



# Measuring Twitter Chat Participant Engagement: #LiveFitNOLA Example

## Appendix 1: How to visualize and measure engagement level for hashtag-based Twitter conversations

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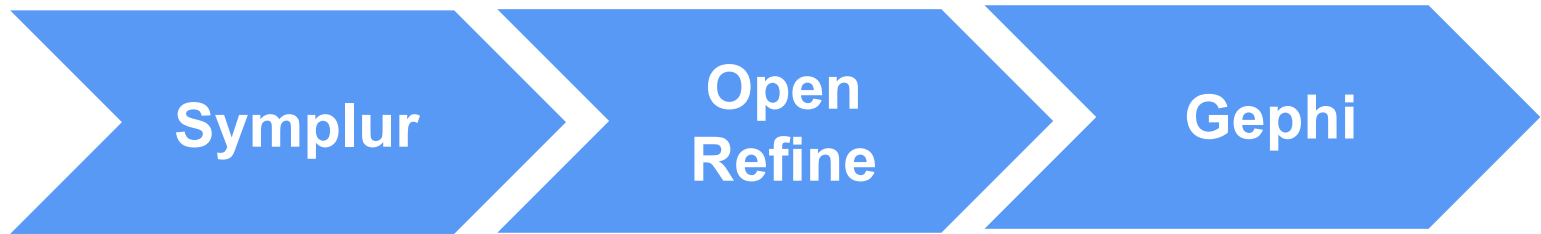
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# Analytical Process

- Data source: Full 75-min transcript (744 tweets)
- Mapped participant engagement
  - 135 Twitter users (66 participants + 69 mentioned usernames)
  - 474 mentions (engagements between Twitter users)

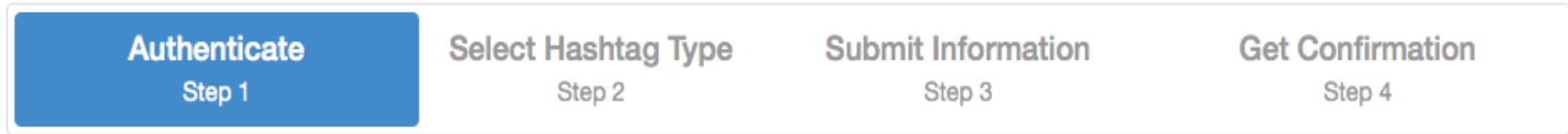


# SYMPLUR

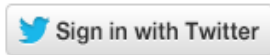
Register a Hashtag and Collect Twitter chat Transcript

# How to submit a hashtag with Symplur:

## Submit your hashtag The Healthcare Hashtag Project



You need to *Sign in with Twitter* before you can submit



Your hashtag should:

- be healthcare related
- be of value to the healthcare community
- be of a certain usage level by multiple people
- be unique enough that its intended conversation isn't drowned out by other uses of the same hashtag

# How to collect hashtag-based Twitter two-way communication transcript from Symplur:

- Search for the hashtag of interest in Symplur (e.g. #LiveFitNOLA)

The screenshot shows the Symplur website interface. At the top, there is a navigation bar with the Symplur logo, links for SYMPLUR SIGNALS, HEALTHCARE HASHTAGS (with a dropdown arrow), BLOG, and CONTACT, and a search box labeled "Search Symplur". Below the navigation bar, there are several category buttons: Healthcare Hashtags (highlighted in orange), Tweet Chats, Conferences, Diseases, Ontologies, and Regular. The main content area is divided into two columns. The left column is titled "Why the Healthcare Hashtag Project?" and contains three sub-sections: "Discover Where The Healthcare Conversations Are Taking Place", "Discover Who To Follow Within Your Specialty Or Disease", and "Discover What Healthcare Topics Are Trending In Real-Time". Below these sub-sections is a search input field containing "#livefitnola" and a search icon. The right column is titled "The Community by the Numbers" and displays four statistics: "1,095,886,540 Tweets" (with an orange "Tweets" label), "15,360 Topics" (with a green "Topics" label), "8,008 Hashtags" (with a yellow "Hashtags" label), and "3,086 Contributors" (with a blue "Contributors" label).

[Healthcare Hashtags](#)
[Tweet Chats](#)
[Conferences](#)
[Diseases](#)
[Ontologies](#)
[Regular](#)






Found 2 results for "#livefitnola"



## #livefitnola Hashtags

Hashtag	Type	Topics and Description
#LiveFitNOLA	Healthcare Tweet Chats	chronic disease, community health, exercise, new orleans, nutrition, Obesity, physical activity #LiveFitNOLA Twitter Chat is hosted by Fit NOLA and Tulane PRC on the 1st Thursday of every month 12-1pm CST. We'll talk about health & wellness topics relevant to New Orleans with a new guest host each month that can add their lens of insight to the selected theme....

## #livefitnola Influencers

-  [@fitnola](#)
-  [@tulaneprc](#)
-  [@runnotc](#)
-  [@eatlocalnola](#)
-  [@frenchmktnola](#)

## ■ Open hashtag page

### #LiveFitNOLA Tweet Chat

#LiveFitNOLA Twitter Chat is hosted by Fit NOLA and Tulane PRC on the 1st Thursday of every month 12-1pm CST. We'll talk about health & wellness topics relevant to New Orleans with a new guest host each month that can add their lens of insight to the selected theme.

Last chat: Thursday 3rd September 10:00 AM PDT  

Next chat: Thursday 1st October 10:00 AM PDT

#LiveFitNOLA is a [healthcare tweet chat](#) hashtag submitted by [@FitNOLA](#)


### What is #LiveFitNOLA?

#### Healthcare Topics

- [chronic disease](#)
- [community health](#)
- [exercise](#)
- [new orleans](#)
- [nutrition](#)
- [Obesity](#)
- [physical activity](#)




#### Related Hashtags

- [#COS15](#)
- [#NHConference](#)
- [#icn2013](#)
- [#YWM2014](#)
- [#IOMobesity](#)
- [#DiabetesInterview](#)
- [#childobesitychat](#)
- [#PowerofToday](#)

 Tweet { 3 }  Like { 0 }

## ■ Scroll down to the bottom of the page to set date and time

#### #LiveFitNOLA Twitter Transcript and Analytics

<b>Start</b>	<b>End</b>	 Open in Symplur Signals	Get Transcript
03/05/2015 10:00 AM 	03/05/2015 11:15 AM 	Get Analytics	

**Time Zone:** All times are Pacific Time/San Francisco. -0700 GMT. [Convert](#)

- Click on “Get Transcript” to load the transcript within the specifically defined timeline (Example transcript page: [www.tinyurl.com/LiveFitNOLAMarch52015](http://www.tinyurl.com/LiveFitNOLAMarch52015))
- Two options to collect data and time specific transcript:
  - Copy and paste the hashtag transcript from Symplur into an Excel file, saved as a .csv file.
  - Download R from [www.r-project.org/](http://www.r-project.org/). Then, use and edit the R code provided in Appendix B.



