



## Centralities - Measures and Reports

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## Agenda

- Guiding Questions
- Review of Centrality Measures
- ORA Walk Through 1
- ORA Walk Through 2
- ORA Walk Through 3



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## Guiding Questions

- Who is most important to this operation?
- Is Fred a connector or a broker?
- Which shipping port is most vulnerable?
- Which doctor should receive the referral bonus?

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## Guiding Questions

- Question?
- Please list all the Drs. to whom you have referred patients in the past six months.

✓ Doctors : size 10  
 ● Nurses : size 25  
 ● Specialty : size 4  
 ● Task : size 20

✓ Refers Patient To  
 ← Specialty  
 ← Works With

**1. Characteristics**

- One Way
- One mode
- One type of link
  - Binary
  - Directed

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## Steps in a Structural Analysis

- Collect network data.
  - Connections among people, knowledge, resources, events ...
- Enter data into ORA.
- Visualize.
- Generate Report.
- If multiple networks create combined measures.
- If needed look at some measures in more depth.
- Possibly drop isolates and pendants
- Check interpretations.

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## Ego-centric

- Please tell me, within the last six months, the first names or initials of up to 5 people you talk to most often about important matters?

Respondent					
1 2 3 4 5	Name _____				
1 2 3 4 5	No Yes	Name _____			
1 2 3 4 5	No Yes	No Yes	Name _____		
1 2 3 4 5	No Yes	No Yes	No Yes	Name _____	
1 2 3 4 5	No Yes	No Yes	No Yes	No Yes	Name _____

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## Ego-centric Network Data are Node-based

Same or Higher Econ. Status

Primary Schooling

Live Outside of Village

Kin (sister-in-law, brother)

Confidants & Friends

Older

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## Critical Personnel

- Individual whose absence will dramatically alter performance of organization
  - Only person who can do a task
  - Only person with certain organizationally critical knowledge
  - Person who spreads good morale
  - Person who is only one with critical knowledge
  - Only person who knows key people
- Examples
  - Lead scientist
  - Long term administrative assistant
  - One person lab/technician

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## Critical Personnel

- Direct identifiers
  - The key entities: e.g., degree centrality
  - The exclusivities: e.g., task
  - The integrators: e.g., simmelian ties
  - The loads: e.g., workload and cognitive demand
- Indirect
  - Those who have access to, can influence, those who are critical

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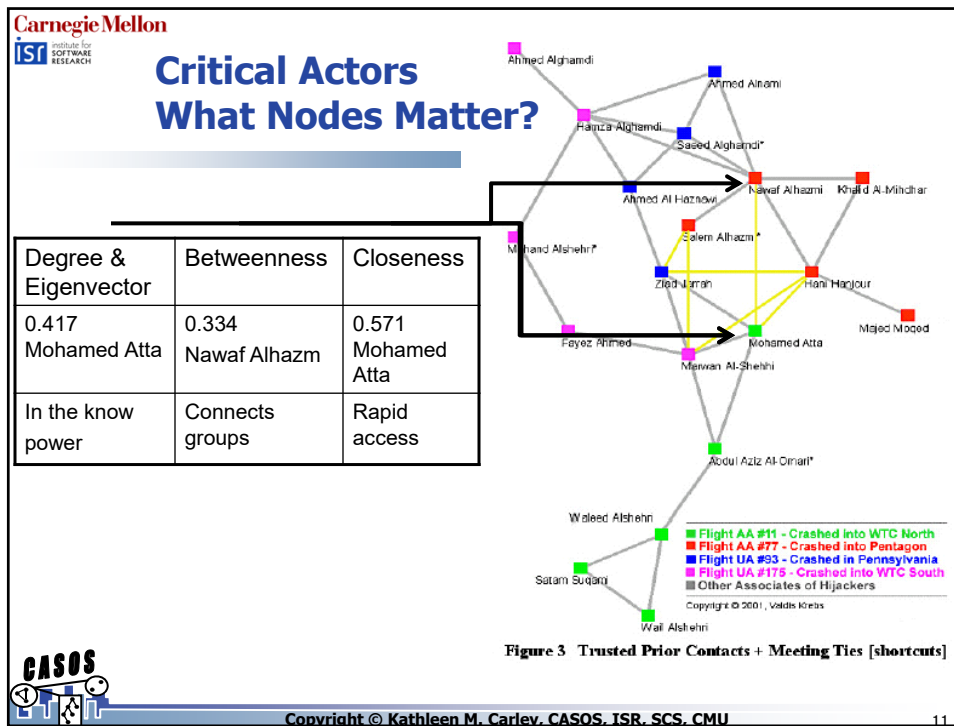
## Node Level SNA Metrics Common Used: Centralities

- Degree Centrality
  - Node with the most connections
- Betweenness Centrality
  - Node in the most best paths
- Eigenvector Centrality
  - Node connected well-known people
- Closeness Centrality
  - Node that is closest to all other nodes

