BIONET XR

User Guide

CONTENT

Loading A Network File

- Click the navigation button pointed with a red arrow in Figure 1. When a network is not loaded, some buttons are disabled, like Visual Settings, and you need to load a network file.

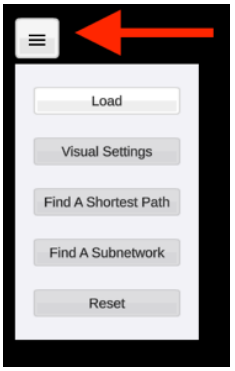

Figure 1

- Click to Load button to open the Load panel shown in Figure 2. In the File tab, click the Open File Browser button.

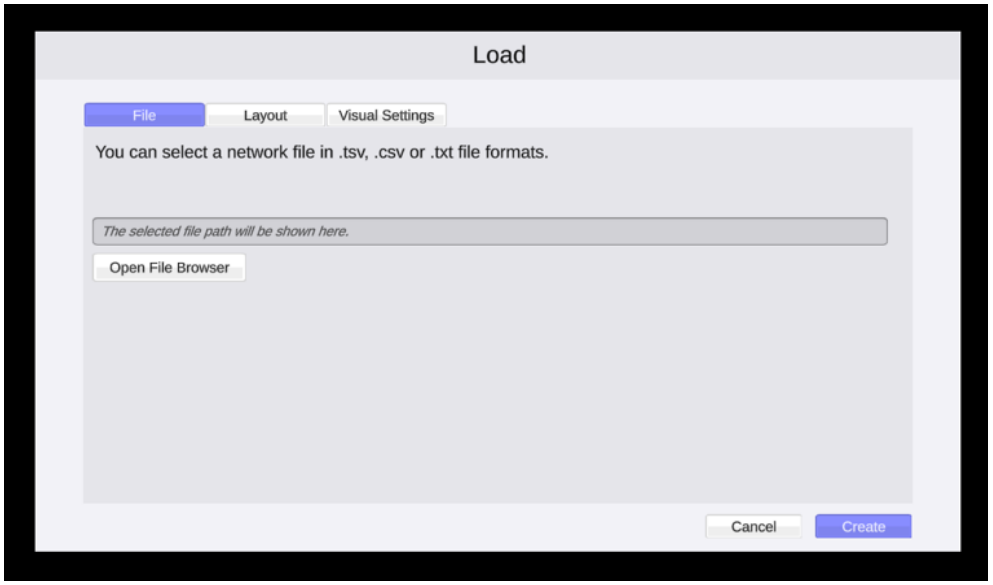

Figure 2

- As shown in Figure 3, a browser to select the network file will open. Select a file by double-clicking on it. The chosen file path is shown in Figure 4.

Figure 3

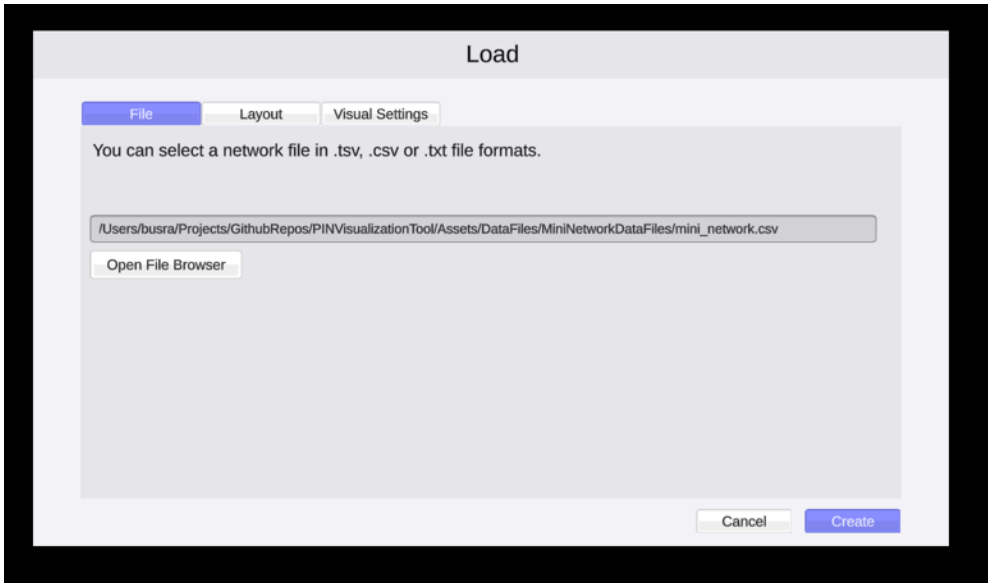

Figure 4

- Select the Layout tab and mark the layout you want to apply, as shown in Figure 5. Once the network is created, you cannot change the layout.

