

## Tracking Critical-Mass Outbreaks in Social Contagions

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The emergence of social movements may not always be predictable but the science about how people connect and communicate ideas may help us understand when such phenomena are likely, or already underway and under-the-radar. While offline interactions between people are not observable at a large scale, the interactions between people on public online social networks such as Twitter are observable. Using hashtags and topical tweets as the digital traces of transmitted ideas, we will test theoretical models of *social contagion*, using this real world data to determine if social contagions associated with mass mobilization events can be detected.

Social contagions are the mechanisms by which ideas and behaviors spread through human social networks. In some cases, the adoption of an idea or a behavior requires social reinforcement: a person's adoption of the idea or behavior – in other words, their infection – only occurs if two or more of their friends have adopted it first. This sort of transmission is common in relation to the growth of social movements since there may be a cost to the adoption of the idea or behavior. We call these *complex contagions*. Such contagions are distinct from *simple contagions*, which require exposure to only one “infected” individual to become infected, as is commonly the case with disease transmission. Formally, in a network graph, complex contagions require two or more of a node's neighboring nodes to be infected for it to be infected. A single long tie connecting nodes in remote parts of a network is sufficient for the spread of a simple contagion. We can see this with the spread of disease. However, since there is a threshold of two or more neighboring nodes required for infection, complex contagions can fail to spread if there are not sufficient numbers of long ties that allow the infection of nodes in remote regions of the network. *Critical mass* occurs once there are just enough infected nodes in one region to take advantage of existing long ties in the network.

Our initial work has focused on tweets collected from Nigeria containing hash tags that were new on or after January 15, 2014. In this presentation we discuss a set of measure we have developed to investigate whether the usage history of a hash tag represents a complex contagion and exhibits critical mass.

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