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## Simple SNA Measures

Measure	Definition	Meaning	Usage
Degree Centrality	Node with the most connections	In the know	Identifying sources for intel; Reducing information flow
Betweenness	Node in the most best paths Needs symmetric data	Connects groups	Typically has political influence, but may be too constrained to act
Eigenvector centrality	Node most connected to other highly connected nodes	Strong social capital	Identifying those who can mobilize others
Closeness	Node that is closest to all other nodes	Rapid access to all information	Identifying sources to acquire/transmit information

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## Brokerage

### Brokerage Roles

The diagram illustrates five brokerage roles based on the relationships between nodes A, B, and C:

- Coordinator:** Node B is at the top, with arrows pointing down to nodes A and C.
- Representative:** Node B is at the top, with an arrow pointing to node A, and node C is positioned below node A.
- Gatekeeper:** Node B is at the top, with an arrow pointing to node A, and node C is positioned to the right of node A.
- Liaison:** Node B is at the top, with arrows pointing to nodes A and C, which are positioned below node B.
- Consultant:** Node B is at the top, with arrows pointing to nodes A and C, which are positioned below node B.

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## Connectivity

- Line connectivity  $\lambda(s,t)$  is the minimum number of lines that must be removed to disconnect  $s$  from  $t$
- Node connectivity  $\kappa(s,t)$  is minimum number of nodes that must be removed to disconnect  $s$  from  $t$

A network graph illustrating connectivity. Node S (green) is on the left, and node T (red) is on the right. The graph consists of 7 nodes and several edges connecting them.

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## Cutpoints

- Nodes which, if deleted, would disconnect net

```
graph LR; Bill --- Bob; Bob --- Biff; Biff --- Bonnie; Biff --- Betty; Betsy --- Biff; Biff --- Bob
```

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## Bridge

- A tie that, if removed, would disconnect net

```
graph LR; a --- b; a --- d; a --- f; b --- e; b --- d; c --- f; c --- h; d --- g; e --- g; f --- h; g --- h; h --- i; i --- j; i --- n; j --- p; j --- k; j --- l; k --- l; n --- o; p --- m; m --- q; q --- s; r --- h
```

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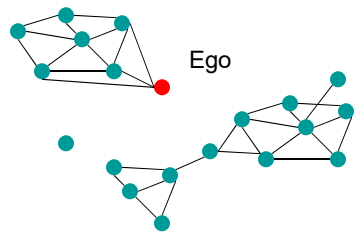




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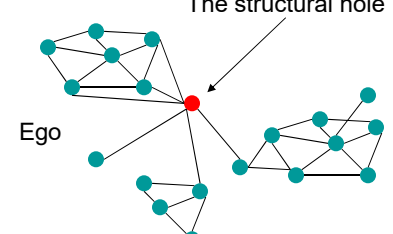
## Structural Holes

**Local Betweenness**



Ego

Few structural holes



The structural hole

Ego

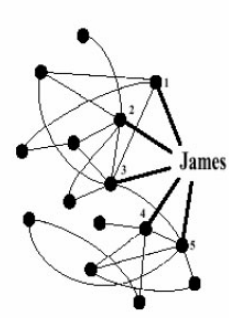
Many structural holes

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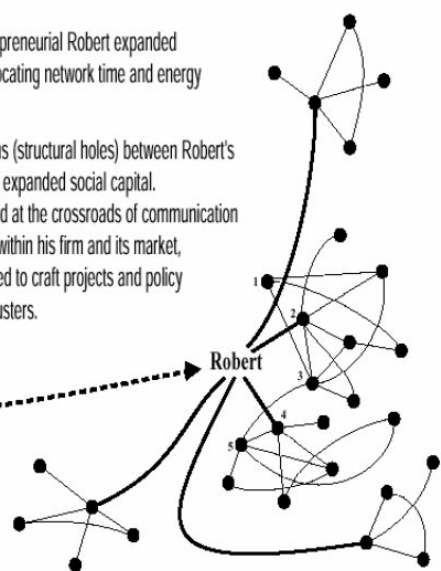
## Structural Holes



James

Robert took over James' job. Entrepreneurial Robert expanded the social capital of the job by reallocating network time and energy to more diverse contacts.

It is the weak connections (structural holes) between Robert's contacts that provide his expanded social capital. Robert is more positioned at the crossroads of communication between social clusters within his firm and its market, and so is better positioned to craft projects and policy that add value across clusters.



Robert

Research shows that people like Robert, better positioned for entrepreneurial opportunity, are the key to integrating across functions and across the people of increasingly diverse backgrounds in today's flatter organizations. In research comparisons between managers like James and Robert, it is the people like Robert who get promoted faster, earn higher compensation, receive better performance evaluations, and perform more successfully on teams.

Slide from Ron Burt



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## Alternative Measures

- Page rank
  - Iteratively Weighted degree centrality
  - Page rank of node  $i$  is  $PR(p_i)$
  - $D$  is the dampening factor  $PR(p_i) = \frac{1-d}{N} + d \sum_{p_j \in M(p_i)} \frac{PR(p_j)}{L(p_j)}$
  - $L(p_j)$  is the outdegree of node  $j$
- Authority Centrality –
  - A node is authority-central to the extent that its in-links are from nodes that have many out-links.
  - The authority of a node are calculated by:  $a(i) = \sum_{(j,i) \in E} h(j)$ ,
  - Where  $a(x)$  is the authority of node  $x \in \{i, j\}$

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## Clustering Coefficient

(Carley et al., 2013: 845-847)

NODE LEVEL –  
Measures the degree of clustering in a network by averaging the clustering coefficient of each node, which is defined as the density of the node's ego network.

