

User Influence and Social Networks

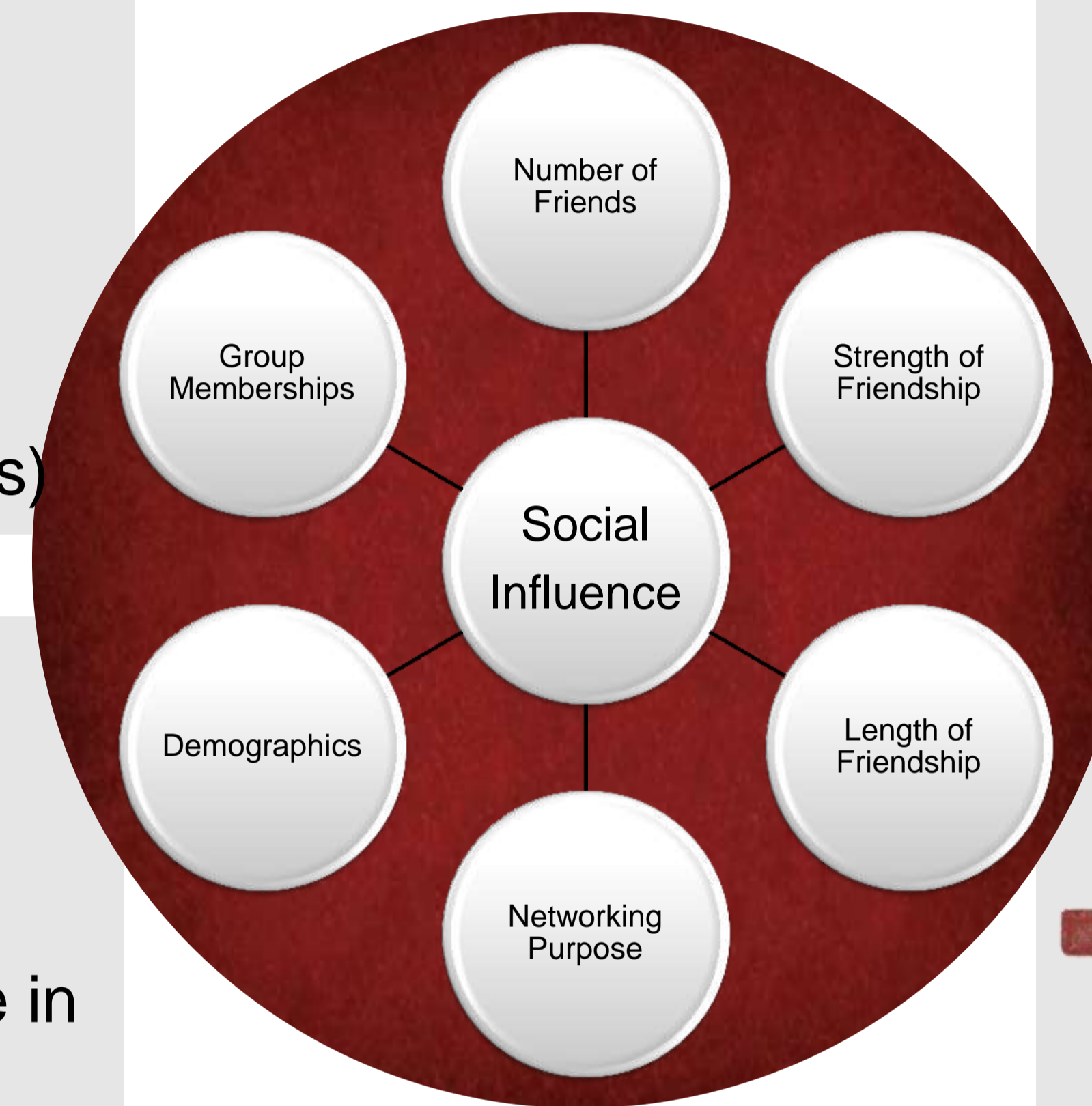
