FIG supplementary definitions

No changes are made for the definitions of the events, which are nodes in the FIGs. The complementary changes are made for the definition of edges, including the direction and connectivity of the edges.

## Direction of the edges

In pagerank, a hyperlink defines an edge from a source to a destination. The destinations will have a higher pagerank value. Thus, in our FIG graph, an edge is defined from Node A to Node B if A is influenced by B.

## Connectivity of edges

Edges could appear in the following three categories:

1. Expression to Impression: the edges from expression to impression are defined within attention window
   1. Observer expression nodes (survey) to View nodes
   2. Post nodes to View nodes
   3. Comment nodes to View nodes
   4. Like nodes to View
2. Impression to Expression: Two kinds of view events exist, namely single view and non-single view. **Single view** refers to clicks on the post, where people could see not only the post but the comments of the particular post as well. However, in the situations of **non-single**, people read the posts in trending or home. People **won’t** see the comments of the posts.
   1. **One** View node to **one** Post node: non-single view
   2. **One** View node to **one** Post node and **several** Comment nodes: single view, also note that the **comment nodes must be created before the view node**
3. Expression to Expression
   1. Comment nodes to post nodes: if one comment is made for one post, then the author is apparently influenced by the post

## Evaluation (Precision at K), actually, not sure if called Precision at K or Recall at K

One observer may nominate **one to four** participants in his surveys from day one to day five.

Count the number of nominated participants appear in top K of any graph / Count of all nominated participants.

As an example, the full influence of a participant j for observer a, is the minimal ranking (most influential) in any FIG.

The reported metrics is defined as follows:

## FI1, FI2, FI3 definitions

FI1 results are acquired by PageRank and the graph is defined by the Full Influence Graph (FIG). In typical PageRank, the random walk of the outgoing links follows a uniform distribution. In our attention scenario, we assign more weights to farthest and nearest events. Specifically, for the outgoing links for each node, we use a **beta distribution** (parameterized by alpha and beta) to normalize the weights (sum is 1). Assume an edge connecting from u to v, where u, and v are two events. We use to represent the weights before normalization. is computed with Probability Density Function (PDF) of beta distribution. Beta(u, v) considers the relative position of u to all the events by which v has potentially influenced: . Then we normalize the weights by , such that the sum of weights for outgoing edges from u is 1. There are three parameters in FI1: damping, alpha, and beta. The FI1 values are defined by .

FI2 results are computed with temporal difference. It does not use the PageRank nor the beta distribution. It uses the FIG only and use the temporal difference to compute FI2 values,

FI3 combines FI1 and FI2 after they are computed. It uses the output values directly. .