Let  $G=(V, E)$  be the graph representation of a square network.  
Define for each node  $v \in V$  its Clustering Coefficient  $CC_v$ :  
let  $G_v =$  **ego network of entity v**

Then **Clustering Coefficient for entity: entity v =  $CC_v =$  density ( $G_v$ )**

GRAPH LEVEL -  
Then **Clustering Coefficient for graph: graph =  $\frac{\sum_{v \in V} CC_v}{|V|}$**

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## Bonacich

- Bonacich's power measure corresponds to the notion that the power of a vertex is recursively defined by the sum of the power of its alters.
  - The nature of the recursion involved is then controlled by the power exponent: positive values imply that vertices become more powerful as their alters become more powerful (as occurs in cooperative relations), while negative values imply that vertices become more powerful only as their alters become *weaker* (as occurs in competitive or antagonistic relations).
  - The magnitude of the exponent indicates the tendency of the effect to decay across long walks; higher magnitudes imply slower decay.
  - One interesting feature of this measure is its relative instability to changes in exponent magnitude (particularly in the negative case). If your theory motivates use of this measure, you should be very careful to choose a decay parameter on a non-ad hoc basis.
- Bonacich, P. (1987). "Power and Centrality: A Family of Measures." *American Journal of Sociology*, 92, 1170-1182.

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## Bonacich's power centrality measure

$$c_i(\alpha, \beta) = \alpha(I - \beta A)^{-1} A \vec{1}$$

- $\beta$  is an attenuation parameter (set here by exponent)
- $A$  is the graph adjacency matrix.
- $\alpha$  acts as a scaling parameter, and is set here (following Bonacich (1987)) such that the sum of squared scores is equal to the number of vertices.
  - This allows 1 to be used as a reference value for the "middle" of the centrality range.
- When  $\beta \rightarrow 1/\lambda_{A1}$  (the reciprocal of the largest eigenvalue of  $A$ ), this is to within a constant multiple of the familiar eigenvector centrality score; for other values of  $\beta$ , the behavior of the measure is quite different.
- $\beta$  gives positive and negative weight to even and odd walks, respectively, as can be seen from the series expansion  $C_{BP}(\alpha, \beta) = \alpha \sum_{k=0}^{\infty} \beta^k A^{k+1} \vec{1}$ , which converges so long as  $|\beta| < 1/\lambda_{A1}$ .
- The magnitude of  $\beta$  controls the influence of distant actors on ego's centrality score, with larger magnitudes indicating slower rates of decay.
- High rates imply a greater sensitivity to edge effects.

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# ORA Walkthrough 1

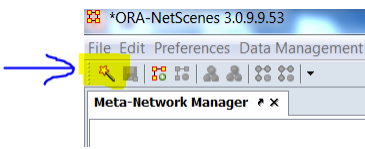
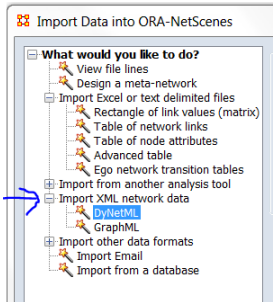
- We'll use Sampson data to get hands on training with Centrality Measures
- Sampson Data: <http://bit.ly/1NSa067> (Also on Thumb Drive)

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# ORA Walkthrough 1

1. Click Import Wizard Button
 
2. Select Import XML Network Data -> DynetML
 

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## ORA Walkthrough 1

3. Click Browse, and select the sampson data from thumb drive

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## ORA Walkthrough 1

4. Click on test network

5. Click on Editor, to manipulate the data

	John	Bosco	Gregory	Basil	Peter	Bonavent...
John	0	0	1	0	0	0
Bosco	1	0	0	-1	0	0
Gregory	1	0	0	0	0	0
Basil	0	-1	0	0	1	0
Peter	0	0	0	1	0	0
Bonavent...	0	0	-1	1	0	0
Berthold	0	1	0	-1	0	0

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## ORA Walkthrough 1

6. Click Trim -> Remove links by value
7. Select Less than, 0
8. Click Remove Links

Now we only have links where one monk liked the other

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## ORA Walkthrough 1

9. Click on test network
10. Click on Editor, to manipulate the data

	John	Bosco	Gregory	Basil	Peter	Bonavent...
John	0	0	1	0	0	0
Bosco	1	0	0	-1	0	0
Gregory	1	0	0	-1	0	0
Basil	0	-1	0	0	1	0
Peter	0	0	0	1	0	0
Bonavent...	0	0	-1	1	0	0
Berthold	0	1	0	-1	0	0

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11. Click Convert Links -> Binarize link values