# Open Refine

Prepare dataset for network visualization and analysis

# How to format transcript data with OpenRefine:

- Download and install OpenRefine ([www.openrefine.org/download.html](http://www.openrefine.org/download.html))

## Download OpenRefine

You will find on this page a list of OpenRefine distributions and extensions available for download. Are we missing something? Want to fix a typo? You can submit changes (pull request) [from here](#).

### [Home](#)

### Official Distribution

### [Download](#)

Read the [installation instructions](#)

### [Documentation](#)

### OpenRefine 2.6

This is the first beta release of OpenRefine 2.6 on Aug 27, 2013. A change log is provided on [the release page](#).

### [Community](#)

- **Windows kit**, Download, unzip, and double-click on *google-refine.exe*. If you're having issues with the above, try double-clicking on *refine.bat* instead.
- **Mac kit**, Download, open, drag icon into the Applications folder and double click on it.
- **Linux kit**, Download, extract, then type `./refine` to start.

### [Post archive](#)

OpenRefine News:  
Spring 2016

- Launch OpenRefine and create a new project

Google refine *A power tool for working with messy data.*

**Create Project**

Open Project

Import Project

**Create a project by importing data. What kinds of data files can I import?**

TSV, CSV, \*SV, Excel (.xls and .xlsx), JSON, XML, RDF as XML, and Google Data documents are all supported. Support for other formats can be added with Google Refine extensions.

Get data from

Locate one or more files on your computer to upload:

**This Computer** Choose Files full\_livefitnola.csv

Web Addresses (URLs)

Clipboard

Google Data

Next »

- Choose files from your computer and click on “Create Project” button

« Start Over Configure Parsing Options Project name  **Create Project »**

Column	source	target
1.	tulaneprc	Welcome to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Â¿s here! Guest host @Healthfitmag is w/ us.
2.	higherpowernola	RT @TulanePRC: Prizes for most engaged #LiveFitNOLA participants include gear & gifts from @FITByYou. @Healthfitmag also has gift from @Mas,Â¿t
3.	healthfitmag	Thanks for having us as the 1st guest host for #LiveFitNOLA monthly chat! Look forward to hearing how everyone stays healthy and fit!
4.	healthfitmag	RT @TulanePRC: Welcome to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Â¿s here! Guest host @Healthfitmag is w/ us.
5.	tulaneprc	We,Â¿re ready to start the 1st #LiveFitNOLA chat! Let,Â¿s get started with the questions!
6.	odcchronic	Excited to be part of today,Â¿s #LiveFitNOLA chat and looking forward to sharing health info to keep #NewOrleans #healthy.

- Remove the first column, named “Column” and contains numbers

744 rows

Show as: rows records      Show: 5 10 25 50 rows

All	Column	source	target
1.	Facet		Welcome to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Å&#x2013; here! Guest host @Healthfitmag is w/ us.
2.	Text filter	ernola	RT @TulanePRC: Prizes for most engaged #LiveFitNOLA participants include gear & gifts from @FITByYou. @Healthfitmag also has gift from @Mas,Å&#x2013;
3.	Edit cells	ag	Thanks for having us as the 1st guest host for #LiveFitNOLA monthly chat! Look forward to hearing how everyone stays healthy and fit!
4.	Edit column	an	RT @TulanePRC: Welcome to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Å&#x2013; here! Guest host @Healthfitmag is w/ us.
5.	Transpose		A chat! Let,Å&#x2013; get started with the questions!
6.	Sort...		A chat and looking forward to sharing health info to keep #NewOrleans #healthy.
7.	View		the 1st #LiveFitNOLA chat! Let,Å&#x2013; get started with the questions!
8.	Reconcile		s the 1st guest host for #LiveFitNOLA monthly chat! Look forward to hearing how everyone stays heal,Å&#x2013;
9.			etc.). Be sure to tag answers w/ (A1, A2, etc.) and w/ #LiveFitNOLA
10.			hanks for the invite!

- Split into several columns...
- Add column based on this column...
- Add column by fetching URLs...
- Add columns from Freebase ...
- Rename this column
- Remove this column**
- Move column to beginning
- Move column to end
- Move column left
- Move column right

- Transform all the contents the “source” column to lowercase

744 rows

Show as: rows records    Show: 5 10 25 50 rows

All	source	target
1.	Facet	me to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Ãs here! Guest host @Healthfitmag is w/ us.
2.	Text filter	TulanePRC: Prizes for most engaged #LiveFitNOLA participants include gear & gifts from @FITByYou. @Healthfitmag also has gift from @Mas,Ã¶]
3.		e for having us as the 1st guest host for #LiveFitNOLA monthly chat! Look forward to hearing how everyone stays healthy and fit!
4.	Edit cells	veFitNOLA chat! Introduce yourself & let us know who,Ãs here! Guest host @Healthfitmag is w/ us.
5.	Edit column	
6.	Transpose	o keep #NewOrleans #healthy.
7.	Sort...	the questions!
8.	View	! Look forward to hearing how everyone stays heal,Ã¶]
9.		w/ #LiveFitNOLA
10.	Reconcile	

Transform...

- Common transforms
  - Trim leading and trailing whitespace
  - Collapse consecutive whitespace
  - Unescape HTML entities
  - To titlecase
  - To uppercase
  - To lowercase**
  - To number
  - To date
  - To text
- Blank out cells

- Repeat the step above for the “target” column

- Transform all the contents the “source” column to be preceded by “@” symbol

**744 rows**

Show as: **rows** records    Show: 5 10 25 50 rows

	All	source	target
1.	Facet		me to the 1st #LiveFitNOLA chat! Introduce yourself & let us know who,Ås here! Guest host @Healthfitmag is w/ us.
2.	Text filter		TulanePRC: Prizes for most engaged #LiveFitNOLA participants include gear & gifts from @FITByYou. @Healthfitmag also has gift from @Mas,Å¶
3.			e for having us on the 1st guest host for #LiveFitNOLA monthly chat! Look forward to hearing how everyone stays healthy and fit!
4.	Edit cells	Transform...	veFitNOLA chat! Introduce yourself & let us know who,Ås here! Guest host @Healthfitmag is w/ us.
5.	Edit column	Common transforms	LA chat! Let,Ås get started with the questions!

