

Visualizer

Introduction

enter introduction text here

Welcome

Welcome to the C-IKNOW workflow documentation. C-IKNOW is a powerful web-based software tool for social network analysis investigation. It has been designed around real-world problems, and it can store and analyze virtually any type of network data. This documentation provides a basic step-by-step walkthrough of how to get started on a C-IKNOW project, while also offering more advanced support. Additional support can be found in the other documentation items, including the C-IKNOW Worksheet and the C-IKNOW Question-Type Primer.

Cyber-infrastructure Knowledge Networks on the Web (C-IKNOW) is the cyber-infrastructure extension of IKNOW (Inquiring Knowledge Networks on the Web). It is a web-based tool that is used to help communities map, measure, and modify the knowledge and information flow within their networks. C-IKNOW leverages cutting-edge advances in social network theories, automated data collection techniques, advanced network analysis techniques and algorithms to map an individual's interests and expertise as well as their multidimensional relations with other members and resources within their community. To serve this purpose, C-IKNOW has multiple social network analysis functionality, including data population and a visualization and analytics suite.

C-IKNOW's data population tools include fully customizable web-administered network surveys and an interface to directly upload virtually any type of network data. An administrator can tailor a survey to his or her own specific needs, and then use C-IKNOW's contact list to get a complete data set for a network. Since the platform is web-based, administering the survey to the desired network is a very straightforward and time-efficient process. C-IKNOW generates unique login information so that each user can take surveys created on C-IKNOW. With permission, users can also have access to visualization tools in order to personally view and manipulate visualizations of their network.

C-IKNOW's visualization and analytics suite allows both administrators and users to access visualizations, recommendation tools, and analytical measures for their networks. The visualizations can be physically manipulated to reorganize and reinterpret the network data. Multiple viewing options include ego-networks and node sizing based upon weighted comparative data. Users can also access the C-IKNOW recommender system tools, which combine relational data and digital traces about the community to provide recommendations to users for future network interactions. A recommendation pathway visualization will allow users to explore their recommendations with a dynamic visual aid. Lastly, C-IKNOW can compute all standard network metrics for any desired network or sub-network. C-IKNOW is a work in progress. It is constantly being tailored to incorporate the newest advances in network theory and new features for optimized performance.

Team

C-IKNOW is developed by Guangyao "York" Yao, Yun Huang and Jinling Li in the Science of Networks in Communities (SONIC) research group at Northwestern University. C-IKNOW evolves from I-KNOW, previous contributors include Dan Zink, Mike Chan, Peter Taylor, Dana Serb, Ryan Kanno, Mike Armstrong, Shyam Kurup, Emily Wang, Sean Mason, Jered Wierzbicki, Jeff Tamer, Hank Green, Steven Harper, Nat Bulkley, Andy Don. C-IKNOW development is supported primarily by grants from the National Science Foundation (NSF) and the National Institutes of Health (NIH).

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License

license information

Getting Started

System requirements

C-IKNOW functions across a wide variety of platforms, including Windows, Linux, and Mac. It can be run with standard browsers, such as Firefox, Safari, etc, however there is a system requirement of flash player 10.

Getting help

C-IKNOW may encounter technical bugs or problems while performing some of its actions. In the event that a bug is encountered, please check here to see how to correct it. If the bug is not included here, please send an email to Scottgaonkar2012@u.northwestern.edu so that the bug can be investigated and fixed.

C-IKNOW Visualizer Interface

The visualization tool is one of CIKNOW's core functions. It rapidly generates high definition network maps and offers a variety of tools to manipulate the visualization.

Nodes: Nodes are shown as rounded-rectangles that are colored based upon either nodetype or attribute or focal node (egonetwork only).

Edges: Edges are the lines that connect nodes to one-another. The relations of the edges can be direct relations, undirect relations, or mutual relations. The arrows tell which way the relations go (if the visualization is for a directed graph).

Legend: The legend is on the right hand of the window. In the legend, it will tell you which colors signify which node properties and which edges are which relation.

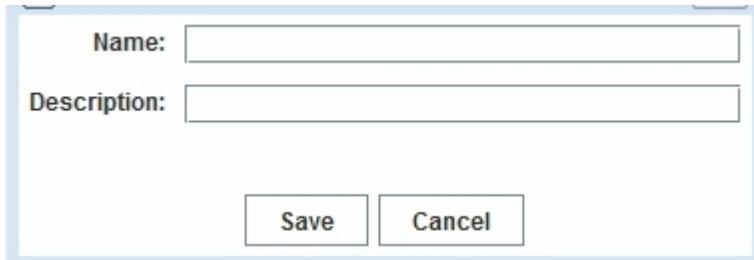
Top Bar: The top bar has a number of options to manipulate or change the available visualization. Below is a description of these features.

Open/Save Network

For Online Visualizer

Save Graph

The online Visualizer allows you to save specific networks as well as visualizations for future use. From the "File" menu, click the menuItem "Save Graph Data..", you will get a small window like this:



The saved network can be accessed under the Saved Visualization tab under Visual Analytics.

For Standalone Visualizer

Open Graph File

Currently, the visualizer only supports C-IKNOW data format. In the future, it will support GraphML and DL format.

Save Graph Data

Save specific networks as well as visualizations in the client server for future use.

Save Graph Image

The visualizer can automatically capture the graph image and legend of the network image.