Now we're sure that all links have value 1, completing our data cleaning

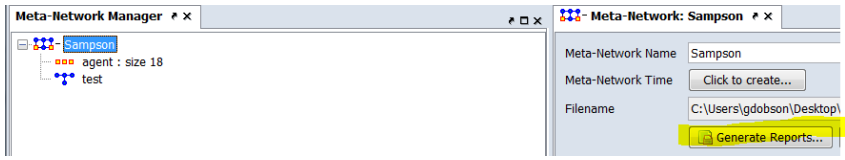
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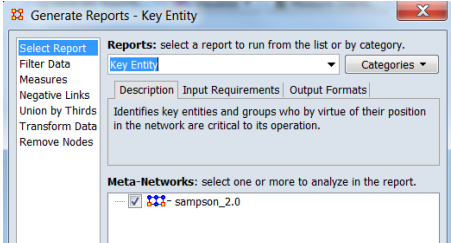
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# ORA Walkthrough 1

12. Select Sampson Meta Network, Click Generate Reports



13. Select Key Entity Report



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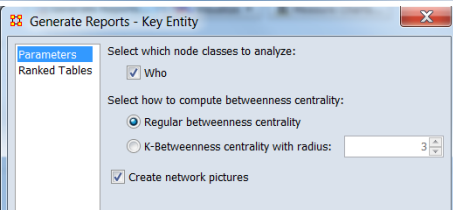
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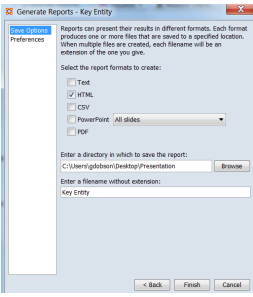
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14. Leave the Defaults



15. Leave the Defaults, click Finish



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# ORA Walkthrough 1

16. Click on Key Agent - Who Analysis

## KEY ENTITY REPORT

Input data: Sampson  
Start time: Mon Jun 4 21:42:26 2018

[Data Description](#)

**Table of Contents**

- [Key Agent - Who Analysis](#)
- [Performance Indicators - measures performance of the organization\(s\) as a whole](#)

Produced by ORA, a joint product of the CASOS center at Carnegie Mellon University and Netanomics

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# ORA Walkthrough 1

The screenshot shows the CASOS software interface. At the top, there is a menu bar with options: File, Edit, Preferences, Data Management, Generate Networks, Analysis, Simulations, Visualizations, System, Help. Below the menu bar is a toolbar with various icons. The main window is titled 'Meta-Network Manager' and contains a configuration panel for a 'Meta-Network: Sampson'. The configuration panel includes fields for 'Meta-Network Name' (Sampson), 'Meta-Network Time' (Click to create...), and 'Filename' (C:\Users\gjobson\Desktop\CASOS S1 2018\Day). There are buttons for 'Generate Reports...' and 'Visualize...'. Below the configuration panel, there are three network visualizations. The first is a central node 'Basil' connected to 'Mark', 'Victor', 'Ambrósio', 'Peter', and 'Bonaventura'. The second is a node 'Elias' connected to 'Albert' and 'Witold'. The third is a node 'Bosco' connected to 'Hugh', 'Levin', 'Gregory', 'John', 'Amand', and 'Berthold'. In the bottom left corner, there is a 'CASOS' logo with a bar chart and a person icon. In the bottom right corner, there is a copyright notice: 'Copyright © Kathleen M. Carley, CASOS, ISR, SCS, CMU' and the page number '33'.

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# ORA Walkthrough 1

## Eigenvector Centrality

Leaders of strong cliques are individuals or organizations who are collected to others that are themselves highly connected to each other. In other words, if you have a clique then the individual most connected to others in the clique and other cliques, is the leader of the clique. Individuals or organizations who are connected to many otherwise isolated individuals or organizations will have a much lower score in this measure than those that are connected to groups that have many connections themselves. The scientific name of this measure is eigenvector centrality and it is calculated on agent or organization by organization matrices.

If the node of interest has a higher than normal value (greater than 1 standard deviation(s) above the mean) the row is colored red. The row is green if the node is within 1 standard deviation of the mean. Finally, the row is colored blue if the node has a lower than normal value (less than one standard deviation(s) below the mean).

Input network: test (size: 18, density: 0.0588235)

Show 10 entries Search:

Rank	Agent	Value	Unscaled	Context*
1	Bosco	3.551874e-01	2.511554e-01	3.749497e-01
2	John	3.551874e-01	2.511554e-01	3.749497e-01
3	Basil	3.453620e-01	2.442078e-01	3.457115e-01
4	Mark	2.749860e-01	1.944444e-01	1.362862e-01
5	Elias	1.666667e-01	1.178511e-01	-1.860506e-01
6	Ambrose	1.587632e-01	1.122626e-01	-2.095697e-01
7	Bonaventura	1.587632e-01	1.122626e-01	-2.095697e-01
8	Peter	1.587632e-01	1.122626e-01	-2.095697e-01
9	Amand	1.542431e-01	1.090664e-01	-2.230206e-01
10	Berthold	1.542431e-01	1.090664e-01	-2.230206e-01

In the table, the first three rows (Bosco, John, Basil) are highlighted in red, indicating high eigenvector centrality. The remaining rows are in white, indicating values within one standard deviation of the mean.