### Custom text transform on column source

Expression Language

`"@"+value` No syntax error.

[Preview](#) [History](#) [Starred](#) [Help](#)

row	value	"@"+value
1.	tulaneprc	@tulaneprc

- Transform all the contents the “target” column
  - Copy: `filter(value.split(/^[^a-z0-9-#@#]/),i,(i.startsWith("@"))).join(",")`
  - And paste in the Expression field below, to extract Twitter usernames mentioned in each tweet.

### Custom text transform on column target

Expression Language Google Refine Expression Language (GREL) ▾

```
filter(value.split(/^[^a-z0-9-#@#]/),i,(i.startsWith("@"))).join(",")
```

No syntax error.

[Preview](#) [History](#) [Starred](#) [Help](#)

row	value	filter(value.split(/^[^a-z0-9-#@#]/),i,(i.startsWith("@"))).join(",")
1.	welcome to the 1st #livefitnola chat! introduce yourself & let us know who,ãôs here! guest host @healthfitmag is w/ us.	@healthfitmag

- Split the contents of the “target” column, to create set of source and target pairs

**744 rows**

Show as: **rows** records    Show: 5 10 25 50 rows

All		source	target
☆	🗨	1. @tulaneprc	
☆	🗨	2. @higherpowernola	healthfitmag,@mas
☆	🗨	3. @healthfitmag	
☆	🗨	4. @healthfitmag	
☆	🗨	5. @tulaneprc	
☆	🗨	6. @cdcchronic	
☆	🗨	7. @healthfitmag	
☆	🗨	8. @samueljcookiii	
☆	🗨	9. @tulaneprc	
☆	🗨	10. @mmh_casey_ipc	

- Facet
- Text filter
- Edit cells
- Edit column
- Transpose
- Sort...
- View
- Reconcile

- Transform...
- Common transforms
- Fill down
- Blank down
- Split multi-valued cells...
- Join multi-valued cells...
- Cluster and edit...

What separator currently separates the values?

Cancel    OK



- Fill down the contents of the “source” column to finalize the relationship between source and target @usernames

**1198 rows**

Show as: **rows** records    Show: 5 10 25 50 rows

All	source	target
1.	healthfitmag	
2.	laneprc	
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

The image shows a data table with 10 rows and 3 columns: 'All', 'source', and 'target'. The 'source' column contains the values 'healthfitmag' and 'laneprc' in the first two rows, and is empty for the remaining rows. A context menu is open over the 'source' column, with a sub-menu open for 'Edit cells'. The 'Fill down' option in the sub-menu is highlighted, indicating the action being performed to copy the content of the 'source' column down to the empty rows.

1198 rows

Show as: rows records Show: 5 10 25 50 rows

All			source	target
☆	🗨️	1.	Facet	healthfitmag
☆	🗨️	2.	Text filter	lanepc
☆	🗨️	3.		happ...
☆	🗨️	4.	Edit cells	Transform...
☆	🗨️	5.	Edit column	Common transforms
☆	🗨️	6.	Transpose	Fill down
☆	🗨️	7.	Sort...	Blank down
☆	🗨️	8.	View	Split multi-valued cells...
☆	🗨️	9.		Join multi-valued cells...
☆	🗨️	10.	Reconcile	Cluster and edit...

- Dataset for network visualization and analysis is now complete

**1198 rows**

Show as: **rows** records    Show: 5 10 25 50 rows

			source	target
☆	🗨	1.	@tulaneprc	@healthfitmag
☆	🗨	2.	@higherpowemola	@tulaneprc
☆	🗨	3.	@higherpowemola	@fitbyyou
☆	🗨	4.	@higherpowemola	@healthfitmag
☆	🗨	5.	@higherpowemola	@mas
☆	🗨	6.	@healthfitmag	

- Export the new dataset with the complete “source” and “target” columns as a .csv file

**1198 rows**

Show as: **rows** records    Show: 5 10 25 50 rows

			source	target
☆	🗨	1.	@tulaneprc	@healthfitmag
☆	🗨	2.	@higherpowemola	@tulaneprc
☆	🗨	3.	@higherpowemola	@fitbyyou
☆	🗨	4.	@higherpowemola	@healthfitmag

Open... Export Help

- Export project
- Tab-separated value
- Comma-separated value
- HTML table
- Excel
- ODF spreadsheet
- Triple loader

# Gephi

Network mapping and analysis

# How to visualize and collect a Hashtag-based two-way communication network with Gephi:

- Download Gephi ([www.gephi.github.io/](http://www.gephi.github.io/))

## The Open Graph Viz Platform

Gephi is an interactive visualization and exploration platform for all kinds of networks and complex systems, dynamic and hierarchical graphs.

Runs on Windows, Linux and Mac OS X. Gephi is open-source and free.

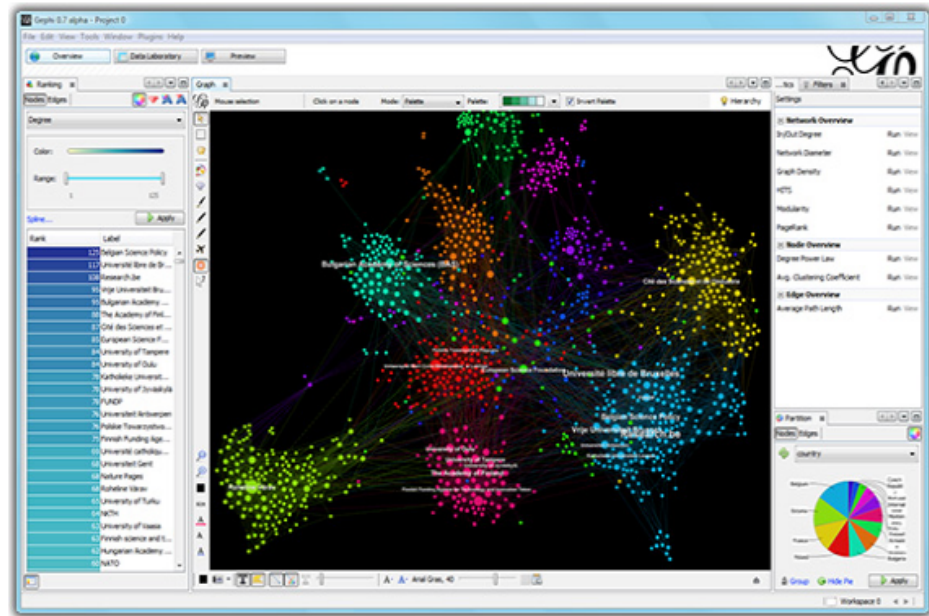
[Learn More on Gephi Platform](#) »