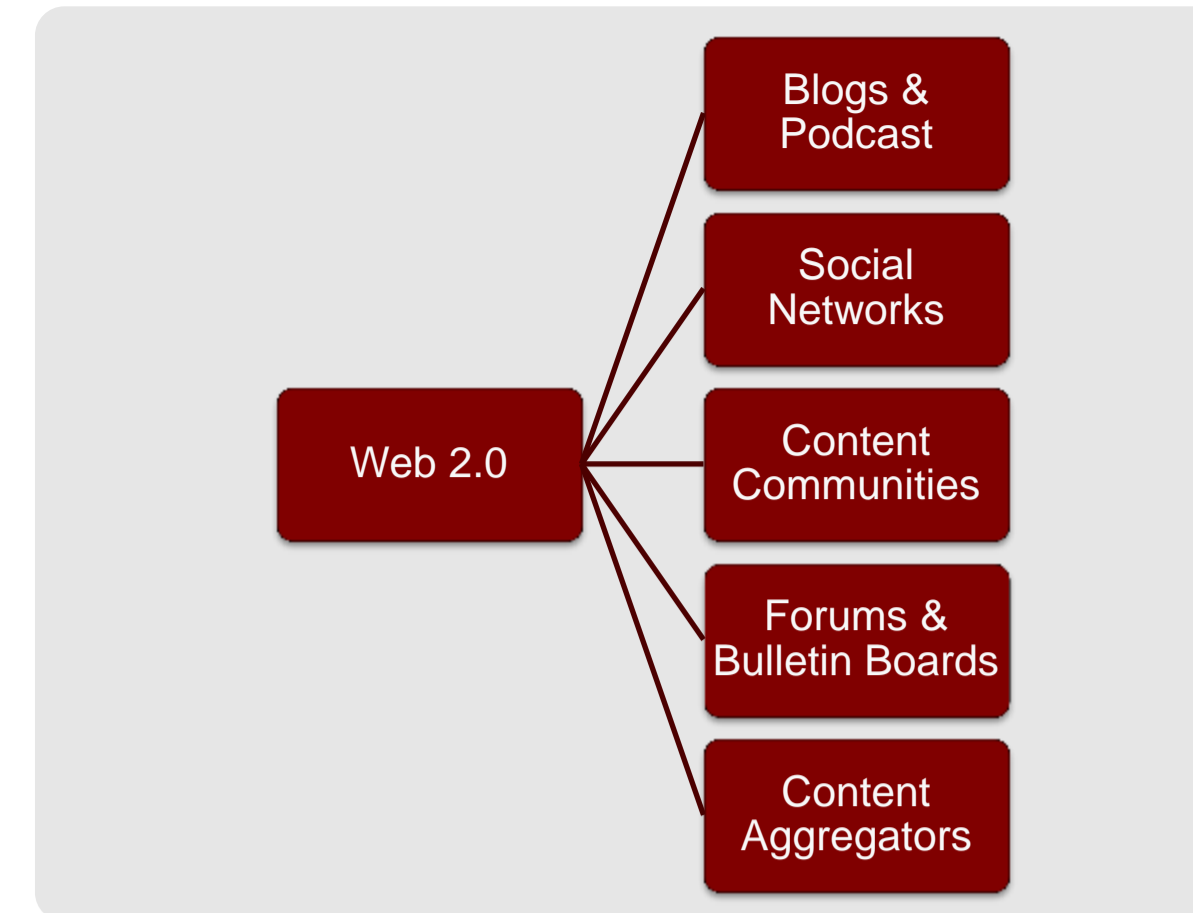
Amir Afrasiabi Rad
a.afrasiabi@uottawa.ca
University of Ottawa