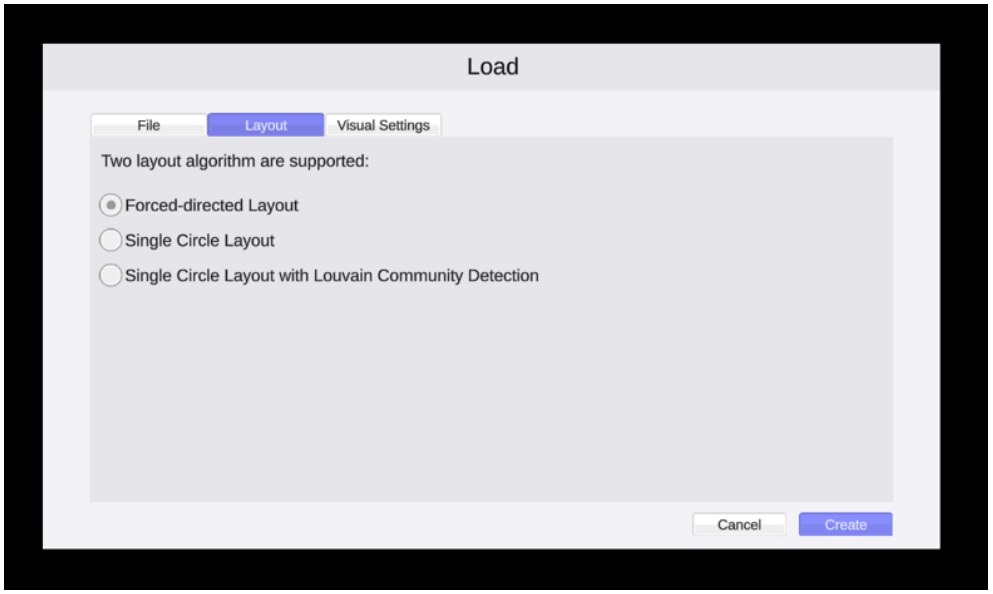

Figure 5

- Select the Visual Settings tab shown in Figure 6.

Figure 6

- You can make the following settings on this tab:
    - **Node Size Slider:** Nodes representing proteins can be enlarged or reduced in size.
    - **Font Size Slider:** The font size of the node names displayed on the network can be increased or decreased.
    - **Node Color Picker:** You can change the default colors of the nodes. When the node degree effect is not enabled, all nodes are represented by that color. You can see the example result for the relevant setting in Figure 7.
    - **On/Off Node Degree Effect on Node Size Checkbox:** When checked, node sizes are assigned proportionally to the node degree value as in the example network in Figure 7.

- **On/Off Node Degree Effect on Node Color Checkbox:** When checked, node colors are assigned on a color scale proportional to the node degree value as in Figure 8.

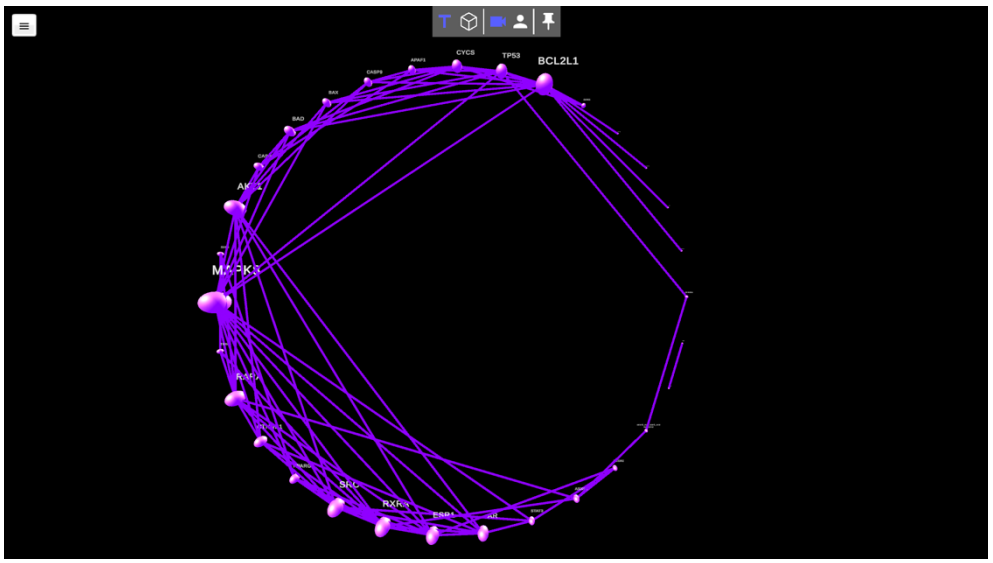

Figure 7

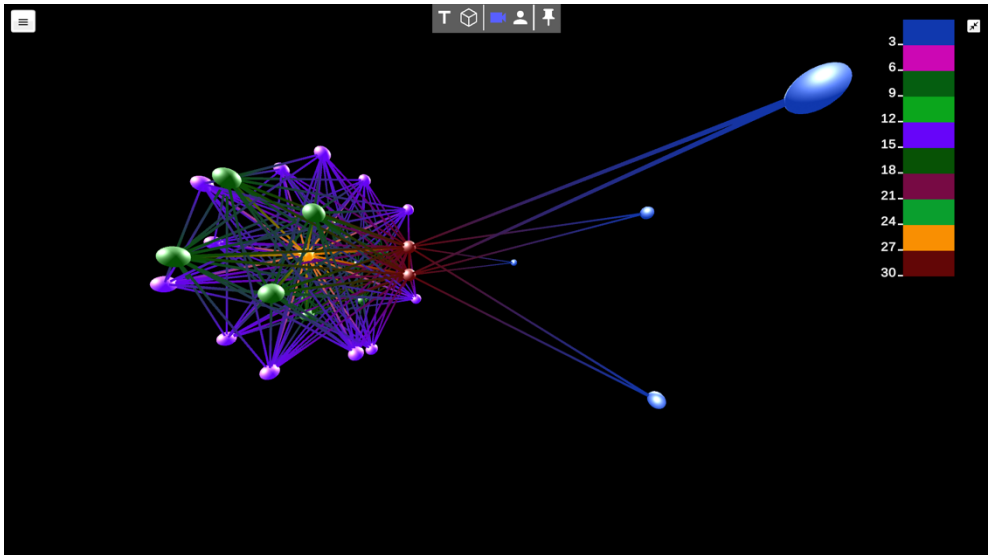

Figure 8

You cannot change these settings after the network has been created.