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16. Open Visualizer, add link between Peter and Hugh

The network graph shows the following connections: Ramuald-Mark, Victor-Mark, Mark-Peter, Peter-Basil, Basil-Bonaventure, Basil-Ambrose, Peter-Hugh, Hugh-Bosco, Hugh-Boniface, Hugh-Berthold, Bosco-John, John-Louis, John-Gregory, John-Amand, Elias-Albert, Elias-Winfrid.

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## ORA Walkthrough 1

17. Re-Run Generate Reports -> Key Entity -> Save as "likes add peter hugh" - observe "Eigenvector Centrality" rankings

Rank	Agent	Value	Unscaled	Context*
1	Bosco	3.551874e-01	2.511554e-01	3.749497e-01
2	John	3.551874e-01	2.511554e-01	3.749497e-01
3	Basil	3.453620e-01	2.442078e-01	3.457115e-01
4	Mark	2.749860e-01	1.944444e-01	1.362862e-01
5	Elias	1.666667e-01	1.178511e-01	-1.860506e-01
6	Ambrose	1.587632e-01	1.122626e-01	-2.095697e-01
7	Bonaventure	1.587632e-01	1.122626e-01	-2.095697e-01
8	Peter	1.587632e-01	1.122626e-01	-2.095697e-01
9	Amand	1.542431e-01	1.090664e-01	-2.230206e-01
10	Berthold	1.542431e-01	1.090664e-01	-2.230206e-01

Rank	Agent	Value	Unscaled	Context*
1	Bosco	5.963698e-01	4.216971e-01	1.063982e+00
2	John	5.355839e-01	3.787150e-01	8.831583e-01
3	Hugh	3.794598e-01	2.683186e-01	4.187265e-01
4	Basil	3.458540e-01	2.445557e-01	3.187574e-01
5	Peter	3.052566e-01	2.158490e-01	1.979898e-01
6	Berthold	2.509890e-01	1.774760e-01	3.655693e-02
7	Boniface	2.509890e-01	1.774760e-01	3.655693e-02
8	Amand	2.254066e-01	1.593865e-01	-3.954473e-02
9	Gregory	2.254066e-01	1.593865e-01	-3.954473e-02
10	Louis	2.254066e-01	1.593865e-01	-3.954473e-02

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## ORA Walkthrough 1

18. Open Visualizer, add link from Mark to Bosco and John to Mark

Albert Elias Winfrid

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## ORA Walkthrough 1

20. Re-Run Generate Reports -> Key Entity -> Save as "likes add mark" - observe "Eigenvector Centrality" rankings

Rank	Agent	Value	Unscaled	Context*
1	Bosco	5.963698e-01	4.216971e-01	1.035323e+00
2	John	5.355839e-01	3.787150e-01	8.545626e-01
3	Hugh	3.794598e-01	2.683186e-01	3.902934e-01
4	Basil	3.458540e-01	2.445557e-01	2.903593e-01
5	Peter	3.052566e-01	2.158490e-01	1.696340e-01
6	Berthold	2.509890e-01	1.774760e-01	8.257561e-03
7	Boniface	2.509890e-01	1.774760e-01	8.257561e-03
8	Amand	2.254066e-01	1.593865e-01	-6.781746e-02
9	Gregory	2.254066e-01	1.593865e-01	-6.781746e-02
10	Louis	2.254066e-01	1.593865e-01	-6.781746e-02

Rank	Agent	Value	Unscaled	Context*
1	Mark	5.519503e-01	3.902878e-01	9.033718e-01
2	Bosco	5.318373e-01	3.760658e-01	8.427256e-01
3	John	5.140632e-01	3.634976e-01	7.891317e-01
4	Basil	2.968666e-01	2.099164e-01	1.342238e-01
5	Hugh	2.278233e-01	1.610951e-01	-7.396071e-02
6	Ramuaki	1.791029e-01	1.266449e-01	-2.208662e-01
7	Victor	1.791029e-01	1.266449e-01	-2.208662e-01
8	Berthold	1.725764e-01	1.220299e-01	-2.405453e-01
9	Boniface	1.725764e-01	1.220299e-01	-2.405453e-01
10	Peter	1.702571e-01	1.203900e-01	-2.475386e-01

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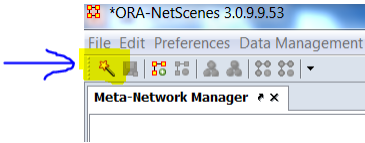
38



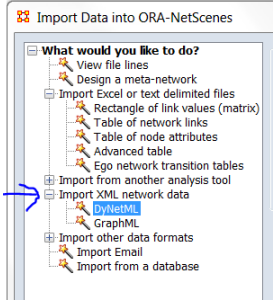
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## ORA Walkthrough 2

