Parallel Processing Letters

GUEST EDITORS NOTE
SPECIAL ISSUE ON
COMMUNITY STRUCTURES IN NETWORKS: METHODS AND APPLICATIONS

Networks in various application domains exhibit an internal structure: they consist of tightly connected components that are more loosely connected to the rest of the network. These components, known as communities, offer to the network structural properties that have proven valuable in various application domains. Mining such community structures is a valuable tool that can enhance the functionality of networks and applications. The uncovering of such structures is a fundamental problem in complex networks and occurs in a variety of forms.

The advent of Web 2.0 technology has accelerated the need to analyze network structures like web communities, social network relations, and in general user's collective activities. The newly emerging applications came along with a different set of problem parameters and demands due to the enormous data size and complexity, rendering the centralized manipulation of data prohibitive and raising the demand for flexible solutions.

Although community finding in networks is an old problem with a variety of solutions, novel emerging applications brought the problem into the surface with a revised set of demands and a whole new set of assumptions and parameters. What was known to be an isolated problem in complex network theory became a whole new area of research, raising new issues and opening a multitude of new perspectives.

The aim of this special issue is to capture the latest developments in the state-of-the-art for community finding. Furthermore, it aims to expose novel and emerging results and ideas in the field, especially in terms of algorithm design, performance measurements and benchmark studies. Another aspect is novel Web 2.0 techniques and applications that exploit community finding and strengthen new directions in the field.

The following four papers have been selected for this special issue:

- The paper entitled "Parallel clustering with CFinder" presents the Grid implementation of CFinder, which identifies overlapping communities in weighted, undirected networks based on the clique percolation method. The parallel version of this algorithm makes the extraction of communities of extremely large networks possible.
- In the paper "Diffusion cascades: Spreading phenomena in blog network

communities" the authors describe how the identification of the community structure of a network can be used for information diffusion between nodes and between communities. The applicability of the method for diffusion cascades in blog networks is described.

- The paper entitled "Locating communities on real dataset graphs using synthetic coordinates" describes a novel algorithm that reveals the entire community structure of a network based on a combination of synthetic coordinates and local interactions of the network nodes. The performance of the algorithm and its ability to identify the communities of graphs from real datasets is demonstrated.
- The final paper of this issue, entitled "Local community identification in social networks" describes a local method capable of identifying overlapping communities, even when the starting node resides at the boundary of a community, a case in which most other methods fail. Experiments on real and computer-generated networks (such as Netscience, Amazon 2006, and Lancichinetti's et al.' benchmarks) demonstrate the improved performance of the proposed method.

We would like to thank all the authors that contributed to this special issue.

Prof. Paraskevi Fragopoulou
Department of Applied Informatics and Multimedia
Technological Educational Institute of Crete, Greece
fragopou@ics.forth.gr

Prof. Artur Andrzejak
Institute of Computer Science
Ruprecht-Karls-University of Heidelberg, Germany
artur.andrzejak@informatik.uni-heidelberg.de

Dr. Carlo Mastroianni
ICAR-CNR, Institute of High Performance Computing and Networking
National Research Council, Rende (CS), Italy
mastroianni@icar.cnr.it

Dr. Costas Panagiotakis
Department of Commerce and Marketing
Technological Educational Institute of Crete, Greece
cpanag@staff.teicrete.gr