# HUDK 4050:00 RE

#### In the news

#### Why edtech can't grow as much as healthtech

Posted Oct 4, 2016 by Svetlana Dotsenko (@svetlanadots)





http://iq.livestories.com/



#### Overturn the Student Unit Record Ban

The vast majority of today's college students pursue higher education to broaden and improve their economic opportunities,<sup>3</sup> and yet we do not know which programs lead to the best outcomes for different types of students. Crucial measures concerning jobs, salaries, and loan repayment elude us. The primary reason we cannot answer basic questions about higher education outcomes is the Student Unit Record Ban, a single paragraph in the 2008 reauthorization of the Higher Education Opportunity Act preventing the Department of Education from collecting and using student level data.<sup>4</sup> That paragraph should be struck and the ban overturned.<sup>5</sup>

#### Keeping student data safe while at the mercy of third parties

The results of the basic scan show the Google Classroom website gets a CSTAR score of 893, followed by Schoology at 877, Engrade at 870, Moodle at 837, Edmodo at 836, Talentlms at 751, and Blackboard at 334.

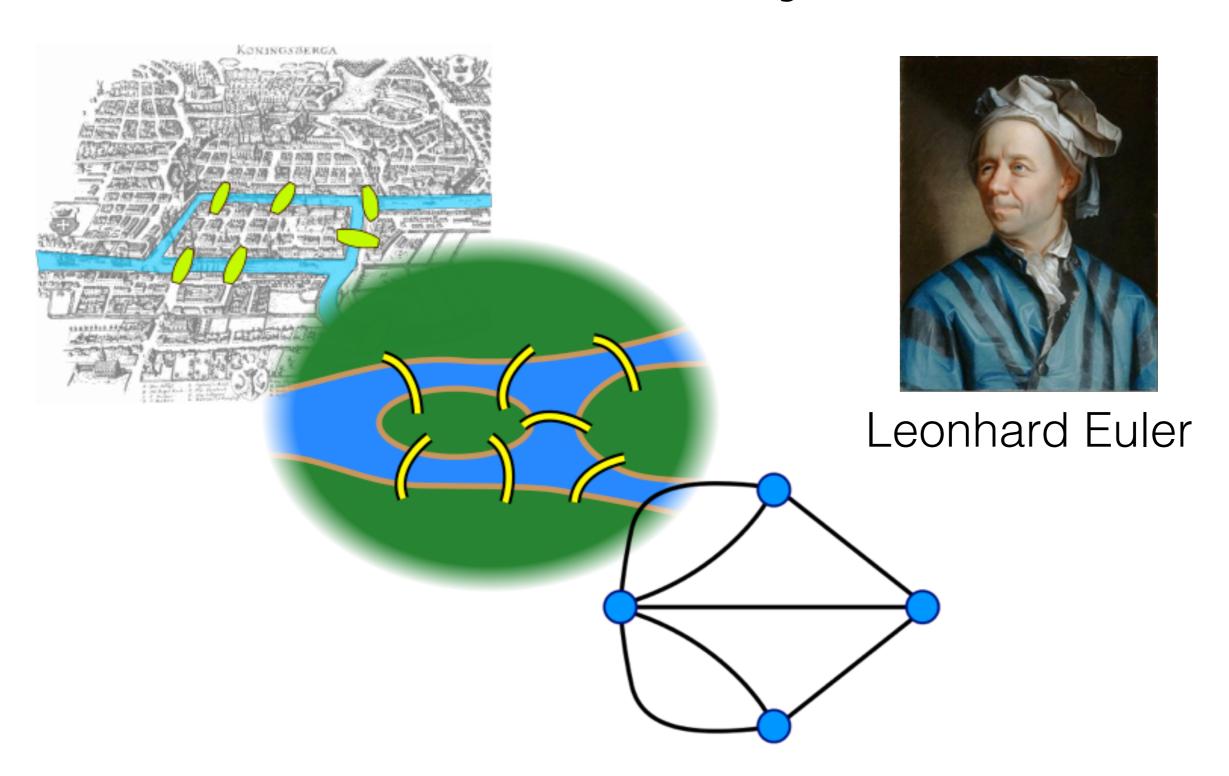
Louisiana education activists declare victory in public records fight

