SocialCom 2011 Tutorial:
Toolkits for Computational Social Science
Using Honest Signals to Predict and Shape Human Responses

During the last decade the Human Dynamics Group has developed measurement toolkits based on electronic badges, smart phones, and signal processing that allow us to accurately quantify human behavior in everyday situations on a continuous basis over long time periods. Using these toolkits we have developed a consistent mathematical modeling approach that accurately predicts outcomes of interactions at the scales of the individual, small group, organization, city, and nation-state. Equal error prediction accuracies for subject behaviors typically range from 80% to 95%, with 40 to 60 percent of the variance modeled. Applications to health outcomes and cultural outcomes have similar accuracies.

This suite of technologies has been called `Breakthrough idea of the year' by Harvard Business Review, `a technology that will change the world' by Technology Today, and Nature published a three-page report that described the work as `taking [modeling of human behavior] to a new level.' Applications of these technologies were called `the next Google' by Newsweek, were critical in winning of the 40th Anniversary of the Internet Grand Challenge, and have been central to the social computing strategies of both DARPA and the World Economic Forum members (multinational companies and government regulators).

The key insight is that humans today are not so different from humans in pre-history, before we had sophisticated language capabilities. Pre-linguistic social species coordinate by signaling, and in particular `honest signals' which in addition to conveying information reliably cause predictable responses by the listener. Examples of honest signaling include patterns of turn-taking, of small group interaction, and of association and communication. Experimental evidence suggests that modern language evolved `on top' of these ancient signaling mechanisms, and that today linguistic and signaling mechanisms operate in parallel, expressing different aspects of the same intentional states. Consequently, by measuring these `honest signals' we can reliably predict outcomes.

Through the course of many laboratory experiments and field-deployments in corporate settings and real-world housing communities, we have gained experience in ways to efficiently set-up new experiments and deploy our sensing and data collection platforms. We have set up the platforms as toolkits that make it much easier to do similar deployments, and configure a wide range of data collection settings and other configuration parameters. In this tutorial we will describe the sociometric badges and Andriod platform sociometric software that we have developed, covering their function, capability, and typical use. These tools will be made available to interested participants. We will also cover the mathematical

toolkit we have developed, describing the theory, capability, and typical use. These tools will also be made available to participants. The tutorial will include a hands-on session demonstrating some of the platforms' capabilities. We will review configuration, data collection, some back-end basics on how to export the data in a format that is useful for analysis, as well as examples of analysis and visualization of the data. Finally, we will illustrate the use of our sociometric measurement tools together with our mathematical analysis tools on a variety of problems, including individual (passive screening for health problems), dyadic (assessing trustworthiness, screening for depression), small group (providing a real-time performance meter for groups), organizations (reengineering communication patterns for greater productivity), and large-scale sociocultural outcomes (diabetes risk, crime risk).

For additional information see http://hd.media.mit.edu

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