- After the visual setting step, click Create button, and the network creation process starts.

- When the network is created, other buttons are also activated in the navigation menu shown in Figure 9.

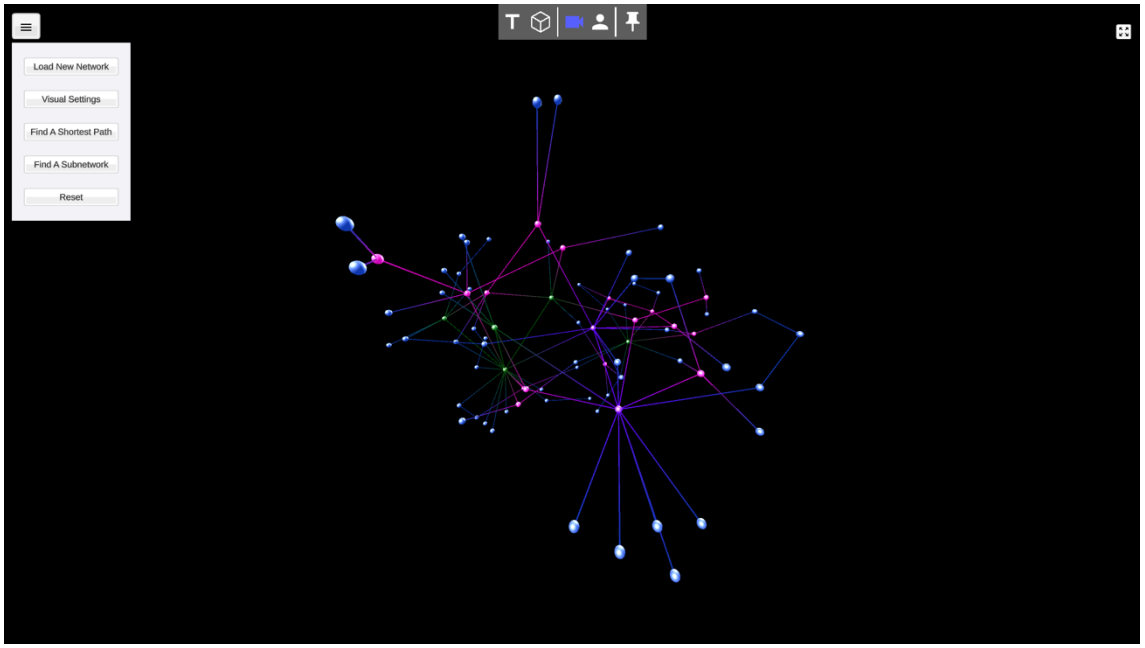

Figure 9

- When the Load New Network button is clicked, a popup is opened in Figure 10. If you click the Yes button in the popup that asks if you are sure (because you might have pressed it by mistake), the Load panel opens again, and you can create a new network with the settings you want.