Layout

CI-KNOW Visualizer implements several standard and customized layouts. Circle layout positions nodes in the network as a circle. It helps to show the well-connected networks. Clustering layout help to show which nodes are well-connected with each other and which nodes are not closely connected with the group.

RadialTree layout computes a radial layout based on a single root node and displays the subsequent depth levels as a tree. It displays how far the other nodes are to the root.

Put Nodes in Circle

Click the  icon in the toolbar; this command organizes the nodes into a circular configuration.

Randomly Scatter Nodes

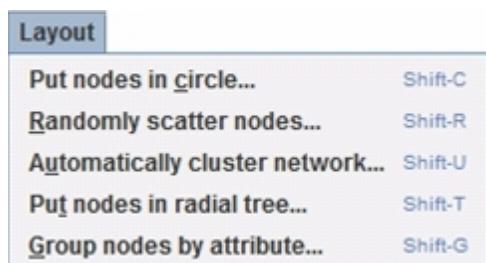
Click the  icon in the toolbar; this command randomly scatters the nodes.

Automatically Cluster Network

This function clusters the network based either on separating existing components or by clustering around the largest component.

If you click the button  in the toolbar, the visualization will show the default view--"Structural View"-- to cluster the components around the largest component.

It is possible, however, to choose this manually by using the "Automatically Cluster Network" menuitem from the "Layout" Menu.



By clicking the menuitem, a dialog box will be generated and you can choose either "Component view" or "Structural view". Component view spreads the components throughout the window by using as much of the space as possible. Structural view places one large component in the middle, and it occupies most of the space. The rest of the components are placed in the periphery, circled around the large central component. Changing the distance between two nodes effects the visualization. A bigger distance preset makes it easier to see the structure of the network, while a shorter distance makes it easier to see the components.

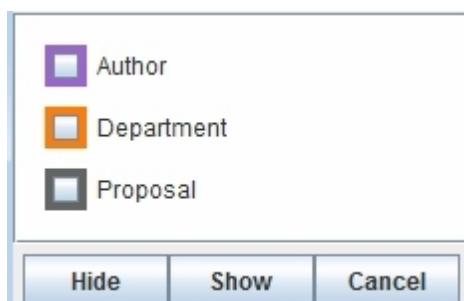
Put Nodes in a Radial Tree

By clicking the  icon, all other nodes will be arranged around a selected focal node in the middle of the visualization.

To perform this layout, you must first select a node as the root node, after you select a node, this node will be highlighted.

Group Nodes by Attribute

By pressing the  icon, all nodes will be grouped based upon their colored attribute. If you do not want to see all the groups, you can choose which groups you want to show from the generated dialog box.



Edit Network

This section provides a series of functions which allow the user to generate a sub-network graph based on node/edge filtering, selected nodes, and ego-centered Networks.

Users may explore the connections between individuals associated with the concept by either eliminating or showing selected node/link types associated with the individuals, or by only hiding/displaying the selected nodes/links. Ego-centered Networks can be generated by selecting all neighbors of a target node within certain distance. Users also have the opportunity to restore the network to the original network.

Hide Selected Nodes

Click the  icon in the toolbar; this command will remove the selected node(s) from the visualization.

See [Node Selection and Deselection](#) to learn how to select your desired node(s).

Show Selected Nodes

Click the  icon in the toolbar; now only selected nodes will appear in the visualization.

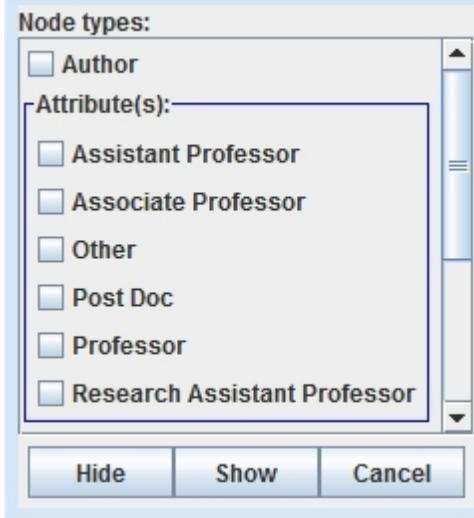
See [Node Selection and Deselection](#) to learn how to select your desired node(s).

Hide Isolated Node(s)

By clicking the  icon in the toolbar, all isolated nodes will be removed.

Hide/Show Selected Node Type/Attribut

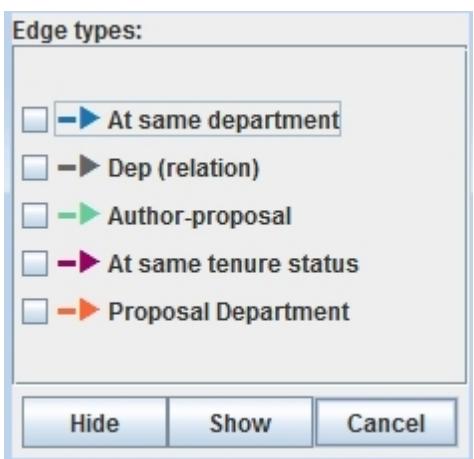
By clicking the  icon in the toolbar, a dialog box will be displayed.



From this dialog box, you can select which node type(s) or attribute(s) you want to be hiding or showing in the visualization.

