Weak Signals as Predictors and Influencers of Collective Action in Online Social Media

Overview
This multi-disciplinary thesis will develop a new technique for detecting weak signals (i.e., emerging trends that initially appear at the fringes of online group rhetoric but quickly and unexpectedly lead to action) in large-scale datasets from online social networks. It will develop a forecasting tool that enables analysts to interpret the weak signals and their relative importance in predicting future behaviours. By analysing the signal data, it will seek to understand how to formulate and seed weak signals so that they influence behaviour in online networks.

Thesis development
Global and national events over the last 2 years have shown that online social media can be a force for good (e.g., Arab Springs) and harm (e.g., the London riots). In both of these examples, social media played a key role in group formation and organisation, and in the coordination of the group’s subsequent collective actions (i.e., the move from rhetoric to action). Surprisingly, despite its clear importance, little is understood about the factors that lead to this kind of group development and the transition to collective action. Most research on online social media (e.g., Rashid 2012) analyses the major themes or keywords prevalent in an online social network at a particular point in time (e.g., trending topics on twitter). Far less attention is paid to the so-called “weak signals” that develop at the fringes of mainstream discussion and later reach a tipping point that leads to significant engagement. Such weak signals have been likened to “hardly discernable cracks anticipating an earthquake” (Ahlqvist 2007).

Weak signals can be an important indicator for forecasting future behaviours in an online social network. They can also help inform efforts to devise strategies to counter potentially violent or disruptive actors, since these counter strategies themselves may take the form of weak signals. Of course, not all weak signals develop into discussions or actions of interest. Consequently, detecting weak signals and, importantly, detecting signals of interest is a key challenge that must be addressed if we are to effectively analyse and understand the trends emerging in online chatter, and develop strategies to influence potentially disruptive behaviours. The challenge is exacerbated by the fact that such weak signals have to be identified in real-time within terabytes if not petabytes of data from an online social network.

The proposed PhD seeks to move toward a solution to this problem by pursuing the following goals:

1. Synthesise approaches from psychology, information retrieval and language analysis to develop a new technique and supporting software
tool to detect weak signals in large-scale datasets from online social networks
2. Develop a forecasting tool to enable analysts to interpret the weak signals and their relative importance in predicting future behaviours
3. Based on insights from (1) and (2) above, elicit guidelines for formulating and seeding weak signals to influence individual or group behaviour in online social networks

Working environment
This interdisciplinary PhD will be centred in the School of Computing and Communication at Lancaster, and enjoy joint supervision from Prof Awais Rashid (http://www.research.lancs.ac.uk/portal/en/people/Awaiz-Rashid/) and Dr. Paul Taylor (http://www.research.lancs.ac.uk/portal/en/people/paul-taylor).
You will become part of the EPSRC-GCHQ Academic Centre of Excellence in Cyber Security Research, working with its team of researchers and having access to its facilities and resources. You will be able to benefit from their complementary set of skills and expertise to develop an exciting and unique research project in this timely and topical area.