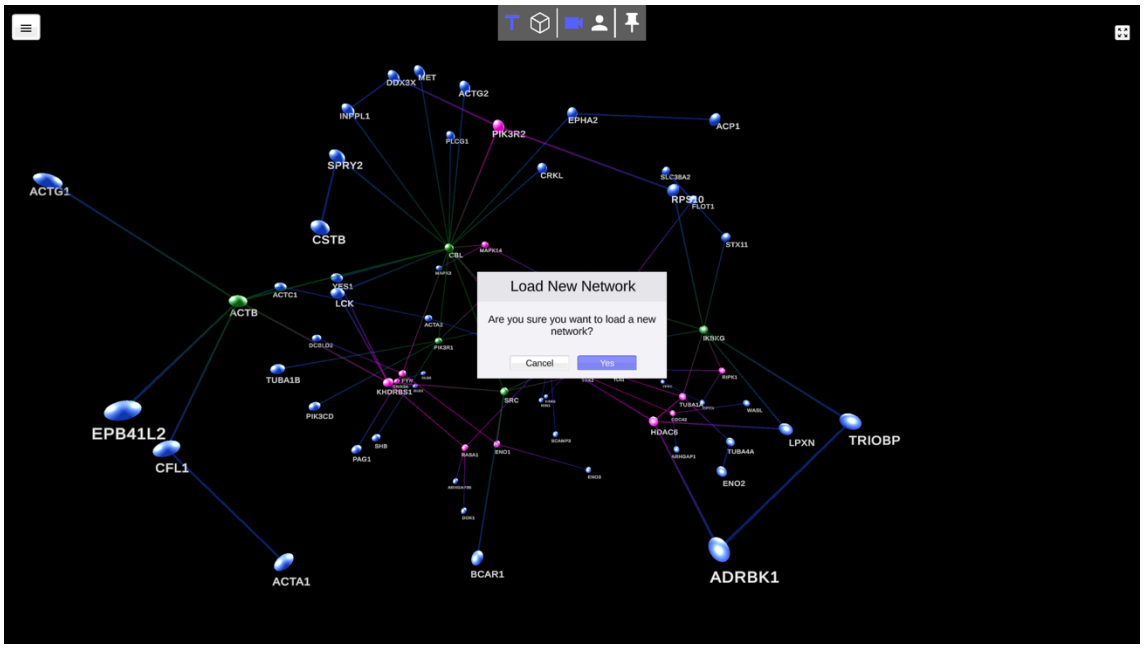

Figure 10

Controls

Controls For Standalone

- **Move Network:** Use WASD (up-left down-right) or arrow keys on the keyboard.
- **Zoom in / out to Network:** Use the mouse wheel.
- **Rotate Network:** Keep holding down the left button of the mouse and move it.
- **Move Node:** Keep holding down a node and drag it.
- **Show Node Parameters:** Click a node to display the network parameters (node degree, normalized node degree, betweenness centrality, closeness centrality) of that node. If the node is selected for the first time, it may take time to calculate these parameters depending on the network's size. Clicked node and first-order neighbor nodes are colored red. The edges between the clicked node and its neighbors are shown as pink. Calculated parameters are shown in the right-bottom box. You can see the node selection examples for these explanations in Figure 11 and Figure 12.

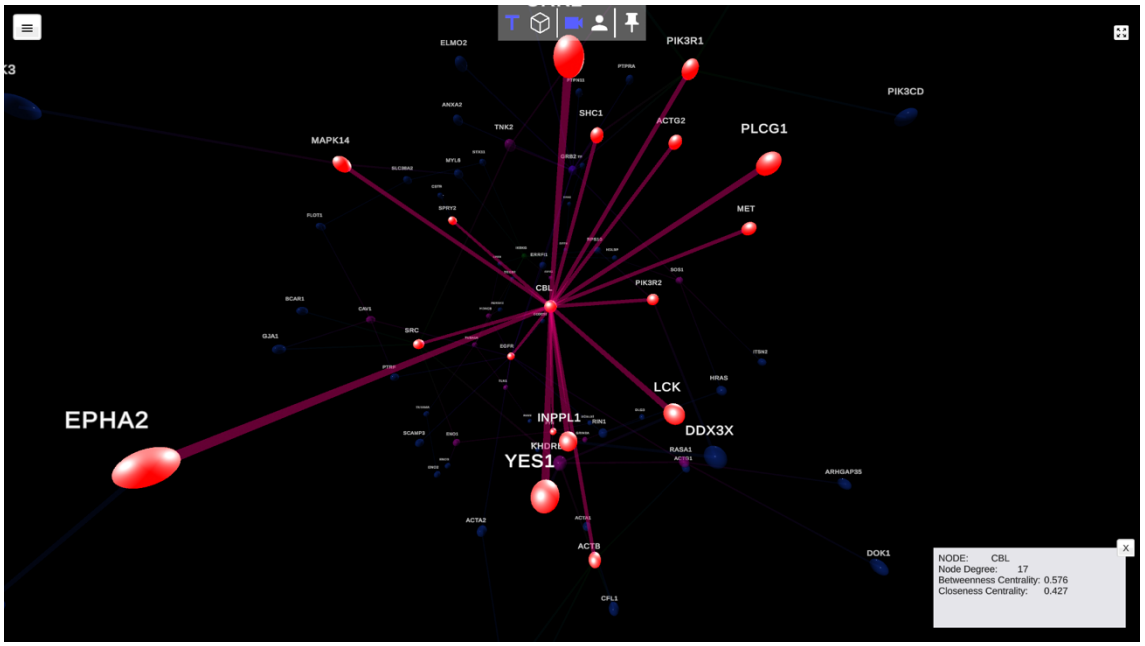

Figure 11

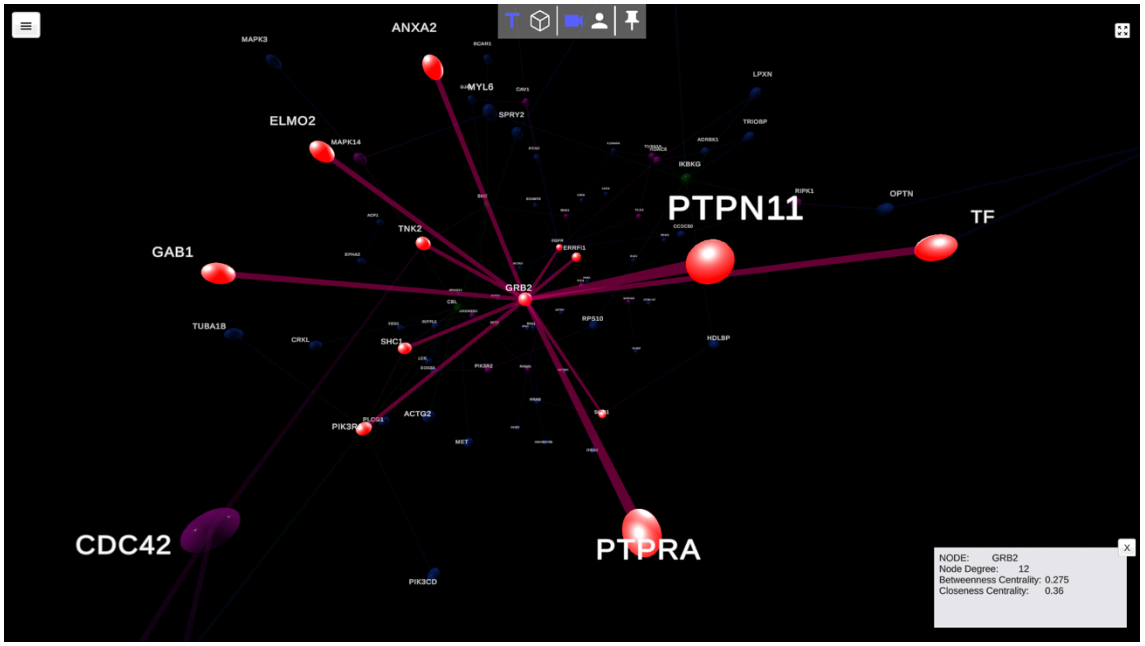

Figure 12

Controls for VR

VR offers 3D interaction instead of 2D interaction. Hence, interaction paths in VR are more similar to interacting with a real-world object. So it differs from the controls in Standalone and WebGL.