### Twitter Data

- Go to Github and download the data
- Find some patterns

# Social Network Analysis

# History

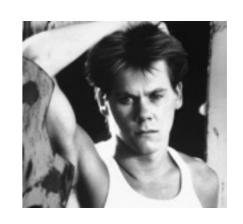


# History

- Random network the size of the US (in 1950) would require at most two intermediaries to connect any two people (Kochen)

- Small World Experiments (Miligram)
  - Postcards sent to random people in Kansas

- People instructed to send their postcard to a target person in Boston or someone that they think might know that person



#### Use in Education

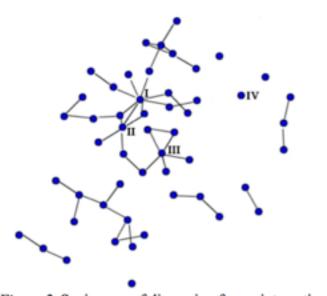
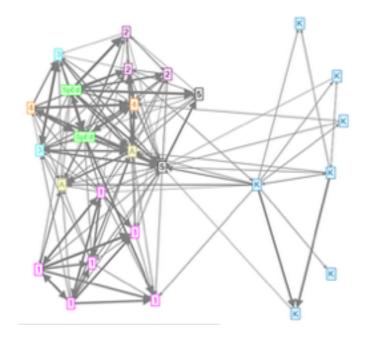


Figure 2. Sociogram of discussion forum interactions

Dawson (2008)

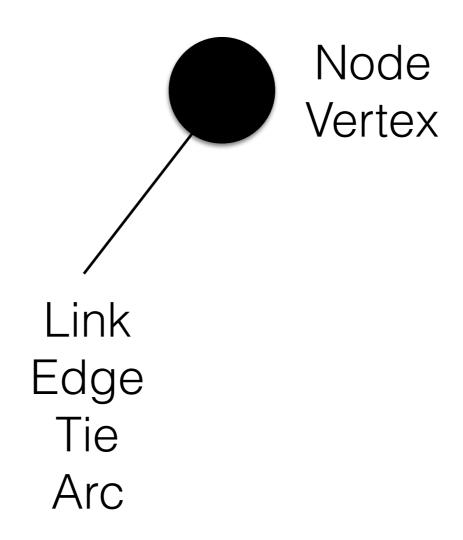
Centrality measures from forum posts correlate to student sense of belonging (mediated by external network)



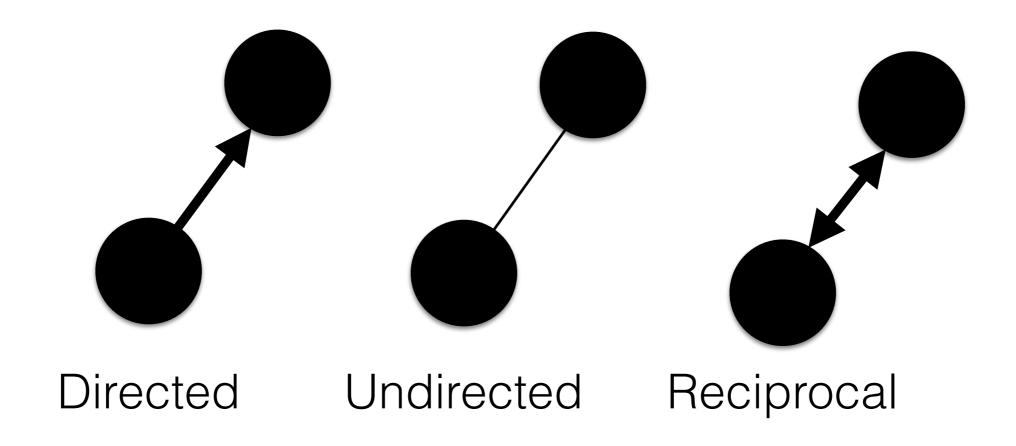
Smith, Trygstad, Hayes (2016)