Hide/Show Selected Edge Type

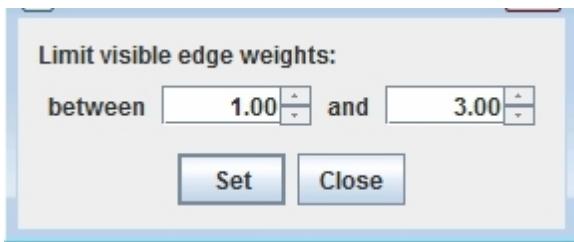
By clicking the icon in the toolbar, a dialog box will be displayed.



From this dialog box, you can select which edge type(s) you want to be hiding or showing in the visualization.

Limit Edge Strengths

This function is used to filter edges with desired strength. By clicking the icon in the toolbar, a dialog box will be displayed.



From this dialog box, you can set the range of strengths and filter the edges by this range.

Show All Nodes and Edges

By clicking the  icon in the toolbar, all nodes and edges will be shown. Each node will be located where it was last displayed on the screen.

Reset to the Saved Network

This function allows you to return to your saved network. The command button for this function is 

Note: This button will only be available when you open a saved network!

Display Options

This section provides a series of display options for a network. The quality of the node/link can be described by its size and shape.

Fit Graph to Screen

Clicking the  icon in the toolbar, will expand/shrink the graph to fit the visualization window.

Minimize Nodes

The button  toggles node size; clicking it once removes labels and shows the visualization as a set of points. Clicking it a second time undoes these changes.

Show Node Image

If a node has an image, click the  button to display the node with both its image and label.

Note: this button will only be available when there is a node containing image somewhere in the network.

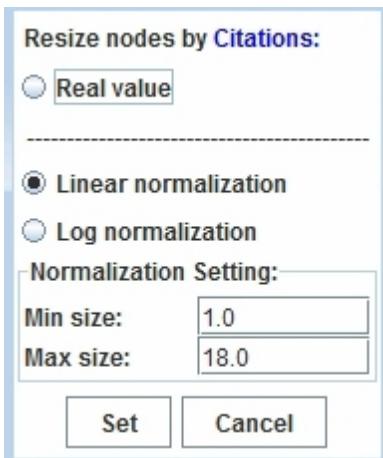
Node Shape By NodeType/Attribute

By clicking the  icon in the toolbar, a node can be displayed by a different kind of shape. Each shape represents one nodeType or one attribute.

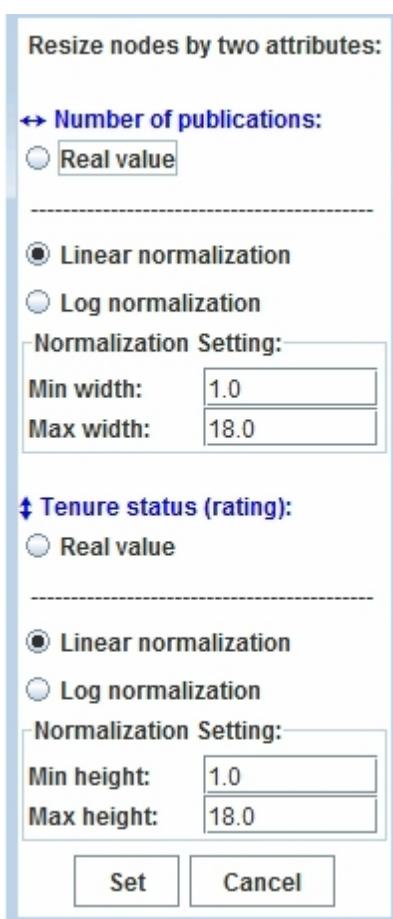
Resize Node By NodeType/Attribute

A node attribute's value can be captured by the size of the node. Currently, the radius of the circle represents the value of an attribute, while the height and width of the rectangle represent an attribute separately.

By clicking the  icon in the toolbar, a dialog box will be displayed.



From the above dialog box, you can set the range of the radius based on a real value, a linear normalized value, or a log normalized value.



From the above dialog box, you can set the range of height and the range of width for rectangles based on a real value, a linear normalized value, or a log normalized value.

Show/Hide Label

The button toggles labels for nodes; clicking it once shows labels and clicking it a second time undoes these changes. By default, you can show/hide all nodes in the network. If you want to display the label(s) for only some of the nodes, please select your desired node(s) first, then click this button.

See [Node Selection and Deselection](#) to learn how to select your desired node(s).

Node Depth

Press ctrl and select two nodes in the network. Then select the option  to show all nodes connected to those two nodes at the specified depth.

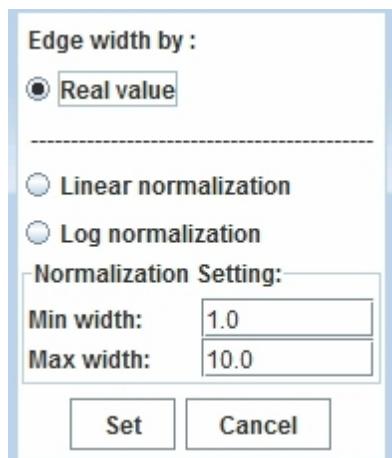
Show Edge Strengths

Clicking on  will toggle numbers corresponding to the edge strength on top of all edges. Clicking it once shows the strength number and clicking it a second time undoes these changes. Binary relations will always have a strength of 1.0

Note: This button will only be available when you open a saved network!