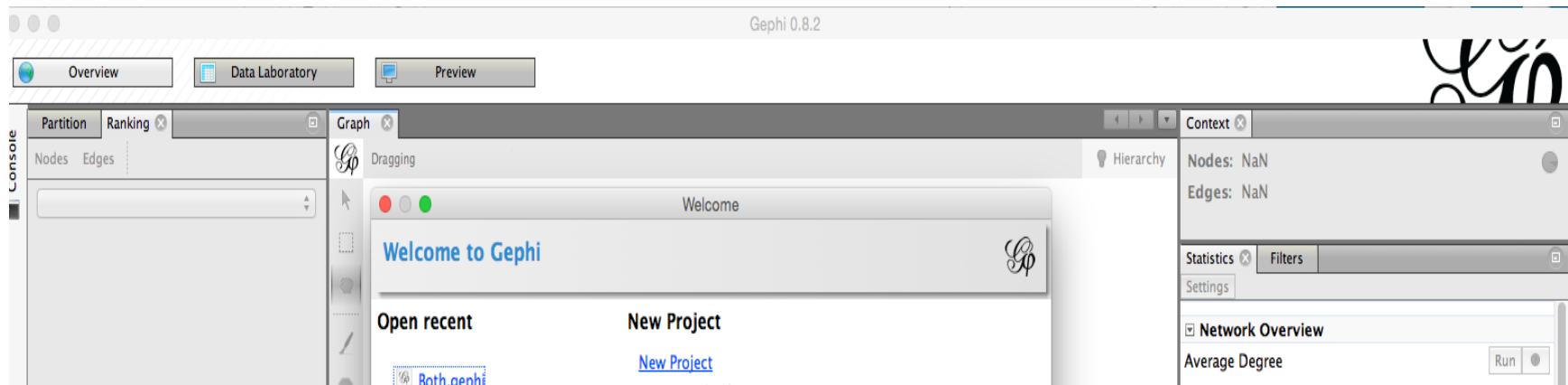
[Release Notes](#) | [System Requirements](#)

► **Features**  
► **Quick start**

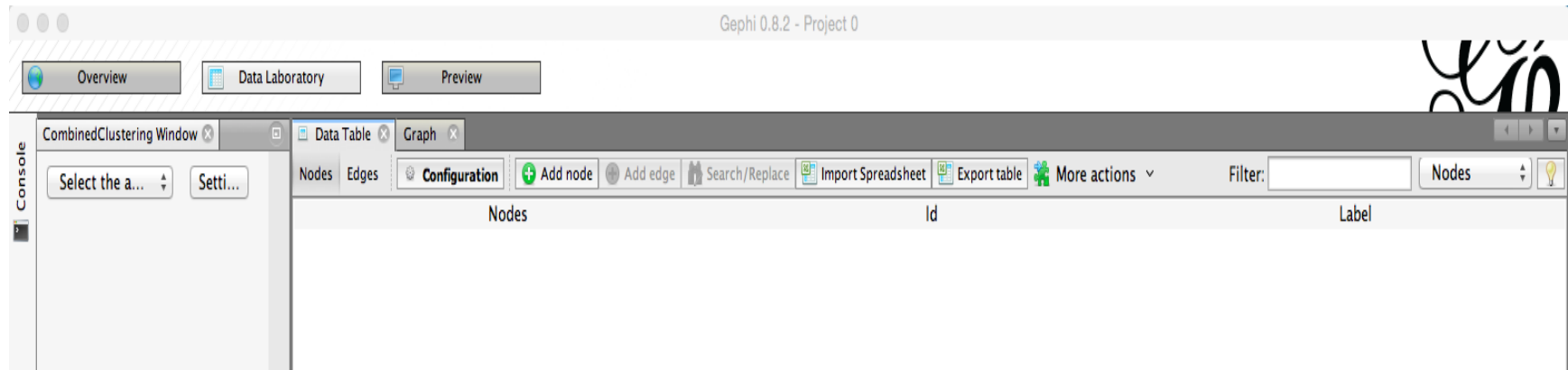
► **Screenshots**  
► **Videos**



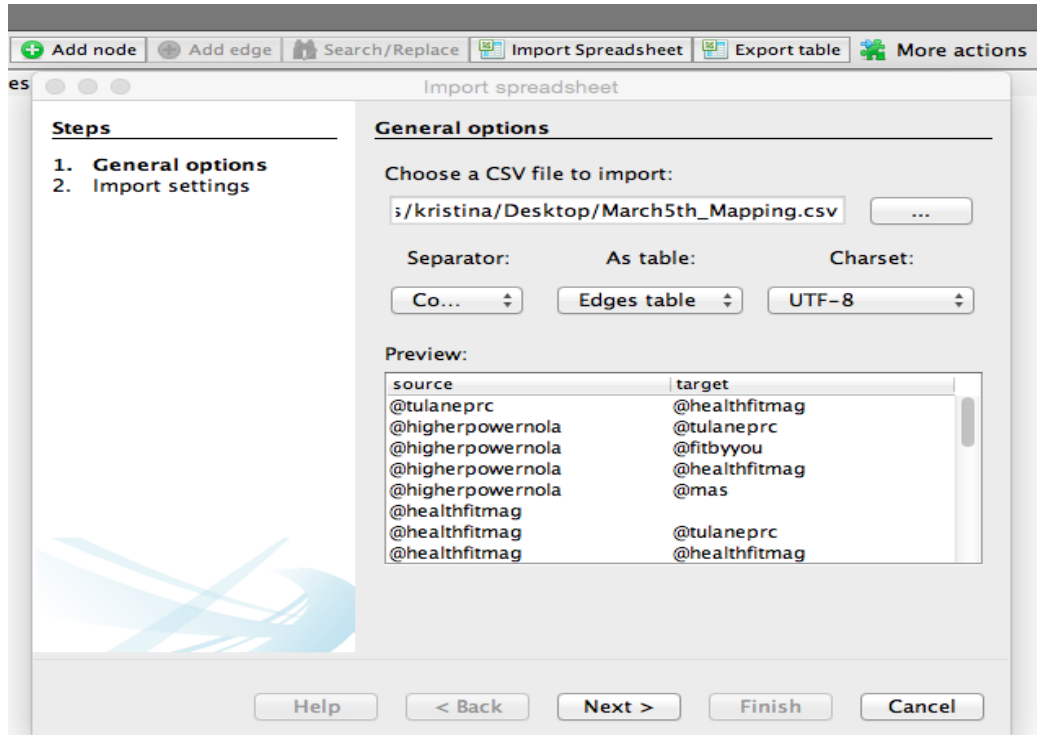
## ■ Open Gephi and create a new project