1. Click Import Wizard Button



2. Select Import XML Network Data -> DynetML



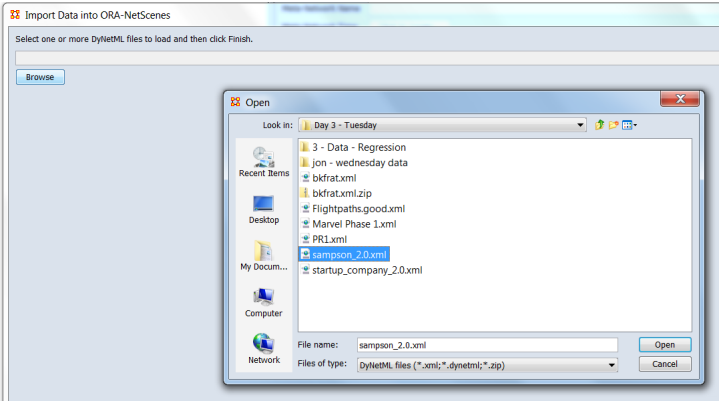
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## ORA Walkthrough 2

3. Click Browse, and select the sampson data from thumb drive



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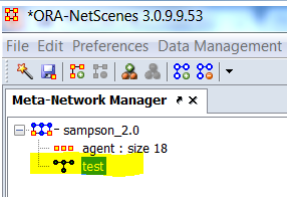
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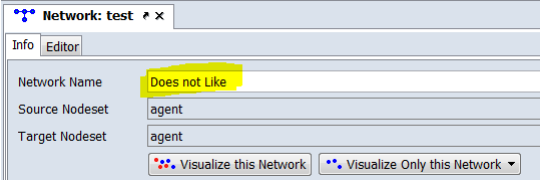
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## ORA Walkthrough 2

4. Click on test network



5. Change the name to "Does not Like"



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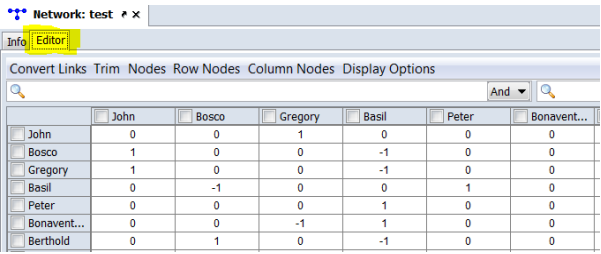
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## ORA Walkthrough 2

6. Click on Editor, to manipulate the data



	John	Bosco	Gregory	Basil	Peter	Bonavent...
John	0	0	1	0	0	0
Bosco	1	0	0	-1	0	0
Gregory	1	0	0	-1	0	0
Basil	0	-1	0	0	1	0
Peter	0	0	0	1	0	0
Bonavent...	0	0	-1	1	0	0
Berthold	0	1	0	-1	0	0

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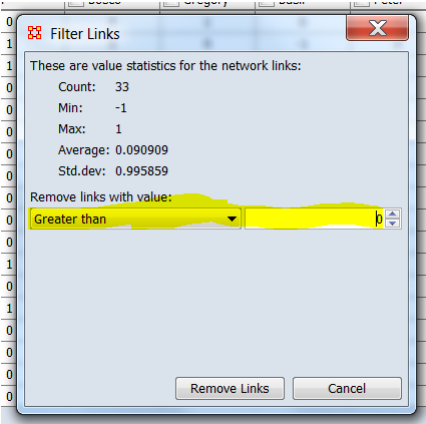


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## ORA Walkthrough 2

- Click Trim -> Remove links by value
- Select Greater than, 0
- Click Remove Links

Now we only have links where one monk didn't like the other



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## ORA Walkthrough 2

- Click Convert Links -> Binarize link values

Now we're sure that all links have value 1, completing our data cleaning



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## ORA Walkthrough 2

11. Visualize

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## ORA Walkthrough 2

12. Select Sampson Meta Network, Click Generate Reports

13. Select Key Entity Report

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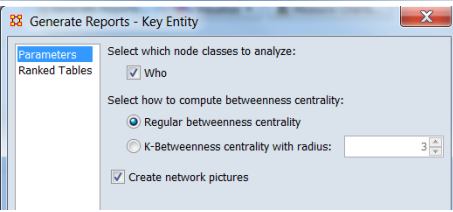
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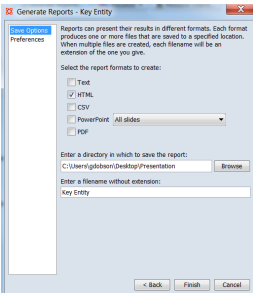
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## ORA Walkthrough 2

14. Leave the Defaults



15. Leave the Defaults, click Finish



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## ORA Walkthrough 2

16. Click on Key Agent - Who Analysis

### KEY ENTITY REPORT

Input data: Sampson  
Start time: Mon Jun 4 21:42:26 2018

[Data Description](#)

**Table of Contents**

- [Key Agent - Who Analysis](#)
- [Performance Indicators - measures performance of the organization\(s\) as a whole](#)


Produced by ORA, a joint product of the CASOS center at Carnegie Mellon University and Netanomics

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## ORA Walkthrough 2

### Total Degree Centrality


Individuals or organizations who are 'in the know' are those who are identified by degree centrality in the relevant social network. Finally, the row is colored blue if the node has a higher than normal value (greater than the mean) and red if the node has a lower than normal value (less than the mean).