SNA can be used to identify influential teachers within their peer group

#### Networks (Graphs)



#### Networks

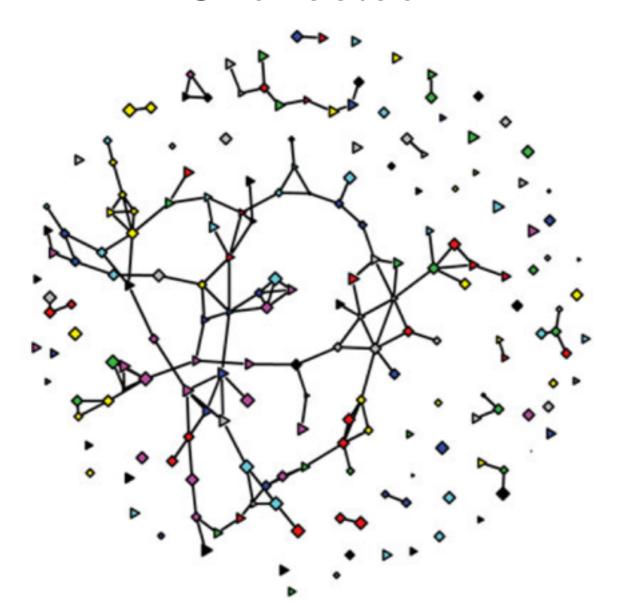


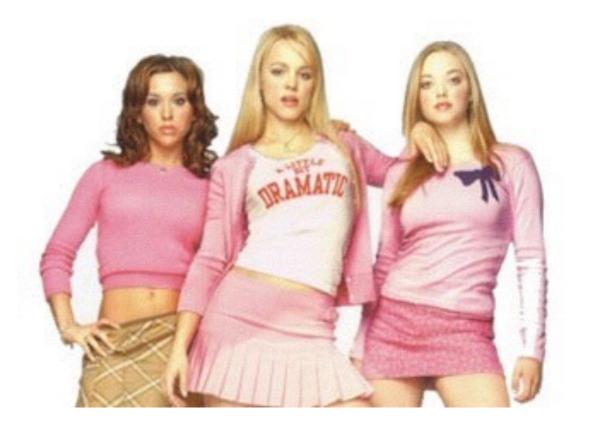
# Degree

The number of links to other nodes in the network

Undirected

Directed

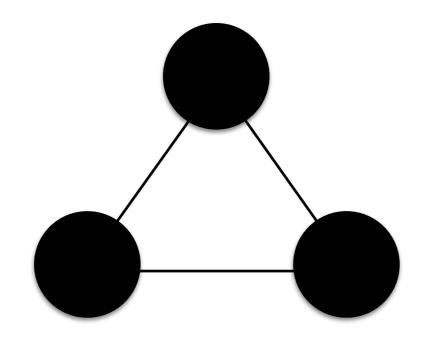




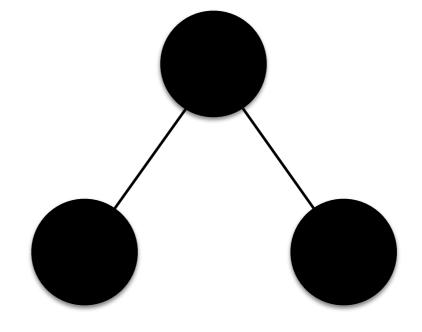
Indegree = Popularity Outdegree = No shame

