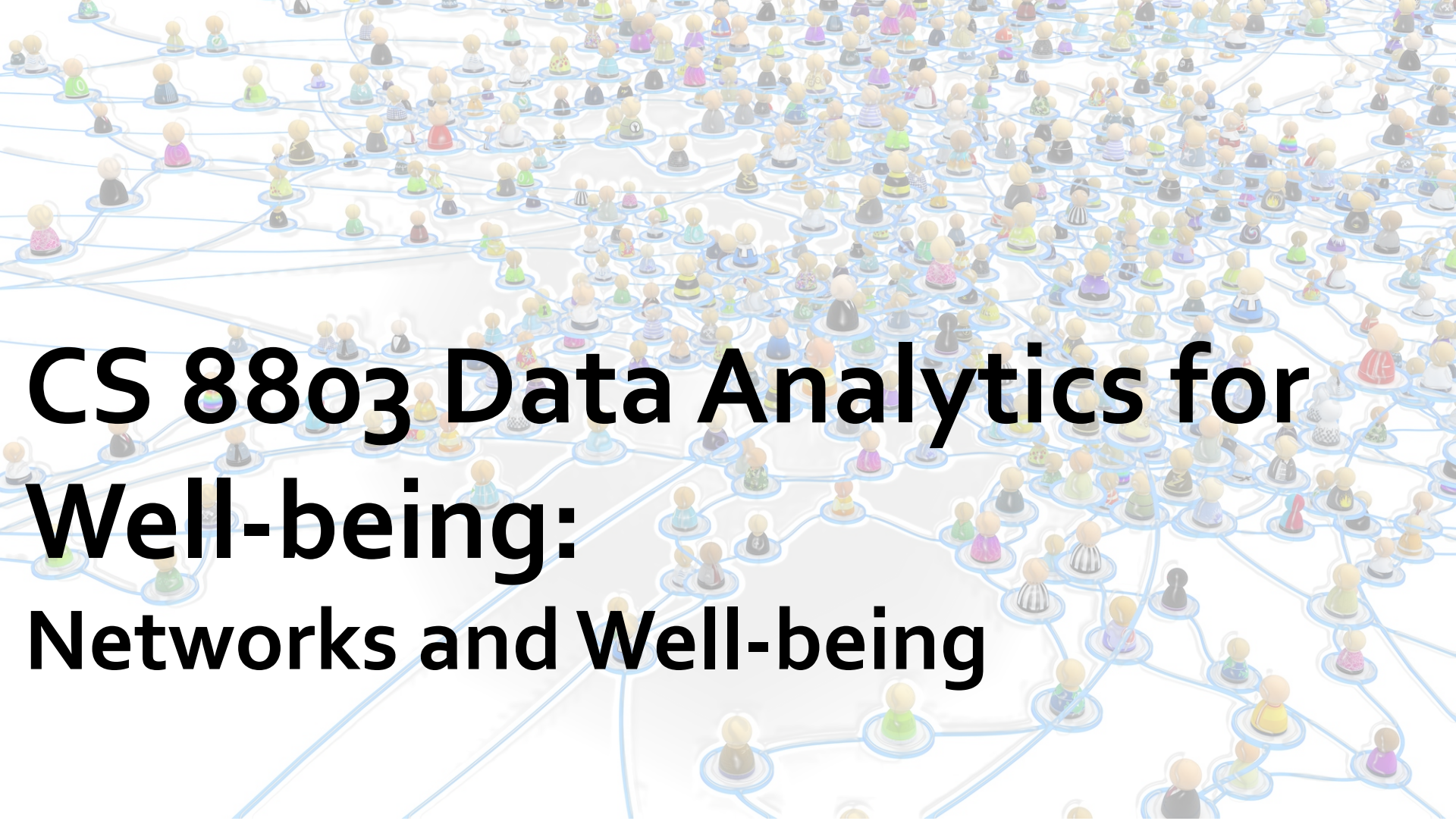

# CS 8803 Data Analytics for Well-being:

## Networks and Well-being

*Munmun De Choudhury*

munmund@gatech.edu

Week 3 | January 27, 2016

# Critique Writing

- Due: 2:05pm on Feb 1 / Piazza
- Grade: 5%
- Idea: Pick a popular press article of your choice, that relates to the class topic(s) and discussion(s). Write a critique on it
- What to submit: 1 page writeup of the critique
- What the critique should have:
  - What is the article about
  - Why is the article relevant to our class
  - Are claims or findings reported in the article seem intuitive? If so, why, and if not, why not?
  - Are claims or findings reported in the article seem supported by research? If so, what is it? If not, what specifically is missing?
  - If you were to reproduce the claims/findings on your own, what would you do differently?

