Inaugural Issue Editorial

WITH this inaugural issue of the IEEE TRANSACTIONS ON COMPUTATIONAL SOCIAL SYSTEMS (TCSS), we welcome readers to an exciting new technical field in modern science and engineering. Although many have recognized that we now have the computational technology, analytic tools, and large-scale datasets needed to model complex, dynamic social systems, the technical community until now has not had a high-quality, peer-reviewed venue for publishing state-of-the-art results nor, conversely, for identifying where such work can easily be found.

The IEEE TCSS will publish papers that deal with the modeling, simulation, analysis, and understanding of social systems from the analytic, quantitative, and/or computational perspectives. "Systems" can include man–man, man–machine, and machine–machine organizations in both cooperative and adversarial situations. Examples of such social systems arise in many political, economic, and commercial contexts. Of particular current interests, for example are social media technologies and their dynamics.

The scope of the IEEE TCSS outlined this way is intentionally broad because it deals with a relatively new area and nobody really knows how this area will evolve, by whom it will be embraced, or what the future technical challenges will be. Nonetheless, there is ample evidence already that the large-scale modeling and analysis of social systems are of growing interest and concern globally.

For example, on an anecdotal level, there appears to be more and more engineering and computer science students being hired to do "computational social systems," although typically called something else like "data science." Those career opportunities appear to be growing in established Fortune 500 companies, government agencies, and high-tech startups alike.

Different sectors have different interests in the operational understanding of social systems. In commerce, for example a company traditionally would like to know who its customers are, how they are best retained, and how to attract new ones. The mechanism for gaining such understanding has been small-scale market research efforts that tended to be labor-intensive, limited in scope, and relatively uninformed about the effects of word-of-mouth and other peer-to-peer communications. That has all changed with the advent of online reviews, social media, recommender systems, and other novel technologies that are scarcely a decade old.

Military and government are interested in computational social systems because a population's allegiances and sentiments might be gauged by newly available observables such as individual-level consumer, communication, and commuting activities that implicitly convey an individual's and, in aggregate, a community's confidence in economic and physical safety and opportunity. Remote imaging can tell you where the people are, but not necessarily whom they trust and whom they fear.

While these and other opportunities for computational social systems abound, there are many challenges ahead as well. Being a new field is challenge enough, but in this case it is a field that is cross-disciplinary by nature. As in all areas of science and engineering, we are best positioned to make advances if we understand the best efforts and mistakes of others working before us. Computational social systems involving human agents should therefore be informed about the applicable psychology, sociology, economic, and anthropology knowledge that precede large-scale data availability and analytics. Just as there are physical laws supporting operationally useful and accurate abstract models of electrical circuits, are there social and psychological theories that can provide the basis for data-driven models of large, complex social systems? As engineers and computer scientists, we must not forget to ask ourselves such questions.

Another key challenge is the data availability for doing empirical computational social systems research. Governments and companies are sensitive to their citizens' and customers' privacy expectations. Commercial enterprises can also gain considerable competitive advantage from deeper understanding of their customer data so are less inclined to share it widely. Accordingly, researchers on the outside or without special agreements will be having difficulty obtaining large-scale data for social systems modeling and analysis. This creates problems for new research as well as validation of previous research so central to the scientific enterprise.

This inaugural issue of the IEEE TCSS contains a collection of articles authored by leading engineering researchers in the field. All papers include surveys of their respective areas to help start shaping and organizing the landscape.

In "Sensing, Understanding, and Shaping Social Behavior," Shmueli, Singh, Lepri, and Pentland from MIT's Media Lab, Cambridge, MA, USA, investigate how trust can be operationalized and predicted, especially to the extent that it has on social persuasion.

Wagner, Singer, Strohmaier, and Huberman from the University of Koblenz, Koblenz, Germany, the GESIS-Leibniz Institute for the Social Sciences, Mannheim, Germany, and HP Labs, Palo Alto, CA, USA, model the effectiveness and semantic stability of social tagging systems on the Web in "Semantic Stability and Implicit Consensus in Social Tagging Streams."

A number of widely used and seemingly different social network measures are compared systematically by Guzman, Deckro, Robbins, Morris, and Ballester of the U.S. Air Force Institute of Technology in "An Analytical Comparison of Social Network Measures."

Krishnamurthy and Poor from University of British Columbia, Vancouver, BC, Canada, and Princeton University, NJ, USA, respectively, model and analyze interactive sensing in social networks in which individuals act as sensors and the

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information exchange between individuals is exploited to optimize sensing, exploring the important tradeoffs between individual privacy and the reputation of the social group in "A Tutorial on Interactive Sensing in Social Networks."

Chen, Kuzmin, and Szymanski from RPI study a variety of modularity concepts in the context of community detection and quality in the paper titled "Community Detection via Maximization of Modularity and Its Variants."

Fundamental problems arising in whether to disclose behavioral models of bad actors such as terrorists and criminals are studied by Serra and Subrahmanian of the University of Marland, College Park, MD, USA, in "A Survey of Quantitative Models of Terror Group Behavior and an Analysis of Strategic Disclosure of Behavioral Models."

"Modeling Temporal Activity Patterns in Dynamic Social Networks" by Raghavan, Ver Steeg, Galstyan, and Tartakovsky of University of Southern California, CA, USA, develops probabilistic dynamical models of users in social media networks such as Twitter.

The IEEE TCSS would not exist without the moral, financial, and operational support of the IEEE Systems, Man, and Cybernetics Society (the lead technical and financial sponsor), and the IEEE Computer Society volunteer leaderships and staffs who recognized that engineering and computing need deeper and more rigorous understanding of the social systems which are increasingly becoming indistinguishable from the technologies that they develop and use.

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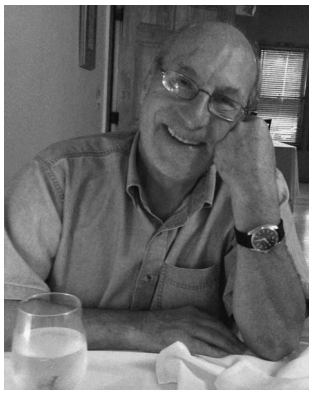

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Dr. Santos is a Fellow of AAAS, a Member of several DoD senior technical advisory committees, and a past Member of the IDA/DARPA Defense Science Study Group. She has served as a member of the Research and Technology Organization Task Group on Psycho-Social Models and Methods in NATO's Effects-Based Approach to Operations Programs. She has received numerous awards, including a National Science Foundation Career Award, the IEEE-CS Technical Achievement Award, the Robinson Faculty Award, and the Spira Award for Excellence in Teaching.