Input network: Does not Like (size: 18, density: 0.0490196)

Show 10 entries


Rank	Agent
1	Basil
2	Bosco
3	Gregory
4	Berthold
5	Bonaventure
6	Mark
7	Winfried
8	Albert
9	Amand
10	Boniface

Basil and Bosco most disliked... John not disliked!



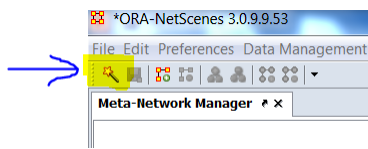
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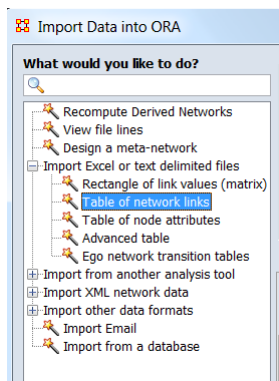



## ORA Walkthrough 3

1. Click Import Wizard Button



2. Click Table of Network Links





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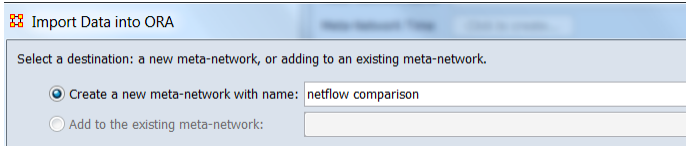
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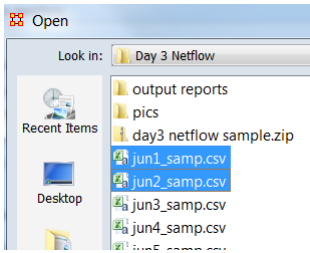
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## ORA Walkthrough 3

3. Create new meta-network, named "Netflow comparison"



4. Browse, select BOTH of jun1\_samp.csv and jun2\_samp.csv

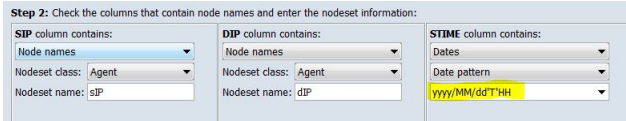


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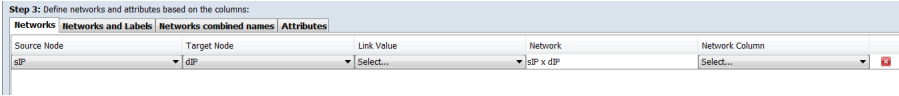
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## ORA Walkthrough 3

5. Set the Step 2 options like so:



6. Set the Step 3 options like so, and then "Next":



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## ORA Walkthrough 3

7. Uncheck "Create a dynamic meta-network" and click "Finish"

Import Data into ORA

Specify these general import options for the data:

Create new nodes for unrecognized node IDs

Select how to handle parsing errors: Log and continue

Create a dynamic meta-network with these options:

Get dates from this column: sTime

Create keyframe meta-networks

Create delta meta-networks

Aggregate by 6 Hour(s)

When importing attribute values: Overwrite values

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## ORA Walkthrough 3

8. Inspect data in the Info and Editor:

**Network: sIP x dIP**

Network Name: sIP x dIP

Source NodeSet: sIP

Target NodeSet: dIP

Properties:  Symmetric (undirected links)  No self-loops  Binary link values

General statistics:

Source count: 8614

Target count: 15582

Density: 0.00087425

Symmetric: N/A

Link statistics:

All links: 117345  
 Min: 0, Max: 5046, Mean: 2.068311, StdDev: 23.209161, Sum: 242706  
 Mean + StdDev: 25.277472

Non self-loops: 117345  
 Min: 1, Max: 5046, Mean: 2.068311, StdDev: 23.209161, Sum: 242706  
 Mean + StdDev: 25.277472

Self-loops: N/A

Self-loop values: N/A

Component statistics:

Isolates: 0

Dyads: 1

Triads: 0

Larger: 1

Larger sizes: Min: 24194, Max: 24194, Mean: 24194, StdDev: 0

When computing measures:

Treat as symmetric: Auto-detect

Ignore self-loops: Auto-detect

Treat as binary: Auto-detect

**Network: sIP x dIP**

Convert Links Trim Nodes Row Nodes Column Nodes Display Options

	205.141.18...	205.141...	205.141...	205.141...	205.141...	205.141...
146.20.2...	2	4	2	2	2	2
108.86.1...	0	0	0	0	0	0
189.203...	0	0	0	0	0	0
106.194...	0	0	0	0	0	0
209.204...	0	0	0	0	0	0
85.26.20...	0	0	0	0	0	0
104.194...	0	0	0	0	0	0
85.26.21...	0	0	0	0	0	0
85.25.63...	0	0	0	0	0	0
78.25.10...	0	0	0	0	0	0
107.223...	0	0	0	0	0	0
14.186.1...	0	0	0	0	0	0
71.175.2...	0	0	0	0	0	0
149.202...	0	0	0	0	0	0
92.250.2...	0	0	0	0	0	0
104.182...	0	0	0	0	0	0
71.58.21...	0	0	0	0	0	0
85.26.22...	0	0	0	0	0	0
65.55.16...	0	0	0	0	0	0
85.26.17...	0	0	0	0	0	0
65.55.16...	0	0	0	0	0	0
65.55.16...	0	0	0	0	0	0
37.28.17...	0	0	0	0	0	0
114.129...	0	0	0	0	0	0
157.56.1...	0	0	0	0	0	0
157.56.1...	0	0	0	0	0	0
37.28.16...	0	0	0	0	0	0
75.97.12...	0	0	0	0	0	0
108.194...	0	0	0	0	0	0
99.127.1...	0	0	0	0	0	0
168.128...	0	0	0	0	0	0
5.36.150...	0	0	0	0	0	0

