

# Preface

Social computing is an area of computer science at the intersection of computational systems and social behavior. Social computing facilitates behavioral modeling, which provides a mechanism for the reproduction of social behaviors and subsequent experimentation in various activities and environments. Contemporary development of novel theories and mechanisms in the understanding of social interactions requires cutting edge research borne from interdisciplinary collaboration. This communication is intended as a scientific literary publication meant to embrace a multidisciplinary audience while maintaining scientific depth.

This was the first international workshop on *Social Computing, Behavioral Modeling and Prediction*, held April 1-2, 2008. It provided an interdisciplinary venue that set the stage for sociologists, behavioral scientists, computer scientists, psychologists, anthropologists, information systems scientists, and operations research scientists to exchange ideas, learn new concepts, and develop new methodologies. Activities included seminars from guest speakers and keynote speakers, and oral and poster presentations. The workshop sessions were arranged into four categories: 1) User's views and requirements, 2) The computer scientist's view, 3) The social scientist's view, and 4) Government plans and research initiatives. The overarching goal was to provide a forum to encourage collaborative efforts in order to increase our understanding of social computation and evaluation. The program committee included researchers from Asia, Europe and the USA, and submissions to the workshop came from Norway, China, Germany, Japan, Italy and the USA, spanning industry, academia and national laboratories.

In one key-note address, Sun-Ki Chai represented University of Hawaii's Department of Sociology in, "*Rational Choice Theory: A Forum for Exchange of Ideas between the Hard and Social Sciences in Predictive Behavioral Modeling*". Scott Atran represented the Institute for Social Research (University of Michigan) in his key-note speech, "*Comparative Anatomy and Evolution of Terrorist Networks*". Lastly, "*The SOMA Terror Organization Portal (STOP): Social Network and Analytic Tools for Real-Time Analysis of Terror Groups*" was provided by V.S. Subrahmanian (University of Maryland Institute for Advanced Computer Studies). In

addition to keynote addresses, invited speaker Michael Hechter (Arizona State University School of Global Studies) addressed “*The Sociology of Alien Rule*”.

In addition to keynote and invited speakers, many scholarly ideas were presented at this workshop, and are conveyed in the following papers. This book contains several general themes, which include 1) data analysis on behavioral patterns, 2) modeling cognitive processes, 3) new tools for analyzing social networks, and 4) modeling organizations and structures. These themes will now be expanded upon in the context of the proceedings of this workshop.

**Data analysis on behavioral patterns.** Insights into the identification and classification of behavior patterns or attributes of individuals within a social network were presented by several research groups. “*Modeling Malaysian public opinion by Mining the Malaysian Blogosphere*”, by Brian Ulicny, delineates indicative behavior patterns of prominent individuals of the Malaysian Blogosphere. “*Behavioral Entropy of a Cellular Phone User*”, by Dantu et al. demonstrates the ability to capture an individual user’s calling behavior based on various patterns, taking randomness levels into account. “*Inferring social network structure using mobile phone data*”, by Eagle et al. offers a new method for measurements of human behavior based on proximity and communication data, which allows for prediction of individual-level outcomes such as job satisfaction.

Analyses to define attributes of a group or groups of individuals were also revealed. “*Using topic analysis to compute identity group attributes*”, by Booker and Strong, demonstrates a modeling framework that investigates inter-group dynamics. “*Behavior profiling for computer security applications*”, by Robinson et al. suggests a new methodology to categorize World Wide Web users based on web browsing activities. The authors have built a hierarchical structure representing key interest areas, which can be collapsed or expanded to include multiple levels of abstraction. Determinable behavior norms can be analyzed and user fingerprints can be created. Possible security applications include detection of policy violations, hacker activity and insider threat.

Behavior is also influenced by culture, which contributes greatly to group dynamics. “*Computational models of multi-national organizations*”, by Levis et al. illustrates an algorithm that takes cultural contributions into account. On a similar note, “*Stochastic Opponent Modeling Agents: a case study with Hezbollah*”, by Mannes et al. demonstrates how SOMA can be utilized to reason about cultural groups - in this case, Hezbollah. SOMA derived rules for Hezbollah and described key findings.

