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Information Quality in Information Fusion and Decision Making

Springer

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Preface

The subject of information quality has been considered by researchers and practitioners in many diverse fields such as organizational processes, management, product development, marketing, personal computing, health care, and publishing among others. At the same time, the problem of information quality in the fusion-based human-machine systems for decision-making has just recently begun to attract attention.

Information fusion is dealing with gathering, processing, and combining a large amount of diverse information from physical sensors (infrared imagers, radars, chemical, etc.), human intelligence reports, and information obtained from open sources (traditional such as newspapers, radio, TV, as well as social media such as Twitter, Facebook, and Instagram). That data and information obtained from observations and reports as well as information produced by both human and automatic processes are of variable quality and may be unreliable, of low fidelity, insufficient resolution, contradictory, and/or redundant. Furthermore, there is often no guarantee that evidence obtained from the sources is based on direct, independent observations. Sources may provide unverified reports obtained from other sources (e.g., replicating information in social networks), resulting in correlations and bias. Some sources may have malicious intent and propagate false information through social networks or even coordinate to provide the same false information in order to reinforce their opinion in the system.

The success of the information fusion processing depends on how well knowledge produced by the processing chain represents reality, which in turn depends on how adequate data are, how good and adequate are the models used, and how accurate, appropriate, or applicable prior and contextual knowledge is. The objective of this book is to provide an understanding of the specific problem of information quality in the fusion-based processing and address the challenges of representing and incorporating information quality into the whole processing chain from data to information to actionable knowledge to decisions and actions to support decision-makers in complex dynamic situations.

The book will emphasize a contemporary view on the role of information quality in fusion and decision-making and provide a formal foundation and implementation

strategies required for dealing with insufficient information quality in building fusion-based systems for decision-making. It offers contributions of experts discussing the fundamental issues, challenges, and the state of the art of computational approaches to incorporating information quality in information fusion processes to various decision support applications for real-life scenarios such as remote sensing, medicine, automated driving, environmental protection, crime analysis, intelligence, and defense and security. The book comprises two parts. Part one contains chapters devoted to models, concepts, and dimensions of information quality in information fusion. Part two includes chapters that describe the incorporation and evaluation of information quality in the fusion-based systems designed for various applications.

Hamilton, ON, Canada — Éloi Bossé
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Addendum

This Addendum concerns a recent open access survey paper that the Editors of this book highly recommend to read as a supplement to Part I:

Dubois, D., Liu, W., Ma, J., & Prade, H. (2016). The basic principles of uncertain information fusion. An organised review of merging rules in different representation frameworks. *Information Fusion, 32*, 12–39. https://doi.org/10.1016/j.inffus.2016.02.006

The authors of the paper present a state-of-the art survey of information fusion rules and their properties across various theories of uncertainty. Reading of the paper will enrich the reader's background to fully benefit from applications in Part II.

The Editors
Éloi Bossé
Galina L. Rogova

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