Edge thickness by Weight

The weight of a relation can be shown by the thickness of the edge. By clicking the  icon in the toolbar, a dialog box will be displayed.



From the above dialog box, you can set the range of the thickness for edges based on a real value, a linear normalized value, or a log normalized value.

View

This section provides different kinds of zooming and moving functions. Clicking on one of the buttons will trigger a cursor, which is used in the graph screen to perform whatever function you want. Clicking the same button in the tool bar will return you to the zooming/moving cursor.

Zoom to a Selection

The button  triggers the zoom cursor. Click and drag the mouse: this allows you to select a rectangular region of the screen. Once the mouse is released, the highlighted rectangular region will be enlarged to fit the screen.

Zoom in on Edges

The button  triggers the "Zoom in on Edges" cursor. Click anywhere in the visualization to take a closer look at the

selected area. Edges will appear longer.

Zoom out on Edges

The button  triggers the "Zoom out on Edges" cursor, which can be used by clicking anywhere in the visualization to move further away. Edges will appear shorter.

Zoom in on Graph

The button  triggers the "Zoom in on Graph" cursor. Click this button to zoom in on both nodes and edges.

Zoom out on Graph

The button  triggers the "Zoom out on Graph" cursor. Click this button to zoom out on both nodes and edges.

Move Graph

The button  transforms the cursor into a hand, allowing the user to move the graph inside the visualization pane.

Other Functions

This section provides a series of important functions that cannot be performed by any of the toolbar buttons.

Search for a Node

Use the search bar to find a specific node in a cluttered network. The bar is in the bottom right-hand corner of the interface.

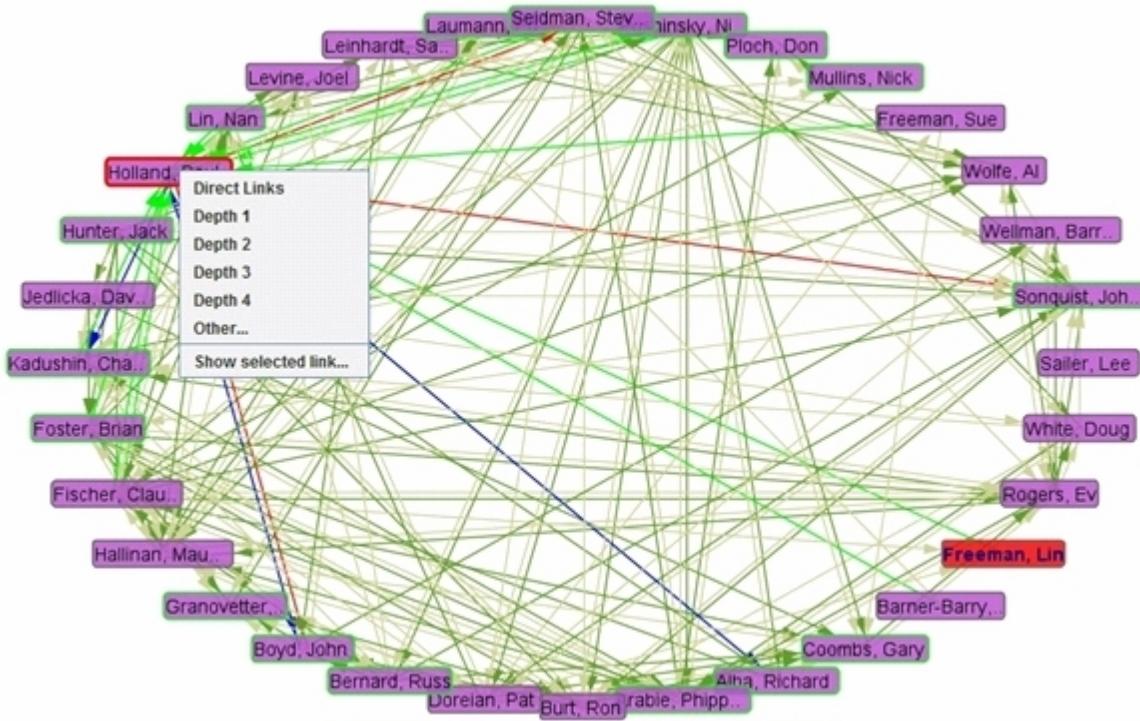


Use either Ctrl + F or mouse click to focus in the search field. Type in the Node Label you are looking for, and it will select the node in the interface.

Node Filtering by Depth

1. Right click on a desired node. You will see the following:

- a. A drop down menu will appear with multiple options
- b. Ties related to the selected node will become colored. The colors correspond to the type of link. Outgoing links are red, incoming links are green, and mutual links are blue.



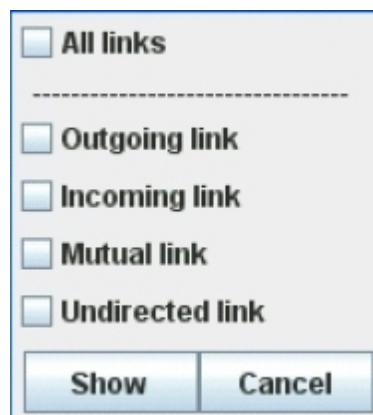
2. Use the menu to navigate the options you would like to select:

Click on the desired depth (originating from that node) to show a smaller version of the original network based around this focal node. If you would like a depth greater than 4, click on 'Other' and specify a larger number.

