Preface

The past few decades have seen the rise of online social networks as a worldwide phenomenon with a high impact on our society. Beyond the obvious exposure phenomena, with obvious implications on security and privacy, people have started to become acquainted—even married!—in online social networks. In parallel, we have seen an enormous growth in terms of the number of published papers in computer science, mathematics and physics that study the organization of such networks. The availability of large free databases of friendships, collaborations and quotations have made possible to study social networks at a scale and with a precision previously unknown.

This issue of *Internet Mathematics*, titled *'Searching and mining the Web and social networks'*, was born out of the interest of the editors for the problem of searching and analyzing not only the web, but also social networks in a broad sense. In particular, we aimed to publish a collection of papers that take a rigorous mathematical viewpoint on problems most important and common in network applications. The general topics represented in this special issue cover ranking of the nodes, network measurements, and adversarial behavior. Each of these topics received a large attention in the literature. We believe however that the originality of the papers presented in this volume is in a high level of mathematical rigor.

All submitted articles have been thoroughly reviewed in accordance with the usual high standards of *Internet Mathematics*. Each paper received reviews from at least two experts: one in the field of application, and one in the in the relevant branch of mathematics. Some high quality submissions have been rejected because they did not sufficiently satisfied either the criterion of practical importance for social networks or did not have a sufficient mathematical depth.

The first two papers deal with the problem of detecting interesting properties of the nodes using only the structure of a social network (i.e., the underlying graph). In the paper *Axioms for centrality* by Paolo Boldi and Sebastiano Vigna the authors try to understand the inner works of *centrality measures*, which are designed to identify which nodes in a social networks are more important than others. The paper *Towards quantifying vertex similarity in networks* by Charalampos Tsourakakis proposes (somewhat dually) new techniques to identiy *similar* nodes in large networks.

The next two papers address statistical measurements in social networks, including the in-depth mathematical analysis of the proposed estimators. The paper *Degree-degree dependencies in random graphs with heavy tailed degrees* by Remco van der Hofstad and Nelly Litvak is the first rigorous study of statistical estimators for correlations between degrees of neighbouring nodes in general social networks, and in common random graph models for them. The paper *Estimating sizes of social networks via biased sampling* by Liran Katzir, Edo Liberty, Oren Somekh, and Ioana A. Cosma proposes a new random walk sampling techniques for estimating the network size – the basic network characteristic that is often important and unavailable in practice.

Finally, the last two papers are devoted to identifying, predicting, and preventing an adversarial behaviour in Web and social networks. The paper *Communities, random walks and social sybil defense* by Lorenzo Alvisi, Allen Clement, Alessandro Epasto, Silvio Lattanzi, Alessandro Panconesi addresses a question whether a sybil attack, when an adversary introduces fake nodes and links in the graph, can be identified, based solely on the graph structure. To this end, they study analytically the change of the graph characteristics under a specified model of the sybil attack. The paper *The classification power of Web features* by Miklós Erdélyi, András A. Benczúr, Bálint Daróczy, András Garzó, Tamás Kiss and Dávid Siklósi analyzes in a rigorous experimental setting a wide range of signals used to detect *spam* pages. Both these papers also provide an excellent review on their respective topics.

We would like to thank the authors of all submissions for their high quality contributions. It has been our pleasure to receive and handle the very interesting papers submitted to this volume. We hope that it will give rise to new fascinating research on the topic.

Nelly Litvak, Sebastiano Vigna, guest editors.