

# Preface

The emergence of various computational paradigms, from Sensor Networks and Internet of Things (IoT) to Social Networking, Cloud and Data Centers, is manifesting the need for their integration into larger computational systems to support end users with collective intelligence and decision-supporting systems in an inter-cooperative mode. Such integration and collective building of intelligence is raising many research and development issues and challenges due to the heterogeneous nature of computational resources (sensors, devices, servers, data centers, etc., of the interconnecting networks) of data sources as well as different computational intelligence layers on top of them. The inter-cooperative collective intelligence is emerging as a new cross-cutting feature in many multi domain applications, in which knowledge can be built in a collective manner, being it from information and actions of millions of Internet users worldwide in social networks, the intelligent networks of smart devices and intelligent things, networks of producers and consumers, or combinations of them. Among most salient features of collective intelligence is the decentralized co-creation and building of knowledge on certain activity, problem, phenomena, or complex system of interest driven by creativity, innovation, and collaborative problem solving. As an example, in the business domain, the inter-cooperative collective intelligence promotes the collaborative value creation as part of the business model.

This book investigates and provides insights on research issues in the field of collective intelligence and focuses especially on the new paradigm shift of collective intelligence built inter-cooperatively in large-scale Internet-based systems. This shift is being driven by the profound change of the Internet from the vision of a network of networks of computers to a global platform of people, computers, networks, and devices offering services and enabling interactions, and collaborations globally. Indeed, unlike the recent past when collective intelligence used to be built from single platforms, e.g., separate social networks nowadays, users can provide information from many interconnected platforms as well as from their mobile and wireless devices, which enrich the generated information with the context, and thus, enables to extract and build valuable knowledge in an inter-cooperative way. Additionally, such large amount of generated information can be nowadays accommodated in Cloud computing, inter-Clouds, and data centers, which make possible its massive, intelligent processing, and extraction of useful information and knowledge.

## Main Contributions of This Book

This book covers the latest advances in the rapid growing field of inter-cooperative collective intelligence aiming at the integration and cooperation of various computational resources, networks, and intelligent processing paradigms to collectively build intelligence and advanced decision support and interfaces for end users. The book brings a comprehensive view of the state of the art in the field of integration of Sensor Networks, IoT, Social Networks, Cloud Computing, Massive and Intelligent Querying, and Processing of Data. As a result, along its 15 chapters, the book presents insights and lessons learned so far and identifies new research issues, challenges, and opportunities for further research and development agenda. Emerging areas of applications are also identified and usefulness of inter-cooperative collective intelligence in multi-domain applications is envisaged.

Specifically, the contributions of this book focus on the following research topics and development areas of inter-cooperative collective intelligence:

*The Internet of Intelligent Things:* IoT is rapidly expanding to different application domains due to ever-increasing number of mobile and wireless devices connected to Internet and their increasing capability not only to observe but also to actuate on the real world. Therefore, the new paradigm of Internet of Intelligent Things (IoIT) has emerged. Through the cooperative sensing and coordination and action, the IoIT enables the development of collective intelligence applications.

*Cloud Computing and Data Centers:* The amount of information generated through Internet-based systems, users, devices, etc., as well as their interaction and collaboration require large computing and storing capacities due to the unprecedented amount of data. On the one hand, due to the advanced services delivered through the Cloud, the interactive collaboration and information generation can be at global large-scale systems. On the other hand, the Cloud computing and data Centers make possible to store and process very large amounts of data, known as “big data” and deliver *knowledge as a service* to end users.

*Integration of IoT and Cloud Computing Platforms:* The shift from collective intelligence to inter-cooperative collective intelligence is being pushed by the integration of various paradigms and technologies into large-scale systems. Indeed, the systems of today are able to embrace from low level layers of smart devices and intelligent things to mobile computing and the Cloud in a transparent and seamless way.

*Inter-cooperative Collective Intelligence:* The global nature of Internet-based systems and their conception in terms of various heterogeneous systems, data sources, social networks, smart networks, clouds, and inter-clouds add to the collective intelligence, the dimension of inter-cooperativity by which knowledge can be extracted from and delivered at global level.

*Social Networks and the Internet of Intelligent Things:* The combination of social networks and intelligent things enables not only sharing and problem-solving collaboratively, but also providing more accurate solutions to complex problems.

*Innovative Business Models and Services:* Businesses of today are driven by “business intelligence,” which among others promotes the need to create value in a decentralized, inter-cooperative, and collective way. Thus, the collective intelligence is seen as the way to obtain new innovative business models in which consumers and producers are intergrated into one business model.

*Emerging Applications:* The inter-cooperative collective intelligence is fast expanding to many application areas such as *World Sensing*, *Smart Cities*, *Intelligent Buildings*, *Ambient Intelligence*, *eHealth*, etc.

*Targeted Audience and Last Words*

The contributions in the book are from researchers from both academia and industry, who bring interesting views and experiences in the field of inter-cooperative collective intelligence. Thus, the audiences of this book—academics, instructors, and senior students as well as researchers and senior graduates from academia, networking and software engineers, data analysts, business analysts from industries and businesses—can benefit from such views as well as from the interdisciplinary nature of the contributions in the book.

We hope that the readers find this book useful in their academic and professional activities and that it can foster their collaboration and inspire them for innovative approaches in this rising field of inter-cooperative collective intelligence!

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