# Network Analysis in Public Health: History, Methods, and Applications

| Level | Definition and purpose | | Standard network measures |
|---|---|---|---|
| Individual | A single actor or node | Degree | Connectivity of a given actor or node given by the number of lines that are incident (connected) to the node |
| | Identification of the position or location and characteristics of an actor within a network | Centrality | Importance or prominence of a given actor or node<br>Following are several types of centrality:<br>Betweenness: extent to which an actor lies between two nodes that would not otherwise be connected<br>Closeness: how close an actor is to all other actors on the basis of distance between nodes<br>Degree: extent to which an actor is connected to others; the simplest of the centrality measures<br>Prestige: specifically for directed networks; extent to which other members choose a given actor or node |
| | | Structural equivalence | Extent to which actors play similar roles within a network by having the same patterns of connections to other actors |
| Subgraph | A subset of the graph based on certain nodes or links | Dyad | A pair of actors and the possible tie between them |
| | | Triad | Three actors and the ties between them |
| | Examination of characteristics of a group | $k$-core | All nodes in a network with degree $\geq k$ |
| | | Clique | Three or more actors connected by all possible connections |
| Network | The entire system of nodes and links | Density | Ratio of observed ties to possible ties |
| | | Diameter | Longest of all geodesics (shortest path between two nodes) |
| | Description or inference based on the structure of the entire network | Centralization | Extent to which the graph shows a hierarchical or centralized structure |

# Main Idea

- The article surveys the use of social network analysis in public health in three different ways:
  - to study existing public health networks (e.g., service referral networks),
  - to apply a network theory to a health phenomenon (e.g., examining whether a contagion hypothesis explains patterns of STD transmission),
  - and to use a network approach for developing and implementing health interventions (e.g., using network characteristics to identify central actors to speed up diffusion of health information).

# Overview of Findings Surveyed

- In studies of street-level drug markets, researchers found that network position was associated with levels of AIDS risk behaviors and HIV infection rates.

- Structural network properties are known to be associated with the epidemic stage or level of transmission of HIV within a population.
- The amount of assortative and disassortative mixing within the network and the presence of cyclic or dendritic structures are indicators of how HIV is spreading through the population
  - Both assortative and disassortative mixing increases HIV risk over random mixing

# Overview of Findings Surveyed

- Directly and indirectly in a number of studies, researchers have linked social capital to health and well-being, typically finding that greater levels of social capital are associated with better health or well-being

# Overview of Findings Surveyed

- Ennett & Bauman used previously defined terminology to describe three major social positions that may be associated with health behavior: clique member, liaison, and isolate.
  - Isolates were identified as having little or no interaction with peers and having higher odds of being a current smoker.
  - Clique members, or groups of adolescents that spend more time with each other than with others, and liaisons, who interact with others but not a specific group, both had lower smoking rates.
- Another study confirmed that risk-takers accumulated in isolate positions and that individuals in isolate positions drifted toward risk-taking groups, whereas clique members shifted from non risk-taking behaviors to risk-taking behaviors over time

The paper talks about utilizing social networks to study disease contagion, to do this online, what would be an appropriate platform and (network) data source to use?

If we were to study if online social networks and social media could be used to study flu transmission and contagion, what type of data would be most appropriate? What type of network characteristics would you expect to see?

Social networks help build, maintain and enhance access to social support and social capital. Would all types of online social networks have the same effect? Facebook? Reddit? Some anonymous network? Does tie strength matter?

# Job loss, social tie strength, and psychological well-being

venturebeat.com/2013/03/14/facebook-data-scientist-jobseekers-with-strong-social-ties-online-5x-more-likely-to-find-work/

## Facebook data scientist: Jobseekers with strong social ties online 5X more likely to find work

JOHN KOETSIER MARCH 14, 2013 8:04 AM

TAGS: FACEBOOK, FEATURED, JOB SEEKER, MOIRA BURKE, ROBERT KRAUT, SOCIAL MEDIA, STRENGTH OF WEAK TIES

The paper talks about social networks in the physical world where ties map to actual social friends/contacts. Online, our social networks are often spread across sites and can indicate different types of social relationships beyond friendship.

In studying well-being, would the type of social tie make a difference?