# Density

How close is the graph to the maximal number of links



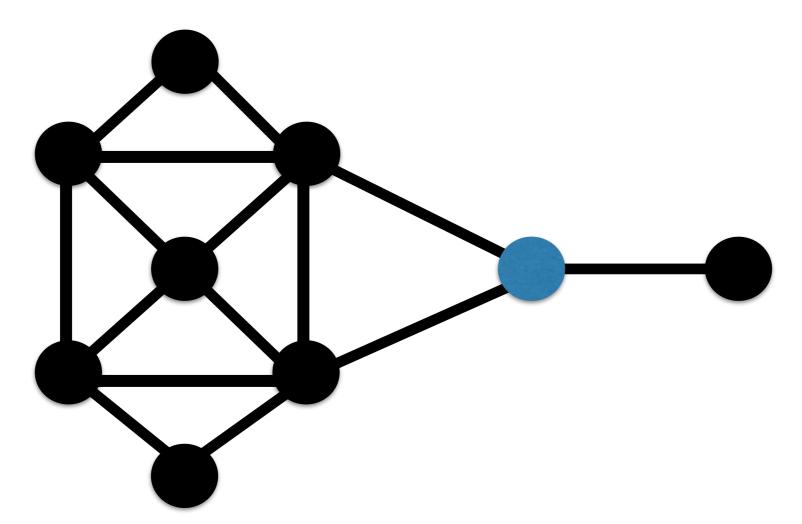
3 actual 3 possible Density = 1



2 actual 3 possible Density = 0.67

# Betweenness Centrality

The extent to which a node lies between other nodes



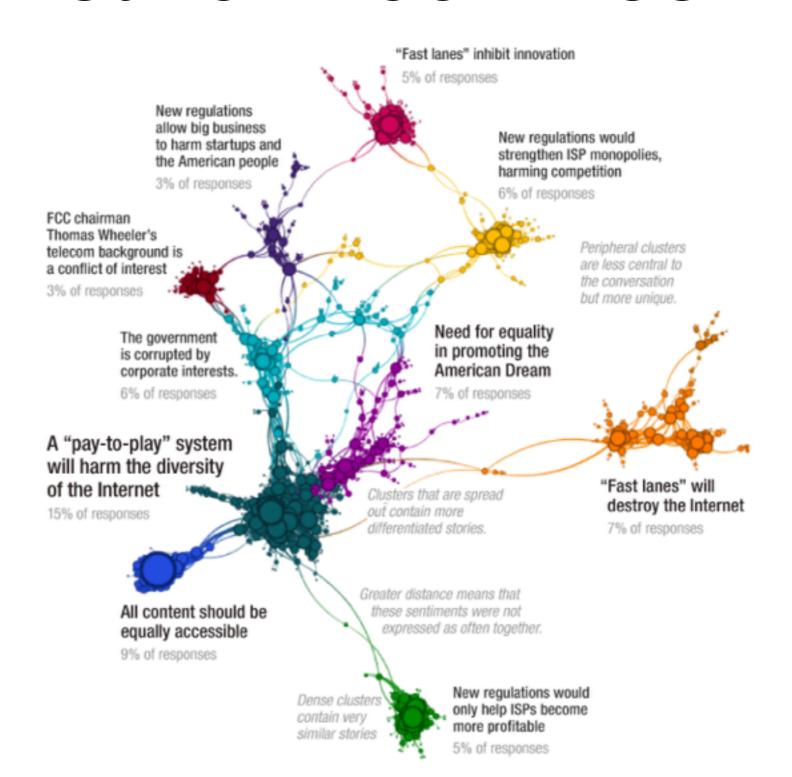
It is equal to the number of shortest paths from all nodes to all others that pass through that node

# Modularity

The fraction of the edges that fall within the given groups minus the expected such fraction if edges were distributed at random

$$\begin{split} Q_{\rm S} &= \frac{1}{2\bar{w}} \sum_{i} \sum_{j} \left( \bar{w}_{ij} - \frac{\bar{w}_{i}\bar{w}_{j}}{2\bar{w}} \right) \delta(C_{i}, C_{j}) \\ &= \frac{1}{4w} \sum_{i} \sum_{j} \left( w_{ij} + w_{ji} - \frac{(w_{i}^{\rm out} + w_{i}^{\rm in})(w_{j}^{\rm out} + w_{j}^{\rm in})}{4w} \right) \delta(C_{i}, C_{j}) \\ &= \frac{1}{4w} \sum_{i} \sum_{j} \left[ \left( w_{ij} - \frac{w_{i}^{\rm out}w_{j}^{\rm in}}{2w} \right) + \left( w_{ji} - \frac{w_{i}^{\rm in}w_{j}^{\rm out}}{2w} \right) \right] \delta(C_{i}, C_{j}) \\ &= -\frac{1}{(4w)^{2}} \sum_{i} \sum_{j} (w_{i}^{\rm out} - w_{i}^{\rm in})(w_{j}^{\rm out} - w_{j}^{\rm in}) \delta(C_{i}, C_{j}) \\ &= Q_{\rm D} - \frac{1}{(4w)^{2}} \sum_{i} \sum_{j} (w_{i}^{\rm out} - w_{i}^{\rm in})(w_{j}^{\rm out} - w_{j}^{\rm in}) \delta(C_{i}, C_{j}). \end{split}$$

# How do we make the network look nice?



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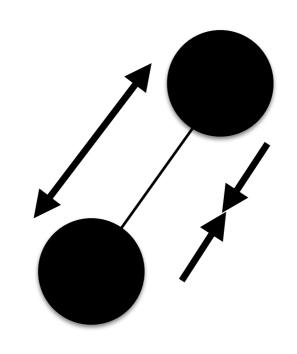
Force directed graphing

Attractive forces

Springs

Hooke's Law: F = kX

Repulsive forces



Electrons

Coulomb's Law: 
$$|\mathbf{F}| = k_e \frac{|q_1 q_2|}{r^2}$$

https://youtu.be/ YGDvR6CRwEc

# https://github.com/ kjhealy/revere