Filter Relation Type

Filter Relations Based upon one Node

Right click on a desired node. You will see a drop down menu as shown in [Node Filtering by Depth](#). To filter by incoming, outgoing, mutual, or undirected links, click on 'Show Selected Link.' This window below will appear. Check the ties you would like to show and click 'Show'. The network will be filtered accordingly.



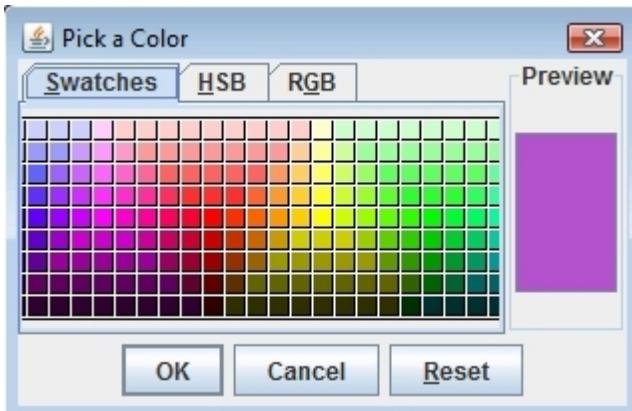
Filter Relations Based upon multiple Nodes

Select multiple desired nodes (see [Node Selection and Deselection](#)). Right click on one of the nodes, the window below will appear. Choose to filter all links, mutual links, or undirected links, then click on 'Show'.



Change Color

Click on a legend image on the legend pane, the window below will appear for you to select a desired color.



Click the OK button, the color of nodes/edges for this type will be automatically changed to your selected color.

Node Selection and Deselection

Select one Node: just click the node you want to select.

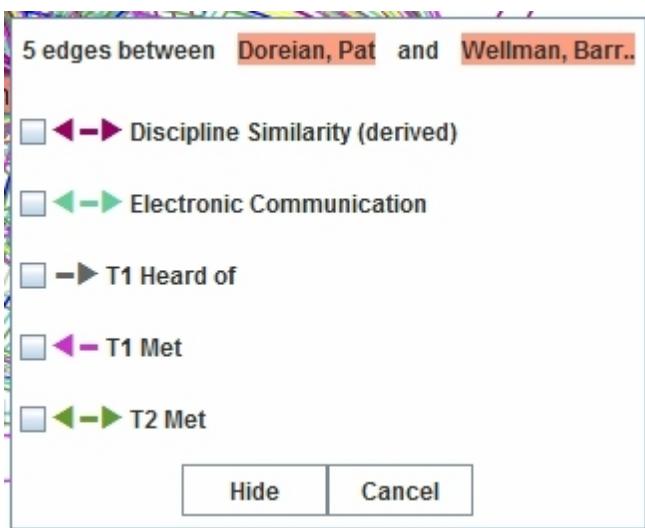
Select multiple Nodes one by one: Hold "Ctrl" key and select nodes one by one.

Select multiple Nodes by rectangular area: Click and drag the mouse, you can select a rectangular area of the screen. All the nodes inside the area will be selected.

Deselect node(s): Click any blank space on the screen to release the selected node(s).

Hide Edge

Any edge(s) between two nodes can be hidden. **Right** clicking on an edge between two nodes triggers the following small window:



Select the edge(s) you want to hide, then click the "Hide" button.

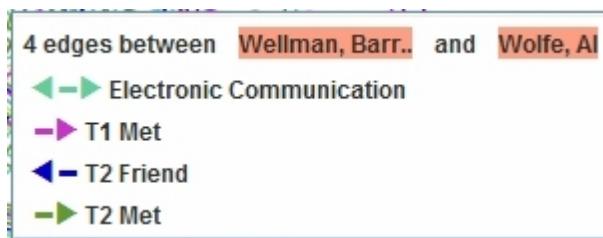
Node Profiles

For the online Visualizer, it is possible to double click on a specific node to see all its unique attributes. You will see a screen similar to the following:

Basic Info	
Name	Levine, Joel
Type	user
Attributes	
Discipline	Sociology
Citations	Citations: 11
Expertise	2
derived attributes: Electronic Communication Degree	Electronic Communication Degree: 10
University Affiliation	Dartmouth
Relations (outgoing)	
+ Electronic Communication(13)	
+ T2 Close Personal Friend(2)	
+ T2 Met(10)	
+ T2 Friend(7)	
+ T1 Close Personal Friend(2)	
+ T1 Met(9)	
+ T1 Friend(7)	
+ Discipline Similarity (derived)(16)	
Relations (incoming)	
+ Electronic Communication(37)	
+ T2 Close Personal Friend(4)	
+ T2 Met(15)	
+ T2 Friend(6)	
+ T2 Heard of(2)	
+ T1 Close Personal Friend(2)	
+ T1 Met(9)	
+ T1 Friend(2)	
+ T1 Heard of(4)	
+ Discipline Similarity (derived)(16)	
Relations (merged)	
+ Electronic Communication(4)	
+ T2 Close Personal Friend(2)	
+ T2 Met(7)	
+ T2 Friend(3)	
+ T1 Met(2)	
+ Discipline Similarity (derived)(16)	

Edge Profiles

For the online Visualizer, if you click on an edge between two nodes, you will see a screen similar to the following:



Click on an edge, you will see a screen that shows all edges and their unique attribute information:

Direct Relations

Freeman, Lin **Computer** Wolfe, Al
Wolfe, Al **Computer** Freeman, Lin
Freeman, Lin **Copy of MRC`Met** Wolfe, Al
Wolfe, Al **Copy of MRC`Personal friend** Freeman, Lin
Freeman, Lin **MRC`Close friend** Wolfe, Al
Wolfe, Al **MRC`Close friend** Freeman, Lin

Survey Question Answers

- + Discipline (0 in common)
- + Expertise (0 in common)
- + University Affiliation (0 in common)

Indirect relation: They have the following nodes in common in the Knowledge Network

- + user(30)

Recommendation

CIKNOW's recommendation tools use network data to provide algorithm-based recommendations for both resource discovery and team assembly. The Resource function allows a user to query a complete list of recommended pathways to any other node or attribute in the network. The Team Assembly function allows a user to assemble a team from nodes in the network based upon specified node attributes and relational characteristics.

This section provides functions for recommendation network visualization. You may see the buttons on the right side of



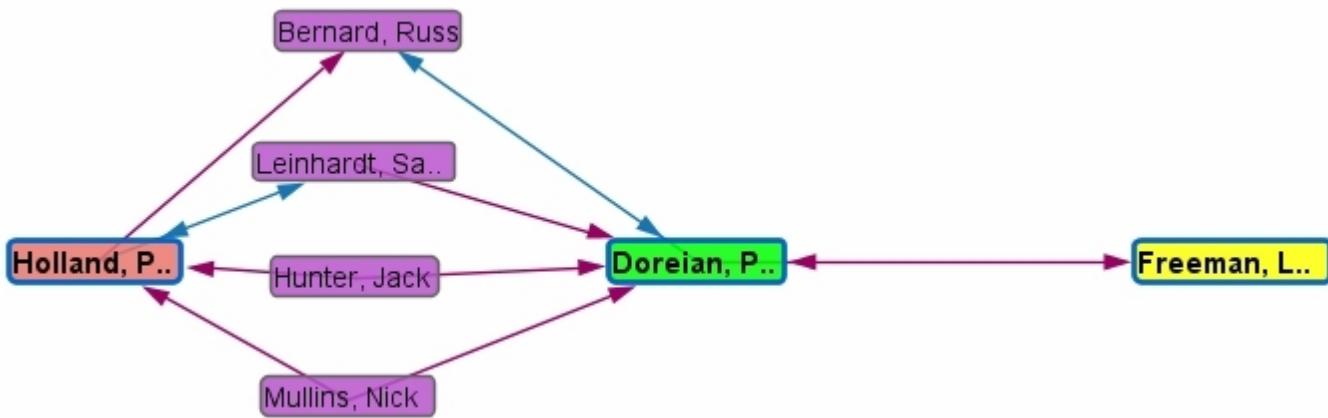
the toolbar like

if the recommendation network is based on Node Type. The buttons will be

if the recommendation network is based on Attribute.

Recommendation Based on Node Type

Click the button, a recommendation layout will be displayed like this:

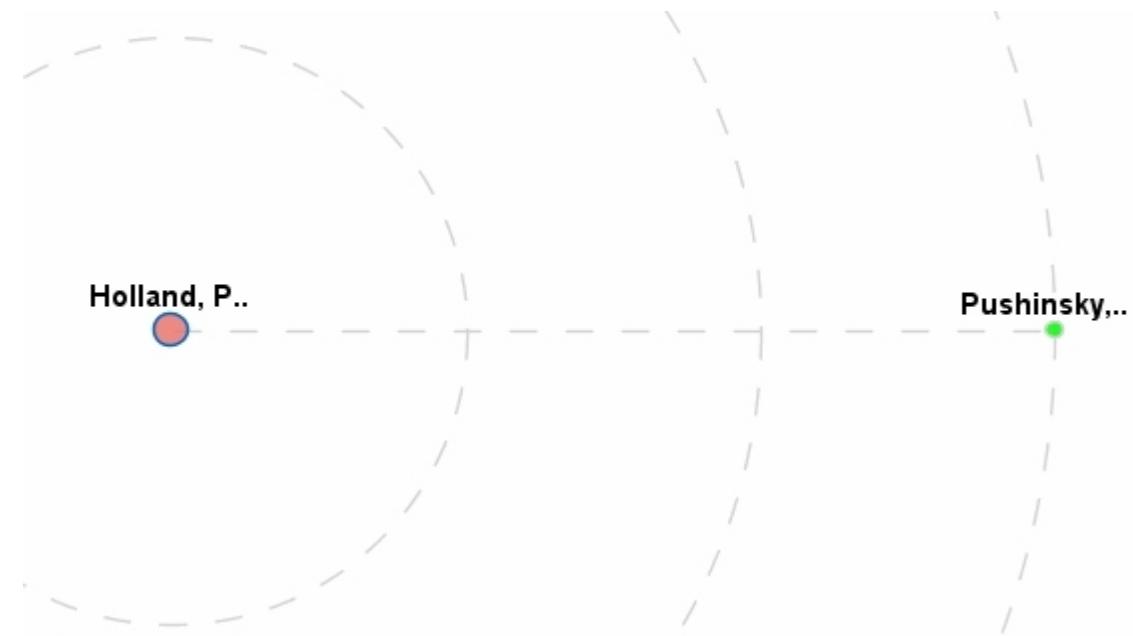


The node colored red is the "requestor" of the recommendation, the node colored green is the "recommendation" and the node colored yellow is the "target" of the recommendation.