**Cognitive processes of learning, perception, reasoning, intent, influence and strategy.** A great deal of research is being performed on computation and modeling of human cognitive processes. “*Particle swarm social model for group social learning in adaptive environment*”, by Cui et al. demonstrates modeling of social learning for self-organized groups in an adaptive environment. This research provides insight into understanding the dynamics of groups such as on-line communities or insurgents. “*Conceptualizing trustworthiness mechanisms for countering insider threats*”, by Shuyuan Mary Ho, demonstrates that trustworthiness as determined by perception in an on-line community is a significant element in cor-

porate personnel security. “*Metagame strategies of nation-states, with application to cross-strait relations*”, by Chavez and Zhang, investigates models for strategic reasoning in gaming, where players mutually predict the actions of other players. This approach is highly applicable to the analysis of reasoning within nation-states. “*Reading between the lines: human-centered classification of communication patterns and intentions*”, by Stokar von Neuform and Franke, identifies communication patterns for qualitative text-context analysis, which aims to derive purpose, context and tone in order to infer intention. Lastly, “*Clustering of trajectory data obtained from soccer game records*”, by Hirano and Tsumoto, summarizes the strategy of game players. Results demonstrate patterns that may be associated with successful goals.

As briefly touched upon above, there are many cognitive complexities associated with human behavior. “*Human behavioral modeling using Fuzzy and Dempster-Shafer Theory*”, by Ronald Yager, combines fuzzy sets for the representation of human-centered cognitive concepts with Dempster-Shafer Theory to include randomness in the fuzzy systems. This combined methodology allows for the construction of models that include cognitive complexities and unpredictability in the modeling of human behavior.

**Tools for analysis of social networks.** By far, the largest general category presented at this workshop included tools and approaches for the analysis of social networks. “*Social network analysis: tasks and tools*”, by Loscalzo and Yu, provides an evaluation of tools developed for social analysis techniques, and how these tools address given tasks in social network analysis. “*Automating frame analysis*”, by Sanfilippo et al, presents an approach to the representation, acquisition, and analysis of frame evidence. This approach provides content analysis, information extraction and semantic search methods in order to automate frame annotation. “*A composable discrete-time cellular automaton formalism*”, by Mayer and Sarjoughian, provides support for extensive use of cellular automata in simulating complex heterogeneous systems in formal model specification.

A multidisciplinary approach to social network analysis was presented in, “*Integrating multi-agent technology with cognitive modeling to develop an insurgency information framework (IFF)*”, by Bronner and Richards. Their work aims to develop a decision-aiding model for behavior strategy analysis of Iraqi insurgents. Specifically, the authors combine sophisticated software engineering technology and cognitive modeling tools to deliver a tool that provides military leaders aide in approaching insurgency problems.

Tools for analysis of inter-group relations were also presented. “*Modeling and supporting common ground in geo-collaboration*”, by Convertino et al., proposes the introduction of process visualizations and annotations tools to support common ground in the sharing and managing of knowledge in geo-collaboration. “*An approach to modeling group behaviors and beliefs in conflict situations*”, by Geddes and Atkinson, describes an approach to modeling group responses to planned operations over extended periods of time in modern military operations.

Finally, research concerned with characterization of sub-network dynamics was presented. “*Where are the slums? New approaches to urban regeneration*”, by Mur-

gante et al., introduces a method for producing a more detailed analysis for urban regeneration policies and programs. This method identifies high priority areas for intervention, increasing efficiency and investment effectiveness in urban regeneration programs. “*Mining for Social Process Signatures in Intelligence Data Streams*”, by Savell and Cybenko, introduces a robust method for defining an active social network, and identifying and tracking the dynamic states of subnetworks.

Modeling organization and structure. “*Community detection in a large real-world social network*”, by Steinhäuser and Chawla, demonstrates that a simple thresholding method with edge weights based on node attributes is sufficient in identifying community structure. “*An ant colony optimization approach to expert identifications in social networks*”, by Ahmad and Srivastava, demonstrates an efficient way to identify experts in a network and direct pertinent queries to these experts.

This book conveys the latest advances in social computing, as communicated at our first international workshop on Social Computing, Behavioral Modeling and Prediction. While the topics presented at this workshop were widespread, the methods and analyses described have broad potential for applicability. We dearly thank and are deeply indebted to all the distinguished scientists who participated.

Phoenix, Arizona,  
April, 2008

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<http://www.springer.com/978-0-387-77671-2>

Social Computing, Behavioral Modeling, and Prediction

Liu, H.; Salerno, J.; Young, M.J. (Eds.)

2008, XVIII, 264 p., Hardcover

ISBN: 978-0-387-77671-2