- Instead of rotating the network, you can move your head or turn around with the headset attached. In this way, you will have the opportunity to have a 360-degree view from your point.
- In VR, the HTC Vive controllers' Trigger button shown in Figure 13 is enough to handle all the interactions.

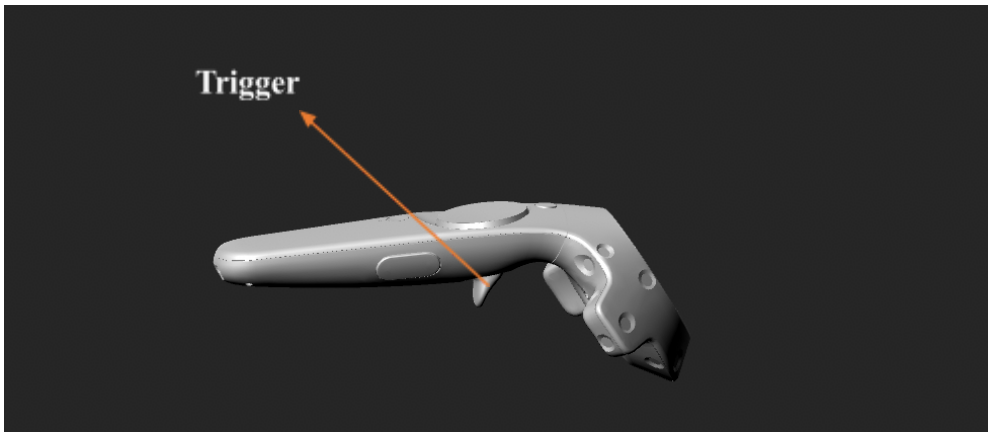

Figure 13

- When you press it for the first time, a pink beam that indicates its direction will emerge from the controller's tip, as in Figure 14.

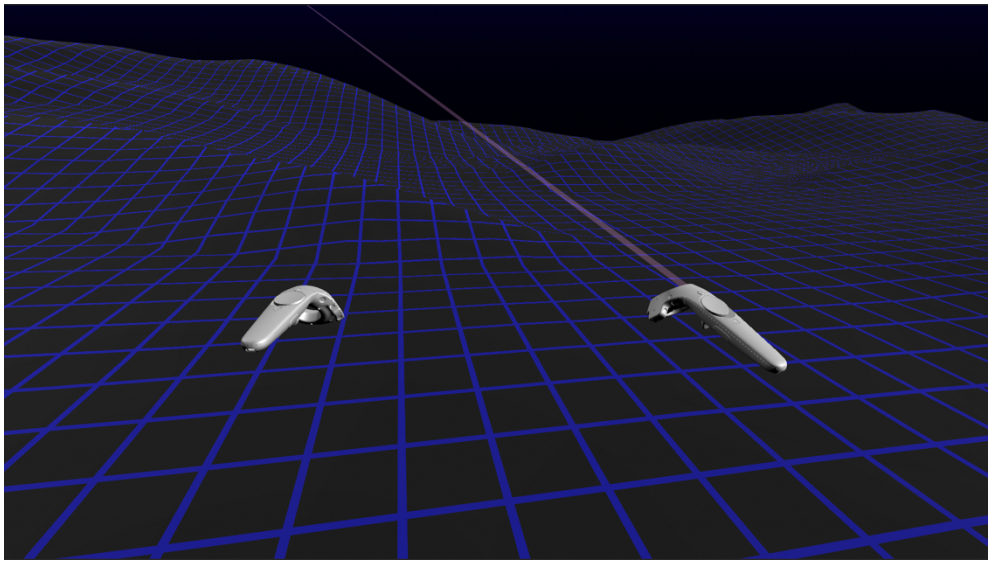

Figure 14

- When you see a black sphere at the end of the beam like in Figure 15, it means you can interact by pressing the Trigger. That is how you can interact with menus and nodes.