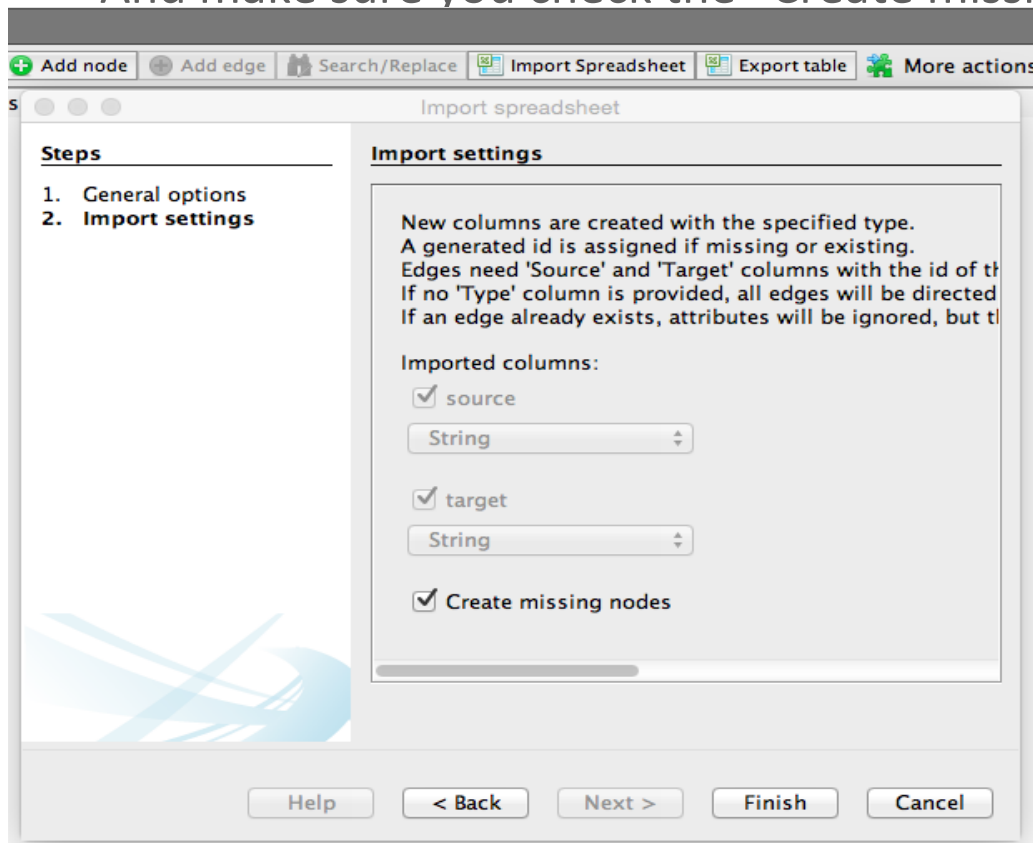
## ■ Select the “Data Laboratory” then “Data Table”



- Import Spreadsheet, the .csv file you saved at the end of OpenRefine step
  - Select “Comma” from the “Separator” drop down menu
  - Select “Edge table” from the “As table:” drop down menu

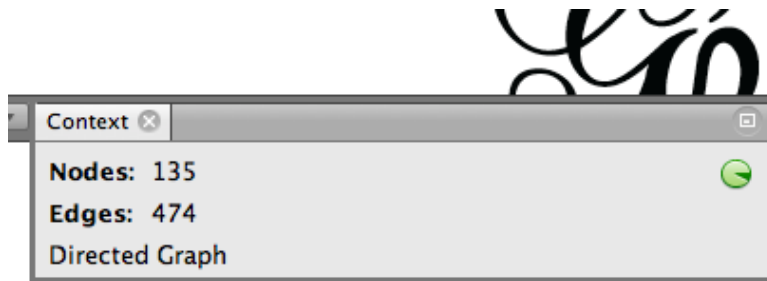


- Click the “Next” button in the import window
- And make sure you check the “Create missing nodes” option.