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# ORA Walkthrough 3

9. Visualize the network (one of them), select "Load Normally"

ORA 3.0.9.9.87  
File Edit Preferences Data Management Generate Networks Analysis Simulations Visualizations System Help

Meta-Network Manager

- jun1\_samp
  - Agent : size 24196
  - Agent x Agent
- jun2\_samp
  - Agent : size 23592
  - Agent x Agent

Network: Agent x Agent

Info Editor

Network ID	Agent x Agent
Source Nodeset ID	Agent
Target Nodeset ID	Agent
Properties	<input type="checkbox"/> Symmetric (undirected links) <input type="checkbox"/> No self-loops <input type="checkbox"/> Binary link values

General statistics:

Source count:	24196
Target count:	24196
Density:	0.00020045
Symmetric:	No

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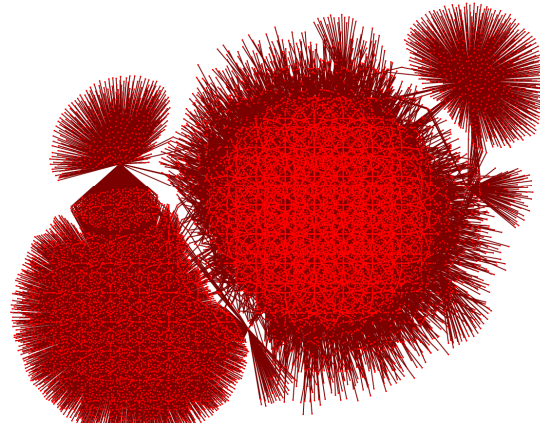
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# ORA Walkthrough 3

jun1\_samp - ORA Network Visualizer

File View Actions Tools Layouts Meta-Nodes Node Appearance Link Appearance Display Help

Hide links with value: Less Than 99.0% Hide Components Sized Less Than 0%



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# ORA Walkthrough 3

10. Select jun1\_samp network and Click "Generate Reports"

ORA 3.0.9.87

File Edit Preferences Data Management Generate Networks Analysis Simulations Visualizations System Help

Meta-Network Manager

Meta-Network: jun1\_samp

Meta-Network Name: jun1\_samp

Meta-Network Time: Click to create...

Filename: **Generate Reports...** Visualize Measure Charts...

General statistics:

Source count: 0

Nodeset count: 1

Node count: 24196

Network count: 1

Total density: 0.0002

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# ORA Walkthrough 3

11. Select "Key Entities Rankings" and select both jun1\_samp and jun2\_samp and click "Next"

Generate Reports - Key Entities Ranking

Select Report

Filter Data

Measures

Negative Links

Union by Thirds

Transform Data

Remove Nodes

Reports: select a report to run from the list or by category.

Key Entities Ranking Categories

Description | Input Requirements | Output Formats

Identifies key entities and groups who by virtue of their position in the network are critical to its operation.

Meta-Networks: select one or more to analyze in the report.

Select All

jun1\_samp

jun2\_samp

< Back Next > Cancel

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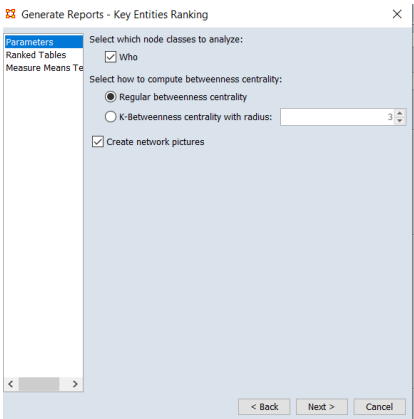
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# ORA Walkthrough 3

12. Leave defaults and click "Next"



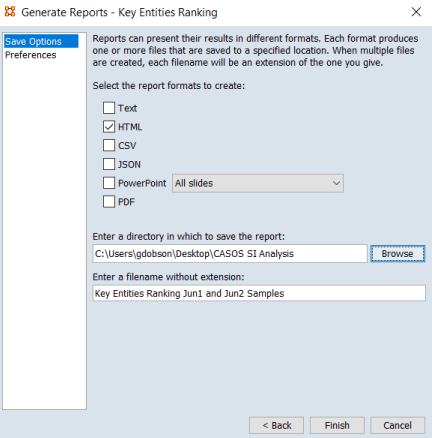
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# ORA Walkthrough 3

13. Select a folder and name of report, click Finish and browse report



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