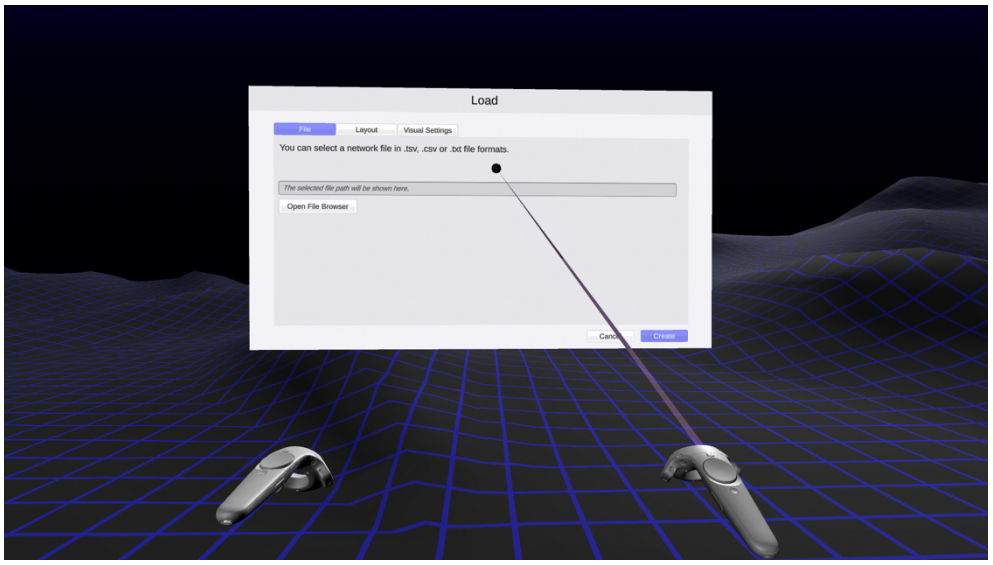

Figure 15

- When you point to the nodes, you will not see only the black sphere at the end of the beam but a blue bubble around that node, as seen in Figure 16. When you press Trigger, you teleport to this node. So you can navigate all over the network.

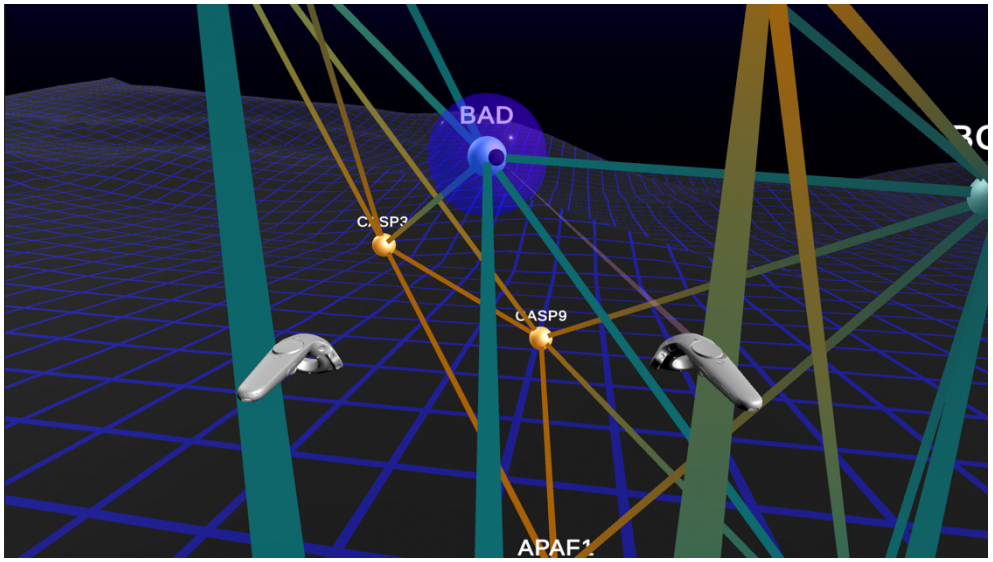

Figure 16

Protein View

- Double click a node to load Protein View of it. The Protein View looks like the one seen in Figure 17. The double-clicked node's information and 3D model (only a model as a placeholder for now) are shown in the Protein View. The data is extracted from a file containing information on human proteins loaded by default at the beginning of the application.

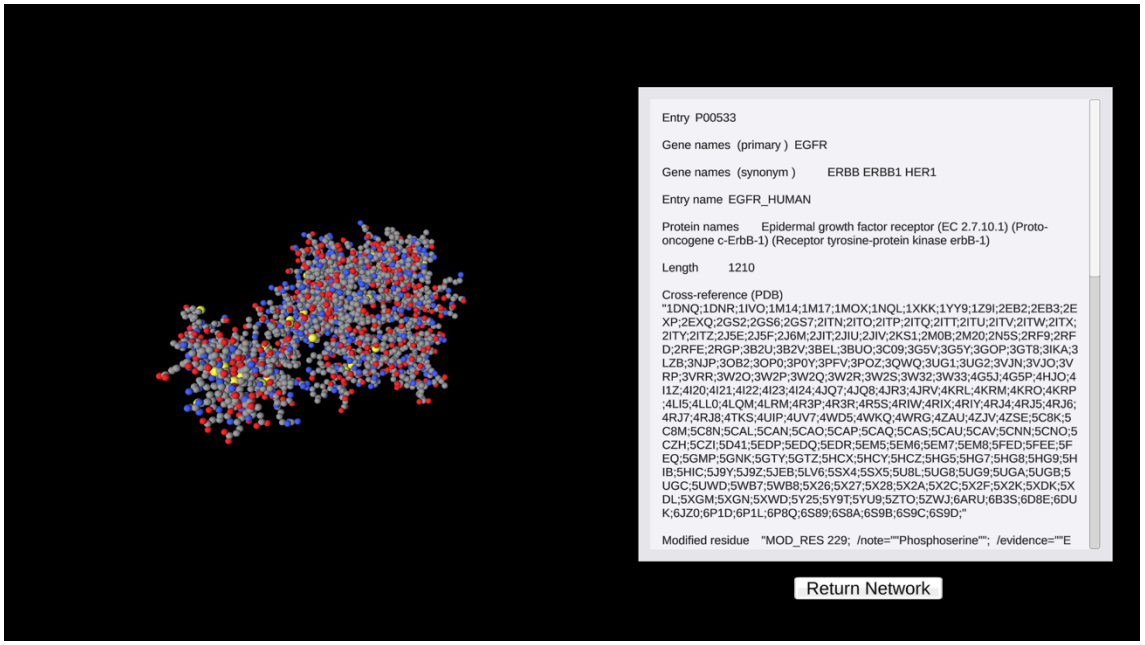

Figure 17

- Use the same controls to move, zoom in/out and rotate the model as the network.
- Click the Return Network button to return to Network View.