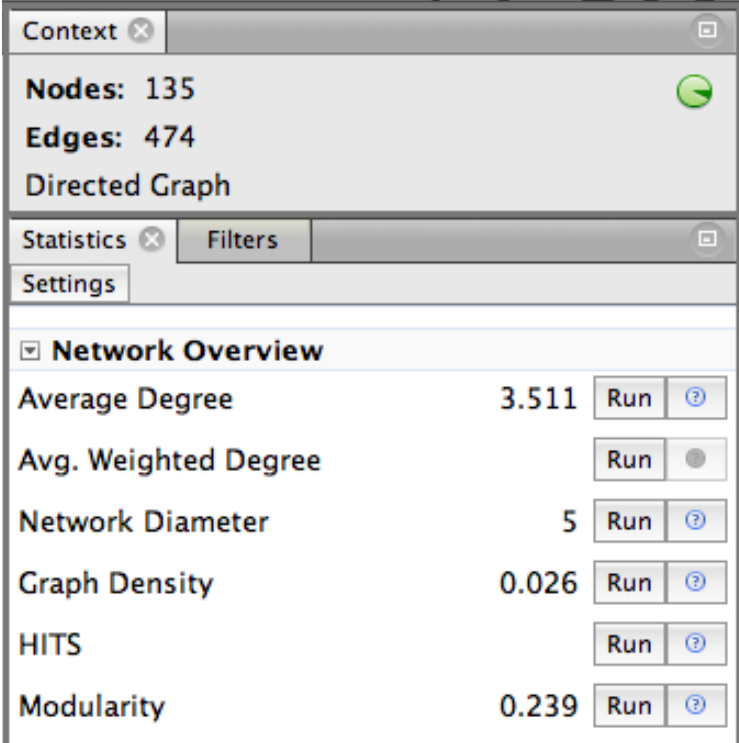




- Go back to the “Overview” tab and note how many “Nodes” and “Edges” are in the network. (Ex: Nodes: 135, Edges: 474).
  - Nodes represent the network members, which include the Twitter chat participants (here, 66 participants) and any other Twitter usernames they mentioned during the chat (here, 69 additional usernames mentioned).
  - Edges represent the relationships or connections between the nodes. In this case, edges are the connections formed when a #LiveFitNOLA chat participant mentioned another participants or another Twitter username.



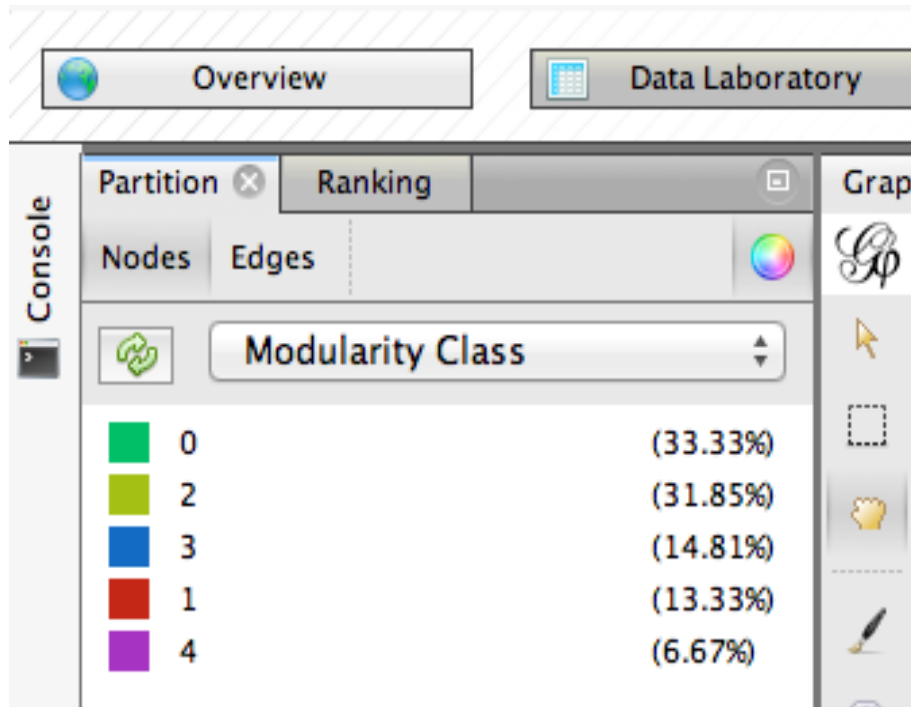
- Under the “Statistics” tab, run some simple metrics. For the purpose of this exercise, the two important metrics are: “Average Degree” and “Modularity”
  - Average degree is the average total number of mentions in the Twitter chat network, regardless of direction
  - Modularity is a community detection algorithm, which identifies the number of communities created in the Twitter chat network based on the number of engagements around particular nodes



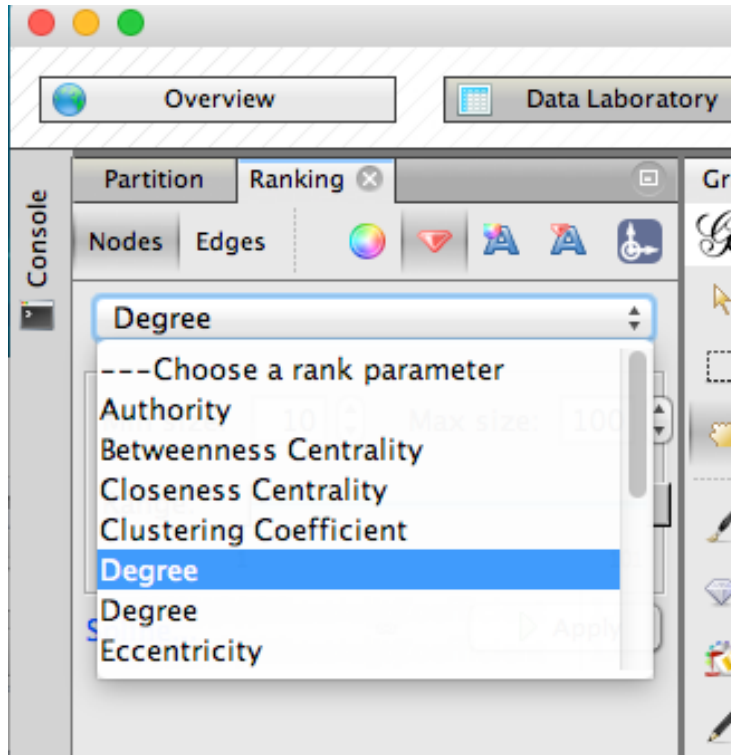
The screenshot shows a software interface with a window titled "Context" and a sub-window titled "Statistics". The "Context" window displays the following information: "Nodes: 135", "Edges: 474", and "Directed Graph". The "Statistics" window has tabs for "Statistics", "Filters", and "Settings". Under the "Statistics" tab, there is a section titled "Network Overview" which lists several metrics with their values and "Run" buttons. The metrics and their values are: Average Degree (3.511), Avg. Weighted Degree, Network Diameter (5), Graph Density (0.026), HITS, and Modularity (0.239). Each metric has a "Run" button and a help icon (question mark).

Metric	Value	Run Button	Help Icon
Average Degree	3.511	Run	?
Avg. Weighted Degree		Run	●
Network Diameter	5	Run	?
Graph Density	0.026	Run	?
HITS		Run	?
Modularity	0.239	Run	?