Morad Benyoucef
Benyoucef@uottawa.ca
University of Ottawa

Social networks are collections of users and their interactions. Through these interactions, the decisions of members of a social network get influenced, and shaped. This factor is broadly referred as the word-of-mouth. Nowadays, successful advertising campaigns are those that increase the product awareness with the lowest cost. If targeted to the right people, viral advertisement (aka word-of mouth distribution) in social networks provides both of the requirements for a successful campaign (low cost and high awareness). This is possible due to the massive user participation in social networks and their connectedness. In our research, we look into discovering right people or communities (called influentials) for targeting the viral advertisement.

Web 2.0

- Users' networks facilitating the flow of ideas and knowledge by allowing the efficient generation, dissemination, sharing and editing/refining of informational content
- What it means to individuals?
 - participation, collaboration, conversation, community, connectedness, rich experiences
- What it means to businesses?
 - openness, collaboration, empowered and engaged customers, crowd sourcing (i.e., leveraging user content and ideas)



Factors affecting influence ↑
CBB model ↓



Social networks & businesses

- Why social networks?
 - Have huge user base
 - Users are motivated to contribute in social networks
 - Facilitate content distribution
 - Provide users with the power to communicate
- What is in it for businesses?
 - 68% of consumers consult friends before making purchase decisions
 - High potential advertisement environment (low cost, high gain)
 - Influence from family and friend exists in all steps of consumer decision making (CBB model)

Measuring Influence

- Social influence in Internet social networks is analogous to a directed graph
 - Direction of an edge is equivalent to the direction of the message traveling in the social network
 - Networks are dynamic, so influence should be analyzed for a certain past period of time
 - The number of interaction determines the link strength
 - Different types of relations have different influence values
 - The influence is important when it is distributed in the network

Influence Metrics

- Indegree: count of interactions from neighbours of node to it. Higher indegree means being more influenced

$$D_i(v) = \sum_{w \in S} \bar{e}(w, v)$$
- Outdegree: count of interactions from a node to its neighbours. Higher outdegree means being more influential (high outdegree with low indegree shows spamming)

$$D_o(v) = \sum_{w \in S} \bar{e}(v, w)$$
- Link strength: count of two-way interactions between a node and its neighbours. High link strength means more influence

$$R(w, v) = \frac{|\bar{e}(w, v)| + |\bar{e}(v, w)|}{D_o(w) + D_o(v)}$$
- In-Cluster: count of connections to by clusters. High in-cluster means more influence

$$C_i(v) = \frac{\sum_{w \in S} D_i(w)}{D_i(v) * (D_i(v) - 1)}$$
- Out-Cluster: Count of connections to clusters. Higher out-cluster means more influence

$$C_o(v) = \frac{\sum_{w \in S} D_o(w)}{D_o(v) * (D_o(v) - 1)}$$

Influence Values

- Influencing others is calculated by

$$Influencer(v) = \lceil \tanh(D_o(v)) \rceil * (\alpha_1 D_o(v) + \alpha_2 C_o(v)) * \sum_{t \in S} R(w, v)$$
- Being influenced is calculated by

$$Influenced(v) = \lceil \tanh(D_o(v)) \rceil * (\alpha_3 D_i(v) + \alpha_4 C_i(v)) * \sum_{t \in S} R(w, v)$$

Values for Businesses

- Improving advertisement campaigns by leveraging social networks
- Targeting only influentials helps the word being spread in the network as influentials influence others in their decisions
- Help in choosing the right type of social network for running the campaign

Ongoing Work

- Applying the model on various social networks (YouTube so far)
- Measuring influence propagation factors to be added to the model
- Evaluating influence for communities rather than individuals
- Bringing the topic factor into the model as individuals or communities are usually influential in a few specific topics not everything

References

- Afrasiabi Rad, A., Benyoucef, M., 2011, A Model for Understanding Social Commerce, Journal of Information Systems Applied Research, 4(2), Aug 2011, pp 63-73
- Afrasiabi Rad, A. and Benyoucef, M. 2011. Towards Detecting Influential Users in Social Networks. E-Technologies: Transformation in a Connected World. G. Babin et al., eds. Springer Berlin Heidelberg. 227-240.
- Afrasiabi Rad, A. and Benyoucef, M. 2011. Measuring Propagation in Online Social Networks: The case of YouTube. Accepted in the 4th Annual CONISAR conference, Wilmington, NC, USA. (To Appear)