# Online/offline social support and psychological well-being

https://research.facebook.com/blog/online-or-offline-connecting-with-close-friends-improves-well-being/?pnref=story

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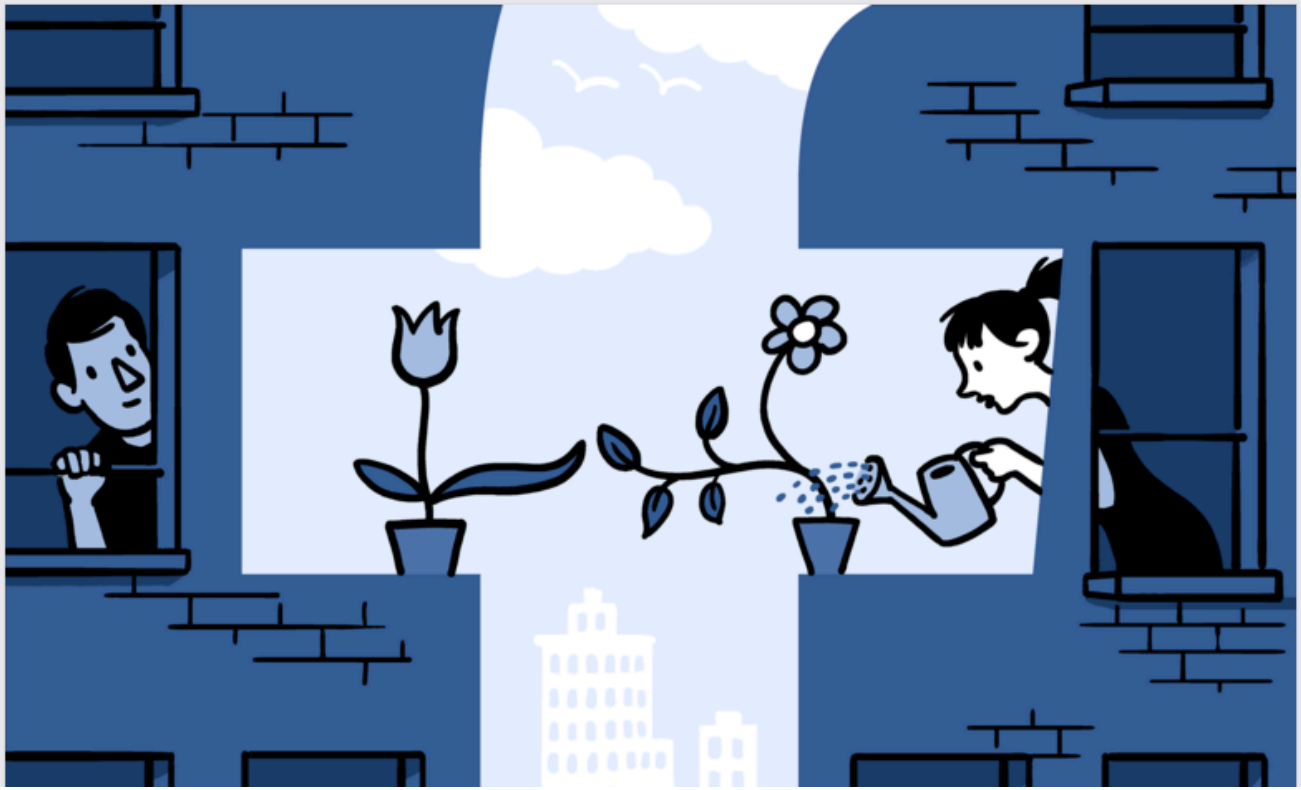
## Online or offline: Connecting with close friends improves well-being

Blog



### Related Publications

**Information Evolution in Social Networks**

Social networks readily transmit information, albeit with less than perfect fidelity. We present a large-scale measurement of this imperfect information...

by Lada Adamic, Thomas Lento, Eytan Adar, Pauline C. Ng · Proc. WSDM'16 · February

**Internet Use and Psychological Well-Being: Effects of Activity and Audience**

Two lines of research fifteen years apart demonstrate that talking with close friends online is associated with improvements in social support, depression,...

by Robert Kraut, Moira Burke · Communications of the ACM · December 2015

The article states that only a handful of studies have employed longitudinal methods to network analysis for public health. Why do you think that is the case?

The article reports: "*Ennett & Bauman also found that liaisons may be at risk for substance use because they become exposed to the norms of different groups, any of which may support misuse*"

Sounds counter-intuitive – can you explain why? By the same token, can exposure to different groups improve chances of substance abuse recovery?

If I were to tell you to study anti-vaccination attitudes on Twitter, do you think analyzing Twitter social network will be useful? If so, why, and if not, why not? What network properties will be most useful if you were to use it?

Last couple of classes we talked about the role of text and language analysis in understanding psychological well-being. Can you come up with a case scenario where combining text and network analysis will be more beneficial than either alone? Why?