. He serves on the editorial board of a number of journals including the IEEE Transactions on Fuzzy Systems, Neural Networks, Data Mining and Knowledge Discovery, IEEE Intelligent Systems, the Journal of Approximate Reasoning and the International Journal of General Systems.



Lotfi A. Zadeh

Prof. Lotfi A. Zadeh; BISC Director

Prof. Zadeh is a Professor in the Graduate School, Computer Science Division, Department of EECS, University of California, Berkeley. In addition, he is serving as the Director of BISC (Berkeley Initiative in Soft Computing). His earlier work was concerned in the main with systems analysis, decision analysis and information systems. His current research is focused on fuzzy logic, computing with words and soft computing. Lotfi Zadeh is a Fellow of the IEEE, AAAS, ACM, AAAI, and IFSA. He is a member of the National Academy of Engineering and a Foreign Member of the Russian Academy of Natural Sciences. He is a recipient of the IEEE Education Medal, the IEEE Richard W. Hamming Medal, the IEEE Medal of Honor, the ASME Rufus Oldenburger Medal, the B. Bolzano Medal of the Czech Academy of Sciences, the Kampe de Fériet Medal, the AACC Richard E. Bellman Central Heritage Award, the Grigore Moisil Prize, the Honda Prize, the Okawa Prize, the AIM Information Science Award, the IEEE-SMC J. P. Wohl Career Achievement Award, the SOFT Scientific Contribution Memorial Award of the Japan Society for Fuzzy Theory, the IEEE Millennium Medal, the ACM 2000 Allen Newell Award, and other awards and honorary doctorates.