Preface

Decision making accompanies a human being throughout their life. Most of the decisions they make are routine, with minor consequence. But some of them are extremely important. This has been noted many times before—decision making is the central topic of myriads of other publications elsewhere. So what is specific about decision making in *this* book?

This book includes extended versions of six selected contributions presented at "Scalable Decision Making: Uncertainty, Imperfection, Deliberation," a workshop held in conjunction with ECML/PKDD 2013, in Prague, Czech Republic. The focus was on uncovering the fundamental processes underlying the dynamic decision making of many interacting, imperfect, and selfish decision makers. Particular attention was paid to the roles of uncertainty, deliberation costs, and the inherent complexity of making decisions in these kinds of systems.

In their contribution, *E. Simpson and S. Roberts* continue to extend their earlier work on the theory and algorithmic support of crowdsourcing, presented in Chap. 1 of *Decision Making and Imperfection*, T.V. Guy,[1] M. Kárný, D.H. Wolpert, Eds., vol. 474, Springer, Berlin, 2013. Their analysis goes beyond simple extraction or aggregation of knowledge from imprecise opinions of a given crowd. In particular they propose a weak but efficient way of controlling such a crowd. Their associated "hiring and firing" algorithm allows one to extract more knowledge from such crowds at much lower costs. It improves the accuracy of combined decisions while requiring fewer responses from the crowd, and makes the crowdsourcing applicable to otherwise poorly manageable case.

P.G. Esteban and D.R. Insua presented work continuing their earlier development (Chap. 6 in the above cited book) of robots that interact with humans as robotic pets, robotic babysitters, teaching assistants, or cooperative caregivers for the elderly. They describe how the abilities of their robots to express and perceive

[1] The work of TVG and MK was supported by GAČR 13-13502S.

emotional features of their users and of other robots are being extended to cover both cooperative and competitive emotional features. The experiments describe the promise of the "adversary risk analysis methodology" they use.

M. Kárný and T.V. Guy explicitly consider decision making as a highly complex process and offer a unifying viewpoint on sources of apparent nonrationality of real decision makers. They focus, in particular, on the issues of preference elicitation; understanding the "non-rationality" caused by the difference of preferences declared and preferences followed; the choice of proximity measures in knowledge and preferences fusion; and the control of the deliberation effort spent on a specific decision-making task.

In their contribution, *K. Hlaváčková-Schindler and S. Pereverzyev* presented improved tools for solving a difficult and important inference problem concerning causality in gene expression networks. The importance of their work can hardly be exaggerated, e.g., for cancer diagnostics. At the same time, it shows how hard classical problems like estimation of the linear model structure are when applied to the scales common in the real world (e.g., several hundreds of measurements serving as the basis for selecting significant causes within a set of candidate causes having cardinality of the order 10^5). While their research was motivated by problems in genetics, there is every reason to believe that the resulting algorithms can be applied to other real-world problems; in particular, those arising in analyzing interactions in a multiagent system.

The chapter by *D. Zühlke, G. Grunst, and K. Rösser* presents recent research concerning support systems for identifying diagnostic result patterns that characterize pertinent patient groups for personalized medicine (breast cancer is considered as a disease example). It stresses how important it is to exploit all available knowledge in life-critical decision making, making a strong case for integration of established clinical findings with systems biology analyses. However, it is quite hard to combine knowledge-rich but vaguely structured opinions of medical experts with technically and formally precise analyses that lack much relevant data. Interactive cooperation of experts with automated feature selection algorithms is seen as the best way to make the features generated by such algorithms graspable and acceptable by medical experts.

S.K. Mesrobian, M. Bader, L. Gotte, A.E.P. Villa, and A. Lintas continue their studies of living organisms and especially people in decision making (Chap. 5 in the above cited book). It is a part of decision-making folklore that human emotions and individual personality (sometimes strongly) influence decision making. This work extends such folklore by studying these influences experimentally with the goal of uncovering quantitative repeatable outcomes. A particular focus is on using ultimatum and investment games to study the influence of human personality. The proximate goal of this work is to benefit patients affected by attention deficit hyperactivity disorder by altered activity in those neuromodulating circuits.

The editors would like to thank the contributors of this volume as well as other workshop participants who contributed to the many theoretical and technical discussions in the workshop and thereby to the present book.

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http://www.springer.com/978-3-319-15143-4

Decision Making: Uncertainty, Imperfection,
Deliberation and Scalability
Guy, T.V.; Karny, M.; Wolpert, D. (Eds.)
2015, XII, 184 p. 41 illus., 13 illus. in color., Hardcover
ISBN: 978-3-319-15143-4