

Preface

A social network is an architecture made up of a set of actors (such as individuals or organizations) and a web of linkages between these actors. The social network perspective provides a clear way of analyzing the structure of whole social entities and identifying essential links among various nodes of the network. The study of these structures uses social network analysis to identify local and global patterns, locate influential entities, and examine complex network dynamics.

Indisputably, social networks and their analysis form an inherently interdisciplinary academic field, which has emerged from social psychology, sociology, statistics, and graph theory and attracts a great deal of attention from computer sciences and engineering. A few lines about the history could be worth bringing here. G. Simmel authored early structural theories in sociology emphasizing the dynamics of triads and “web of group affiliations.” Moreno is credited with developing the first sociograms in the 1930s to study interpersonal relationships. These approaches were mathematically formalized in the 1950s and theories and methods of social networks became pervasive in the social and behavioral sciences. Social network analysis is now one of the major paradigms in numerous disciplines. Together with other complex networks, social networks contribute to the emergence of the discipline of network science.

Generally speaking, social networks are self-organizing, emergent, and complex structures. Globally, coherent patterns appear as a result of some local interactions of the elements that make up the system. These patterns become more apparent as network size increases. However, a global network analysis of, for example, all interpersonal relationships in the world is not feasible and is likely to contain so much information that its relevance becomes questionable. Practical limitations come also with available computing power. The nuances of a local system may be lost in a large network analysis, hence the quality of information may be more important than its scale for understanding network properties. Thus, social networks are analyzed at the scale relevant to the research objectives. In other words, in one way or another, advanced analysis and synthesis environments need to engage concepts of information granularity. Although levels of analysis are not necessarily mutually exclusive, there are three general levels into which networks may fall, namely micro-level, meso-level, and macro-level.

In light of the inherent human-centric facet of social networks, the principles and practice of Computational Intelligence have been poised to play a vital role in the

analysis, design, and interpretation of the architectures and functioning of social networks. As a matter of fact, it has already exhibited a visible position there. In particular, we capitalize on the important facets of learning, structural design, and interpretability along with human-centricity, where all of these aspects are vigorously supported by the leading technologies of Computational Intelligence.

Taking into account the synergy among neurocomputing, fuzzy sets, and evolutionary optimization it is worth stressing that the same synergy plays a pivotal role in the analysis and synthesis of social networks. Fuzzy sets and Granular Computing bring a highly desirable feature of transparency of models of social networks and offer insights into their dynamics and interrelationships among key functional substructures. Evolutionary optimization and population-based optimization are of relevance in the context of the design of adaptive social networks, especially when being concerned with their optimization of underlying topologies and refinements of their hierarchical structures.

The ultimate objectives of the proposed edited volume is to provide the reader with an updated, in-depth material on the conceptually appealing and practically sound information technology of Computational Intelligence in social networks analysis, synthesis, and evaluation.

The volume involves studies devoted to key issues of social networks including community structure detection in networks, online social networks, knowledge growth and evaluation, and diversity of collaboration mechanisms. The book engages a wealth of methods of Computational Intelligence along with well-known techniques of linear programming Formal Concept Analysis, machine learning, and agent modeling. Human-centricity is of paramount relevance and this facet manifests in many ways including personalized semantics, trust metric, and personal knowledge management; just to highlight a few of these aspects. The contributors to this volume report on various essential applications including cyber attacks detection, building enterprise social networks, business intelligence, and forming collaboration schemes.

An overall concise characterization of the objectives of the edited volume can be presented by identifying several focal points:

- Systematic exposure of the concepts, design methodology, and detailed algorithms. The structure of the volume adheres to the top-down strategy starting with the concepts and motivation and then proceeding with the detailed design that materializes in specific algorithms and representative applications.
- Individual chapters with clearly delineated agenda and well-defined focus and additional reading material available via carefully selected references.
- A wealth of carefully structured and organized illustrative material. The volume includes a series of brief illustrative numeric experiments, detailed schemes, and more advanced problems.
- Self-containment. The intent is to provide a material that is self-contained and, if necessary, augment some parts with a step-by-step explanation of more advanced concepts supported by a significant amount of illustrative numeric material and some application scenarios.

Given the theme of this undertaking, this book is aimed at a broad audience of researchers and practitioners. Owing to the nature of the material being covered and the way it is organized, the volume will appeal to well-established communities including those active in various disciplines in which social networks, their analysis, and optimization are of genuine relevance. Those involved in operations research, management, various branches of engineering, and economics will benefit from the exposure to the subject matter.

Considering the way in which the edited volume is structured, this book may serve as a highly useful reference material for graduate students and senior undergraduate students in courses such as those on decision-making, Internet engineering, Computational Intelligence, management, operations research, and knowledge-based systems.

We would like to take this opportunity to express our sincere thanks to the authors for sharing the results of their innovative research and delivering their insights into the area. The reviewers deserve our thanks for their constructive and timely input. We greatly appreciate the continuous support and encouragement coming from the Editor-in-Chief, Prof. Janusz Kacprzyk whose leadership and vision makes this book series a unique vehicle to disseminate the most recent, highly relevant, and far-fetching publications in the domain of Computational Intelligence and its various applications.

We hope that the readers will find this volume of genuine interest and the research reported here will help foster further progress in research, education, and numerous practical endeavors.

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