If you want to see paths with **one more step** between the "requestor" and the "recommendation" as well as between the "recommendation" and the "target", click the

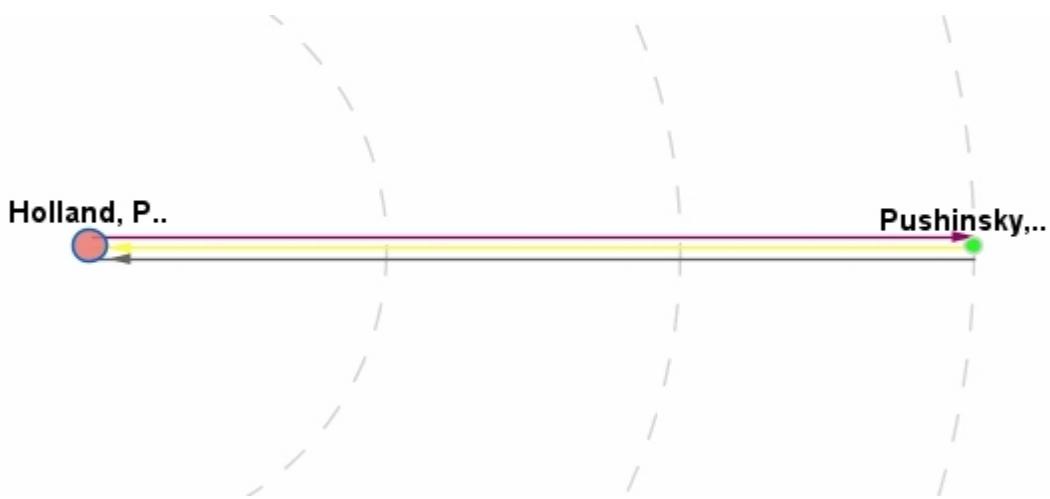
Recommendation Based on Attribute

Click the  button, a recommendation layout will be displayed similar to this:



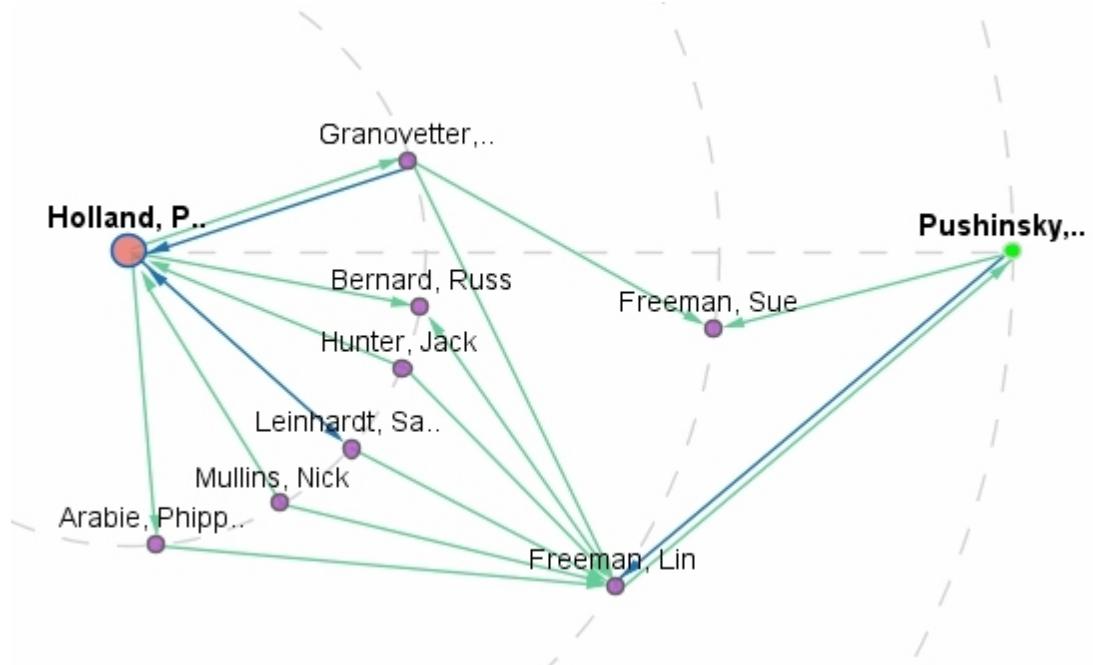
The bigger node colored red is the "requestor" of the recommendation, the node colored green is the "recommendation". The dotted circles indicate how many steps from the requestor to the recommendation. The straight dotted line means there is no direct recommended relations, but only not recommended relations between the requestor and the recommendation.

