Twitter Science: How Much Can Researchers Learn From Your Tweets?

A new study in *Science* this week tries to gauge the mood of the entire world throughout the day by mining hundreds of billions of tweets. But just how much can scientists get out of studying the enormous information dump that is Twitter?

**BY STEPHANIE WARREN**

*Your friend’s tweet about his post-lunch siesta* may seem like a waste of your feed space. But to a growing body of researchers, these trivial tweets can be a gold mine of information. "Twitter is often criticized as mundane, but that’s what we wanted to take advantage of," says Scott Golder, author of a new widely publicized paper published in the journal *Science*. "Most conversations are mundane; we just don’t take the time to record them."

Golder and co-author Michael Macy collected half a billion tweets from 2 million users across the globe. They used a language-analysis computer program that searched the tweets for hot-button words psychologists had assigned to one of two categories. Words like "awesome" and "special" signaled positive moods; words like "afraid" and "fury" signaled negative ones. Golder and Macy tracked how the proportion of positive to negative tweets changed throughout the day to map how we feel, on average, hour by hour. We’re at our best in the morning, and then our moods sour as the day wears on and we sit through one too many boring meetings. We’re generally happier on the weekends, when we wake up about two hours later than we do on weekdays.

The results may be an example of science confirming the obvious, says Bernardo Huberman, the director of the Social Computing Lab at Hewlett-Packard’s HP Labs. But forget the results for a moment. For this study, the method is the message. "The most important thing is what this work portends for the future of social science research," Golder says. And he’s far from the first scientist to try to tap into the data gold mine that social media sites and their constant flow of information represents. But how much can researchers really learn from—and trust—the overflowing, confusing, spambot-infested Twitterverse?

It’s not hard to see the appeal of Twitter for scientists, especially those trying to wrap their minds around human behavior. It’s best to study a creature in its natural habitat, but watching humans in real-time presents certain . . . logistical problems. Scientists can bring study subjects into the lab to see how they react to new situations. But those situations are artificial, and so is the lab environment—people don’t act normally there. Surveys, polls, and interviews aren’t great for
science because human memory is faulty—and because, frankly, people lie to survey takers. Finally, studies also struggle to bring in a group of volunteers representative of a city or region, much less the world. (Thankfully, the college sophomores who volunteer for psychology studies because they need the cash or the academic credits aren’t all that representative of the population as a whole.)

Twitter doesn’t have those limitations. Your stream of tweets is much better representation of who you are on a day-to-day basis than the way you act in a lab experiment. Twitter has an enormous user base that now numbers at more than 100 million. People tweet in real time, and, unless you delete your tweets, you can’t lie about what you said to a survey taker. Lastly, tweets are accessible. While many Facebook users have their statuses, photos, and other info accessible only by friends or friends of friends, comparatively few people protect their tweets. “Twitter conversations are real-time statements from millions of people from moment to moment,” Golder says. “Twitter is not designed as a research platform. But researchers can take advantage of it in order to do science.”

Indeed, Golder is just part of a growing group of scientists trying to data mine Twitter and other social media sites. Last year’s International Conference on Weblogs and Social Media featured many others, such as Michael J. Paul and Mark Dredze of Johns Hopkins University, who looked through Twitter for clues to the prevalence of health woes including flu, allergies, and insomnia. Their study contains amusing and informative nuggets such as: “Messages like ‘I got da flu’ and ‘sick with this flu it’s taking over my body ughhh’ are common. . . . A cursory examination of health-related tweets reveals more detailed information: the message ‘Had to pop a Benadryl . . . allergies are the worst . . . ughh’ indicates a user suffering from allergies and treating with Benadryl. ‘my g ma is so cute when she’s all doped up on Vicadin (sic) for her foot’ indicates Vicodin as a treatment for foot pain.”

Of course, the virtual experience isn’t a perfect proxy for the human experience. Twitter users may be more diverse than a small group of college sophomores, but that doesn’t mean they represent the average joe. “Twitter users are a very particular slice of all people,” says David Lazer of Harvard, an expert in social networks. In fact, he says, we don’t know all that much about who’s on Twitter.

Researchers have to infer most of what they know about the Twitter users they study. While the language someone speaks can reveal their nationality (or at least narrow it down), and sometimes profiles do provide geographic location, most demographic data remains in the dark. Names give researchers a clue to gender and ethnicity, and language analysis programs like the one Golder and Macy used to study the world’s collective mood could also pick out certain key words that give an idea about users’ socioeconomic status. But the depth of information a more traditional study—with the subjects right there in the room—provides is lost. Quality, one might say, is sacrificed for the unmatched quantity of data available on social networks.

That’s presuming you’re even looking at a real account. As PM reported last month, fake users plague the Twitverse. Bots—computer-controlled Twitter accounts—may account for 65 percent of a user’s followers, according to one expert. Bots are tough to rule out of studies because they’re designed to act like humans. “Just because it’s human behavior, you don’t know for sure it’s a carbon-based life-form,” Macy says. He and Golder didn’t try to weed out the fakes; they simply let the enormity of the data sample drown them out.

That approach may be the sign of where Twitter science is headed, once studies of Twitter itself—why people retweet, what to do about spam accounts and content polluters—give way to more studies that try to extract information out of Twitter. Data mining the tweets of the world may never provide the depth of information about any one person that researchers could get by other means. But it lets you ask different questions, and ones that would have been impossible to answer before the social media age: How far did people feel the August earthquake on the East Coast? How does the world’s mood change throughout the day? “Twitter and social media allow you to understand systems,” Lazer says. “It allows you to capture conversation on the societal scale, something that
was, up to now, impossible."