Visual Settings

- Click the Visual Setting button in the navigation menu to open the Visual Settings Panel in Figure 18.

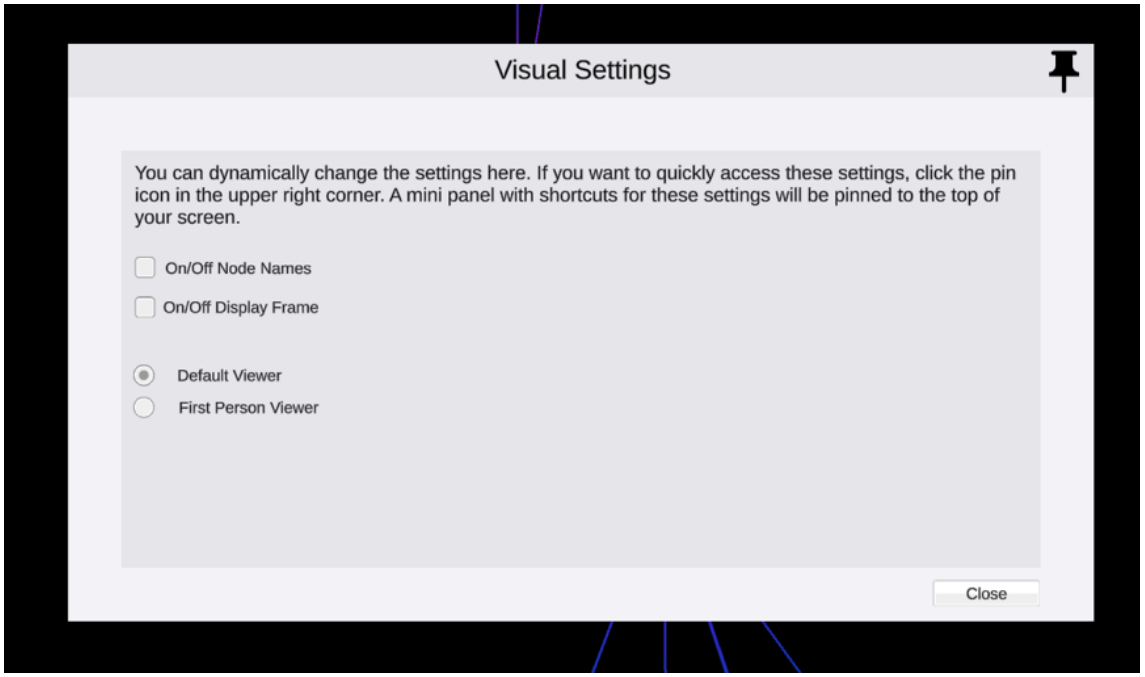

Figure 18

- The visual Setting panel contains settings that can be changed after the network is created. These settings are:
    - **On/Off Name Nodes Checkbox:** Node names can be hidden and shown.
    - **On/Off Display Frame Checkbox:** A yellow cube frame specifies the entire area covered by the network in Forced-Directed Layout and a specific area in other layouts. This can be displayed and hidden as desired.
    - **Default Viewer and First Person Viewer Radio Buttons:** There are two different modes of viewing the network in Standalone and WebGL versions. The Default Viewer is the mode where you can view the network as a third eye. In First Person Viewer, the network is seen from within the network and from the user's eyes as in games.
- You can click on the Pin button indicated by the red arrow in Figure 19 to access these settings more quickly and easily.

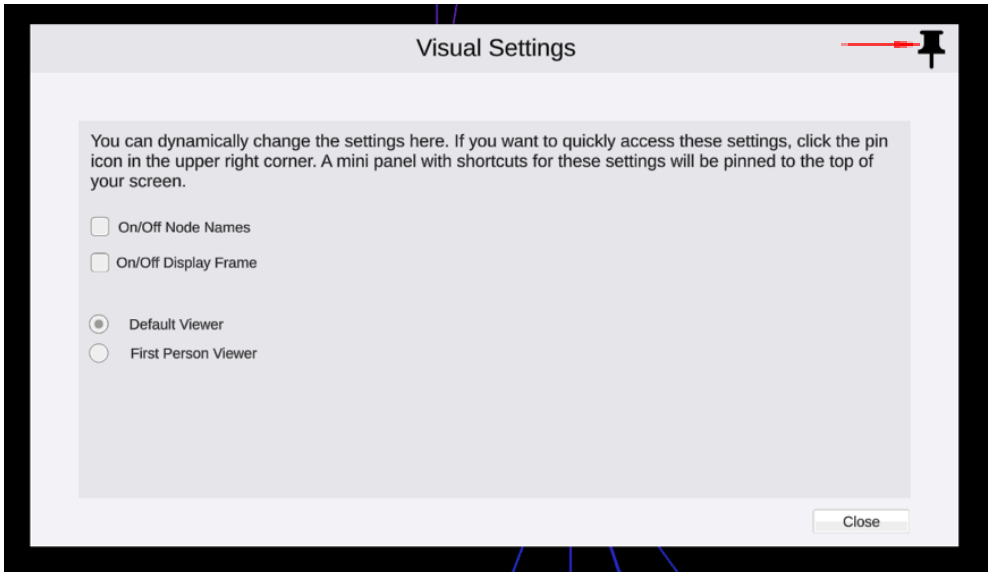

Figure 19

- When pinned, a small bar is seen in the top middle of the application. This bar is pinned by default when the network is created. It contains icon buttons that are corresponding to the settings in the panel. The relationship between the settings on the panel and icon buttons is shown in Figure 20.

