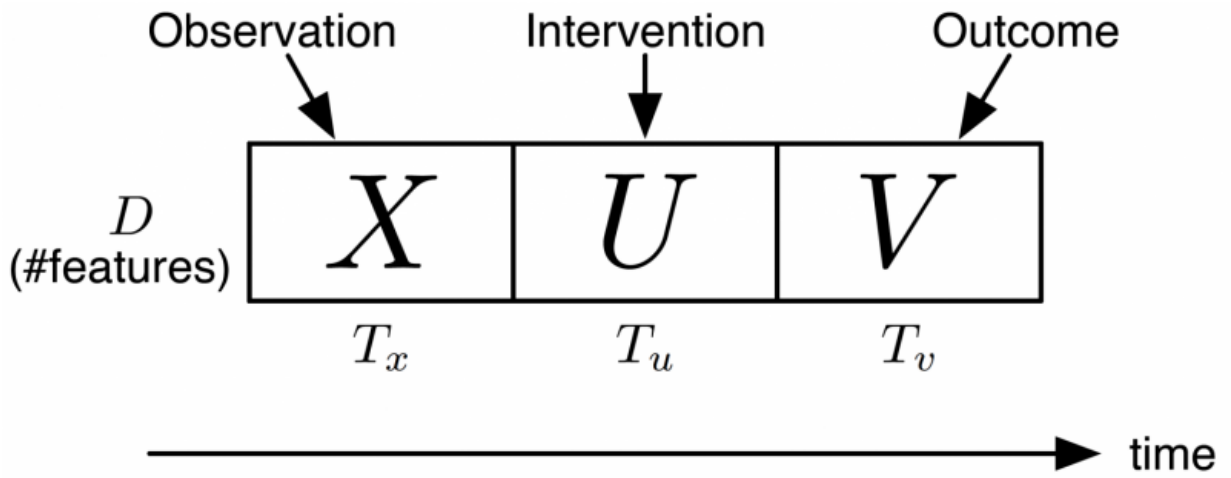
Leveraging social media to engineer success

February 19 2016, by Radu Marculescu



Credit: Carnegie Mellon University Electrical and Computer Engineering

From Facebook to Twitter, Yelp to Mashable—social media channels have a broad and deep impact on society. It's where people get their news, alerts, gossip, and updates. But what if seamlessly scrolling through a media feed can unknowingly convince the user to choose one behavior over another? Researchers in Carnegie Mellon's College of Engineering, in collaboration with Google, Inc., are studying problems related to social media, and the data-driven engineering of social dynamics.

Imagine you are scrolling through your Facebook feed and notice the local news station posts an alert about a traffic accident located in your

commute route. Chances are, you will find a different way to get to work, even if it means a later arrival time. Or if you see a number of Twitter users commenting on a particular hashtag within the past 30 minutes, you can decide the best way to change the social dynamics over the next 30 minutes (via incentives or direct promotions), such that the total readership of the hashtag gets maximized in the following hours. This same observation-intervention-outcome mindset can be related to countless applications.

In their recent paper, "Data-driven Engineering of Social Dynamics: Pattern Matching and Profit Maximization," recently published in *PLoS One*, researchers aim at finding the best short-term interventions that can lead to predefined long-term outcomes.

"The goal of this work is to find what the best intervention dynamics would look like given the input data," says Radu Marculescu, ECE professor at Carnegie Mellon and contributor to the paper. "In other words, society could actually implement a particular intervention in social media that results in a predicted outcome."

More information: Huan-Kai Peng et al. Data-Driven Engineering of Social Dynamics: Pattern Matching and Profit Maximization, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0146490

Abstract
In this paper, we define a new problem related to social media, namely, the data-driven engineering of social dynamics. More precisely, given a set of observations from the past, we aim at finding the best short-term intervention that can lead to predefined long-term outcomes. Toward this end, we propose a general formulation that covers two useful engineering tasks as special cases, namely, pattern matching and profit maximization. By incorporating a deep learning model, we derive a solution using convex relaxation and quadratic-programming

transformation. Moreover, we propose a data-driven evaluation method in place of the expensive field experiments. Using a Twitter dataset, we demonstrate the effectiveness of our dynamics engineering approach for both pattern matching and profit maximization, and study the multifaceted interplay among several important factors of dynamics engineering, such as solution validity, pattern-matching accuracy, and intervention cost. Finally, the method we propose is general enough to work with multi-dimensional time series, so it can potentially be used in many other applications.

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