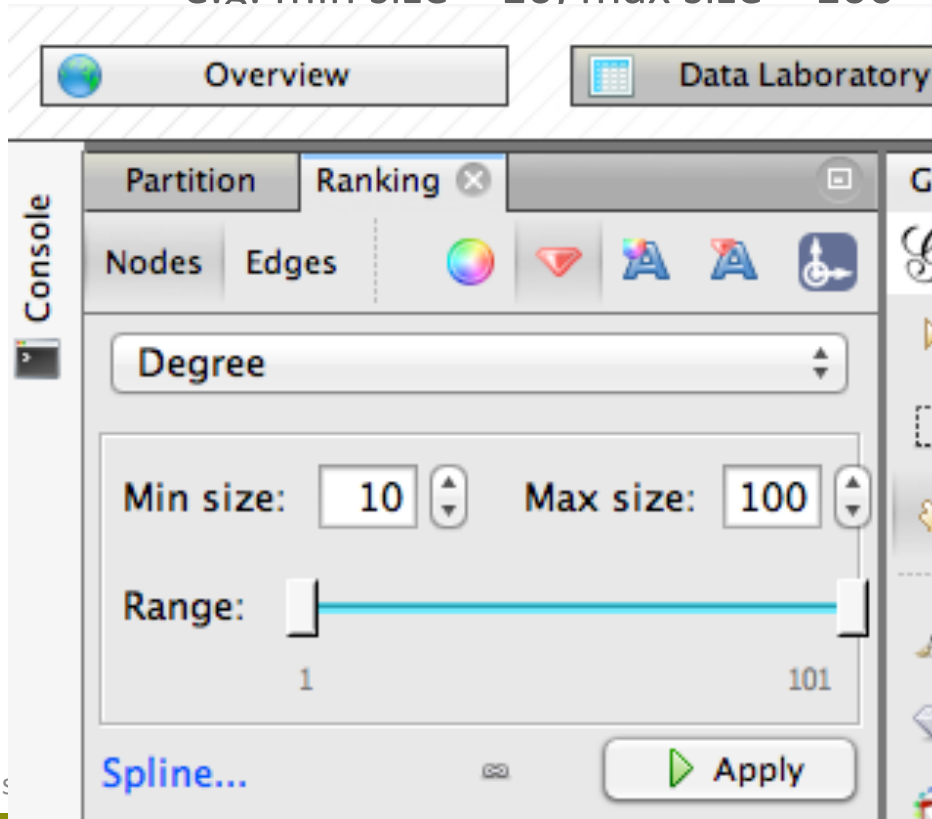
- Under the “Partition” and “Nodes” tabs, click on the green refresh arrows.
  - Choose “Modularity Class” as the partition parameter



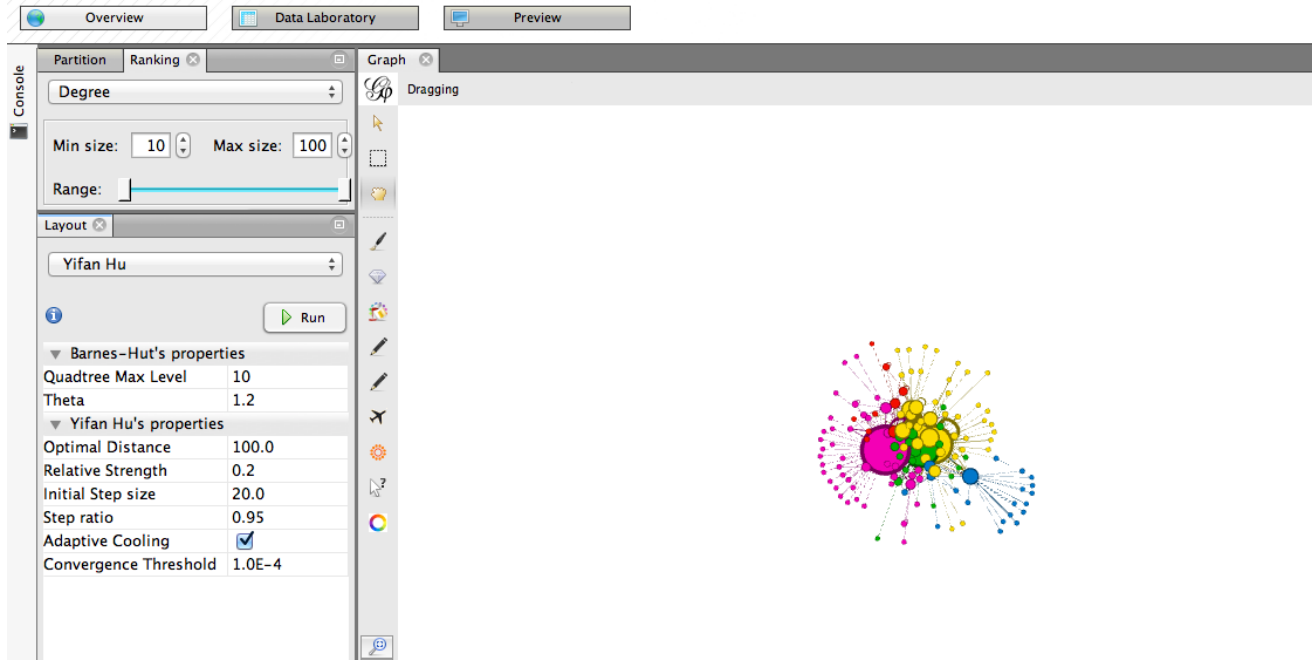
- Under the “Ranking” and Nodes tabs, choose “Degree” as the rank parameter.



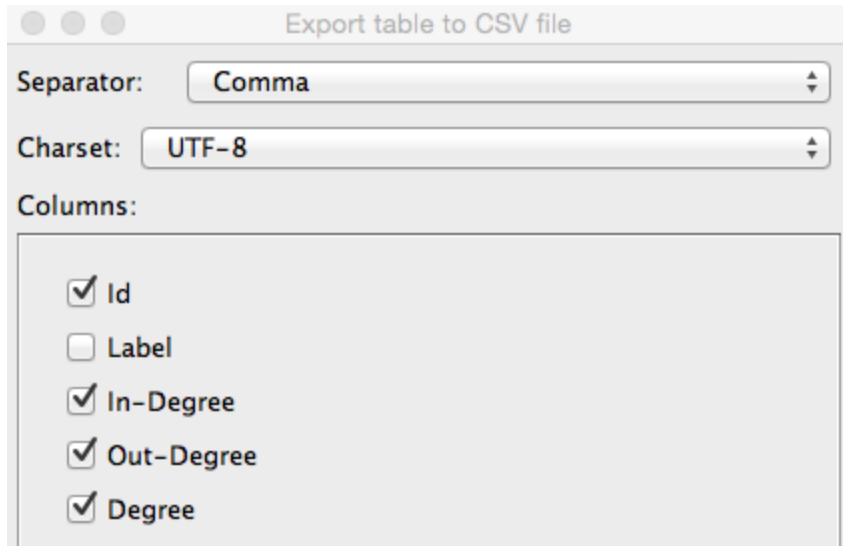
- Set the node sizes by clicking on the red diamond button, under the “Ranking” tab
  - e.g. min size = 10, max size = 100