When mouse hovers over the dotted line, the not recommended relations will be displayed as following:

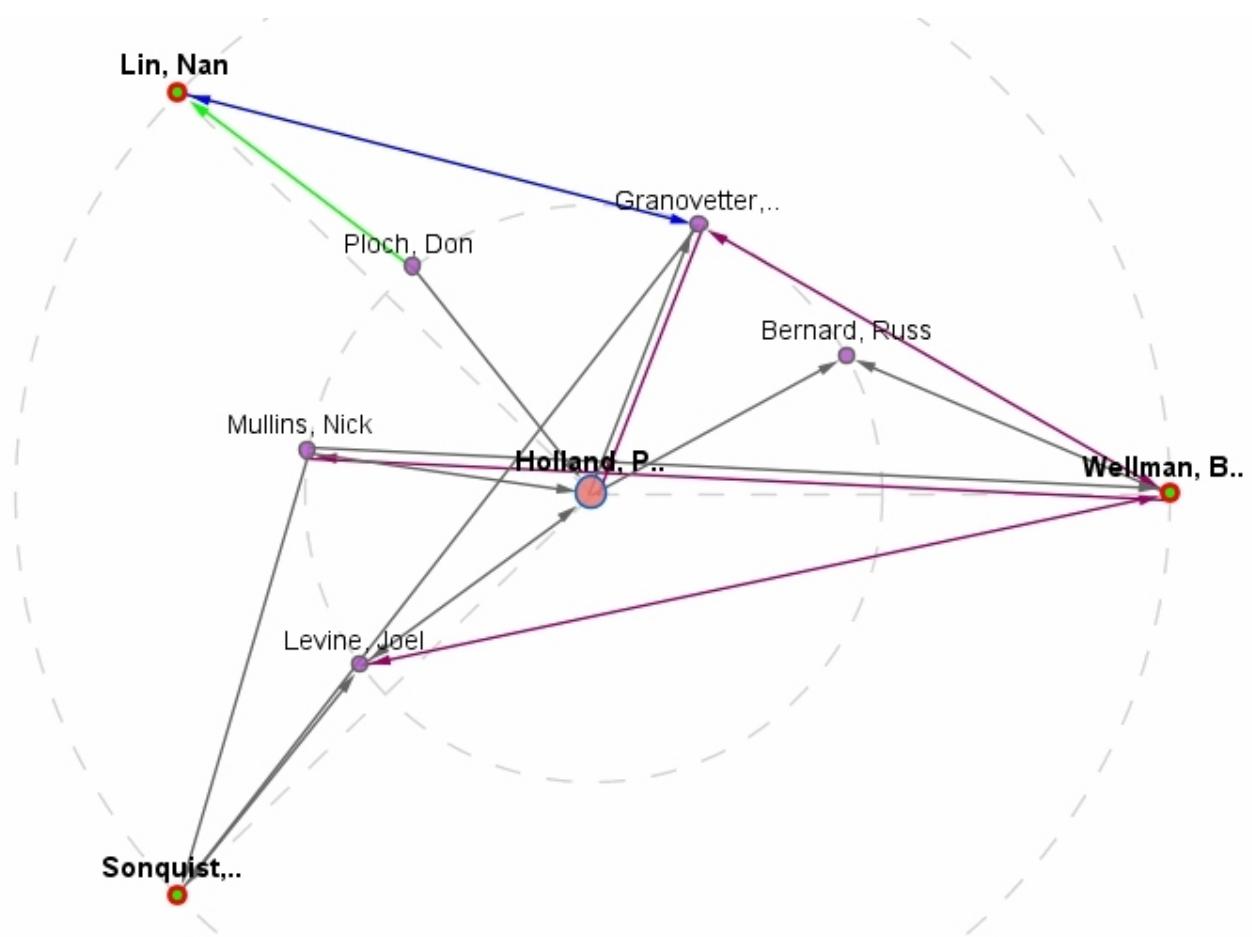


We can see, for this case, there are three direct relations between requestor and the recommendation, but those relations are not recommended. To see the recommended relations between the requestor and the recommendation, hover or click the recommendation node (green node), and you will get the visualization as following.

Click any blank space on the screen and you will be back to the dotted line.



All the paths from requestor to recommendation are by way of intermediary nodes. If you want to show more than one recommendation network on the same screen, just select the recommendation node you want. See [Node Selection and Deselection](#) to learn how to select your desired node(s).



The above shows all the recommended relations for three recommendations at the same screen.

The visualizer also provides a function to see relations which are not recommended, click the  button to do so.

Recommendation Description



The button triggers a window that describes why this node is recommended. The contents of this description are similar to this:

Information about why the following **recommendation** was made to **Holland, Paul**
in response to the query: **Freeman, Lin**

The Visualization shows the shortest path(s) between **Holland, Paul**, the **recommendation** and **Freeman, Lin**. You can reveal additional paths by clicking the 'Show/ Hide Paths' button at the far right of the control menu.

- ♀ Doreian, Pat (Connection to query: 1.0; Connection to you: 0.5; Score: 0.5)
 - ♀ Path(s) between **Holland, Paul** and **Doreian, Pat** (4)
 - Shortest path (4)
 - Hidden path (0)
 - ♀ Path(s) between **Doreian, Pat** and **Freeman, Lin** (8)
 - Shortest path (1)
 - Hidden path (7)
 - Connection(s) via **Bernard, Russ** (1)
 - Connection(s) via **Freeman, Sue** (1)
 - Connection(s) via **Hunter, Jack** (1)
 - Connection(s) via **Leinhardt, Sam** (1)
 - Connection(s) via **Mullins, Nick** (1)
 - Connection(s) via **Rogers, Ev** (1)
 - Connection(s) via **White, Doug** (1)

◀ ▶ || Ok ✖

Appendix

Troubleshooting

Worksheet

Question Type Guide
