Solving Complex Decision Making Problems: Towards an AI-assisted/enabled Judge-Advisor-Type Approach

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Abstract

We are concerned with decision making meant as a selection of a best, or maybe just good option(s) or a course of actions from some feasible ones which is presumably the most common act in human activities. We consider a complex decision making setting with multiple stakeholders who operate in various modes, under uncertain, imprecise and missing information, a high temporal changeability of all characteristics and specifications, multiple criteria, goals or aspects, etc. We advocate a synergistic human – computer interaction for solving such problems, combining the so-called automation with agency.

Such complex decision problems involve the two main stakeholders, the so-called judge, a domain expert who knows the field involved (e.g. city transportation system) but not necessarily the tools to be used for the solution (e.g. operations research), and the so-called advisor who knows the tools but not necessarily the domain. We show how such a judge-advisor setting is applied for complex decision processes. Our particular interest is in the characterization, modeling and evaluation of advice solicitation and then taking or rejecting, by the judge, and advice giving, by the advisor.

Within this general decision making process with the judge-advisor-type division of work, we show how some well-known paradigms of decision aid, decision support (systems) and recommendation can be implemented.

Moreover, we indicate an intrinsic relations to trustworthy SI-assisted decision making and autonomous AI-enabled decision support systems. Some examples on socioeconomic planning are mentioned.

Short Bio

Janusz Kacprzyk is Professor of Computer Science at the Systems Research Institute, Polish Academy of Sciences, WIT – Warsaw School of Information Technology, and Chongqing Three Gorges University, Wanzhou, Chongqing, China, and Professor of Automatic Control at PIAP – Industrial Institute of Automation and Measurements in Warsaw, Poland. He is Honorary Foreign Professor at the Department of Mathematics, Yli Normal University, Xinjiang, China. He is Full Member of the Polish Academy of Sciences, Member of Academia Europaea, European Academy of Sciences and Arts, European Academy of Sciences, Foreign Member of the: Bulgarian Academy of Sciences, Spanish Royal Academy of Economic and Financial Sciences (RACEF), Finnish Society of Sciences and Letters, Flemish Royal Academy of Belgium of Sciences and the Arts (KVAB), National Academy of Sciences of Ukraine and Lithuanian Academy of Sciences. He was awarded with 6 honorary doctorates. He is Fellow of IEEE, IET, IFSA, EurAI, IFIP, AAIA, I2CICC, and SMIA.

His main research interests include the use of modern computation computational and artificial intelligence tools, notably fuzzy logic, in systems science, decision making, optimization, control, data analysis and data mining, with applications in mobile robotics, systems modeling, ICT etc.

He authored 7 books, (co)edited more than 150 volumes, (co)authored more than 650 papers, including ca. 150 in journals indexed by the WoS. He is listed in 2020 and 2021 ”World’s 2% Top Scientists” by Stanford University, Elsevier (Scopus) and ScieTech Strategies and published in PLOS Biology Journal.

He is the editor in chief of 8 book series at Springer, and of 2 journals, and is on the editorial boards of ca. 40 journals.. He is President of the Polish Operational and Systems Research Society and Past President of International Fuzzy Systems Association.