- Choose a layout to visualize the Twitter chat network map.
  - The layout choice is based on preference.
  - For the #LiveFitNOLA Twitter Chat, we first used the “Yifan Hu” layout, then “Noverlap” to remove the overlapping nodes in the network map.



- Back to the “Data Laboratory” and “Data Table” tabs, export Nodes table and save.



Export table to CSV file

Separator: Comma

Charset: UTF-8

Columns:

- Id
- Label
- In-Degree
- Out-Degree
- Degree

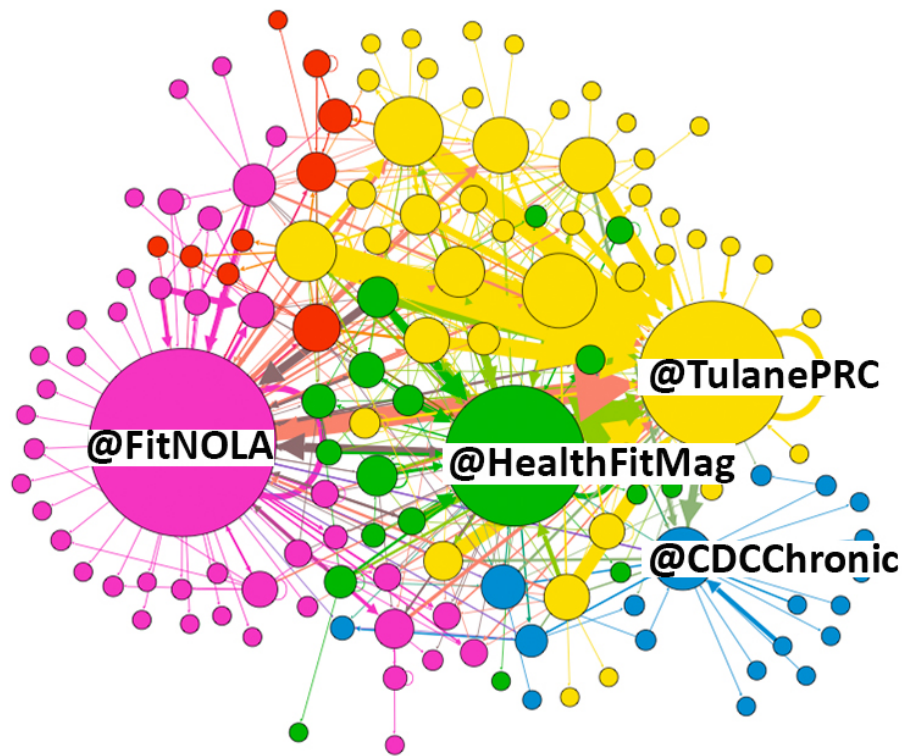
## Network statistics:

- Import the Nodes table file you saved from the last step into Excel
- Run summary statistics for Degree, In Degree, Out Degree
- Identify your usernames of interest (e.g. @TulanePRC and @FitNOLA) and note the number of In Degree and Out Degree they had.
  - Number of in degree = number of incoming communications
  - Number of out degree = number of outgoing communications



# #LiveFitNOLA Network

Analysis results



Total number of nodes = 135  
 Total number of edges = 474  
 Average network degree = 7 (13.4)  
 Degree range = 1 - 101

Number of communities = 5  
 ■ 33.33% centered around @TulanePRC  
 ■ 31.85% centered around @FitNOLA  
 ■ 13.33% centered around @HealthFitMag  
 ■ 14.81% centered around @CDCChronic  
 ■ 6.67% centered around an unidentified user

# Definition of engagement:

- **Engagement** in two-way communications on Twitter is defined as the number of incoming and outgoing mentions between users.
  - A mention can be a direct mention, a retweet, or a reply
  - In other words the incoming and outgoing interactions between two Twitter users within a network bound by a hashtag and a specific timeframe.
- **Overall engagement** for a Twitter user of interest (ex: @TulanePRC) is the total number of two-way communications that user was involved in, regardless of direction.
- **Outgoing mention** is the number of times a Twitter user of interest mentions another user in a tweet.
  - For example: @TulanePRC's outgoing communication is **the total number of times @TulanePRC retweeted or replied to another Twitter user.**
- **Incoming mention** is the number times a Twitter user of interest was mentioned in another user's tweet.
  - For example: @TulanePRC's incoming communication is **the total number of times @TulanePRC other Twitter users retweeted or replied to @TulanePRC.**

# Engagement ratio:

- **Engagement ratio** compares a network member's total number of outgoing mentions to their total number of incoming mentions.

$$\text{@username Engagement ratio} = \frac{\text{@username out degree}}{\text{@username in degree}}$$

**@username out degree:** The number of outgoing mentions for a network member.

**@username in degree:** The number of incoming mentions for a network member.

# Return on engagement (ROE)

- ROE measures the engagement gain or loss generated relative to the amount of engagement invested.
  - In other words, the engagement gain or loss calculated as incoming mentions related to amount of outgoing mentions invested

$$\text{@username ROE (\%)} = \frac{\text{@username's total incoming mentions} - \text{@username's total outgoing mentions}}{\text{@username's total outgoing mentions}} \times 100$$

## #LiveFitNOLA engagement levels:

	Outgoing	Incoming	Out:In	ROE
@TualnePRC	32	45	1 to 1	40%
@FitNOLA	63	38	2 to 1	- 40%
@HealthFitMag	40	33	1 to 1	-18%
@CDCChronic	8	19	1 to 2	138%

# Thank You!

**For questions or comments:**

Kristina M. Rabarison, DrPH, MS

[KRabarison@cdc.gov](mailto:KRabarison@cdc.gov)

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