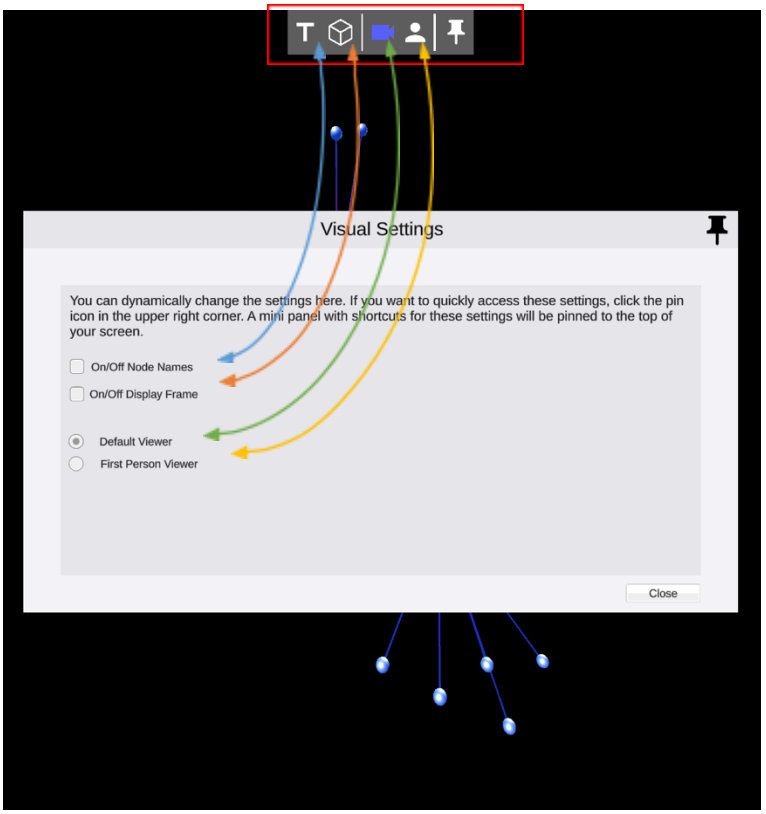

Figure 20

- To unpin, as in Figure 21, click one of the Pin buttons in the bar's right and on the Visual Settings panel.

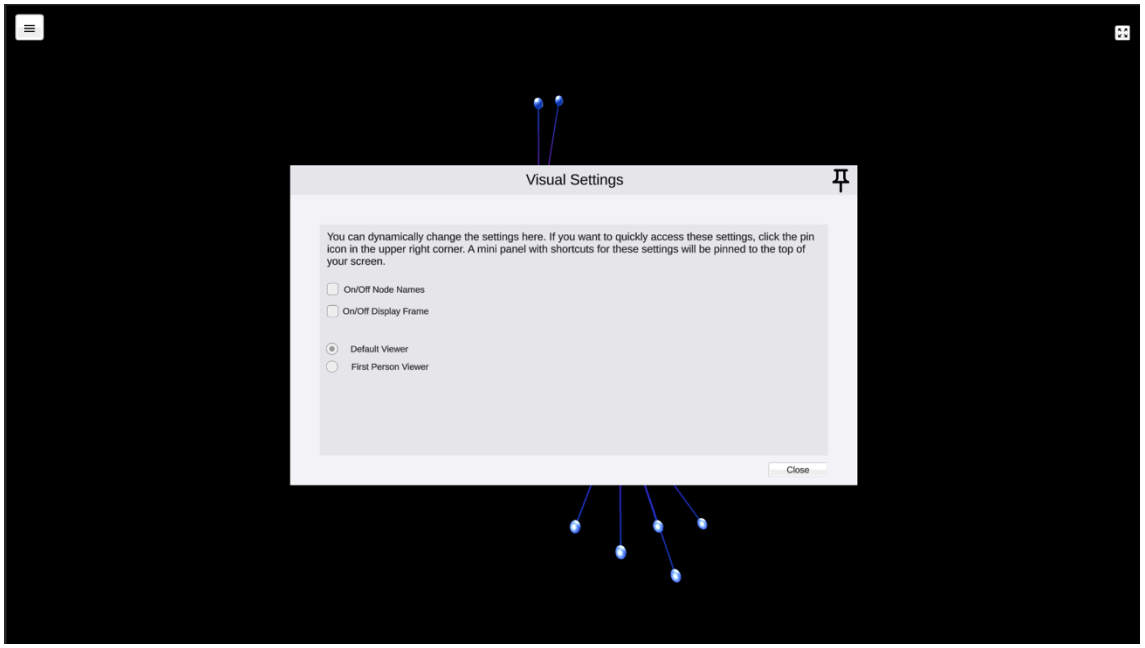

Figure 21

Finding The Shortest Path

- Click the navigation button and click the Finding A Shortest Path button. Figure 22 shows the corresponding panel.
- In the opening panel, two dropdown lists the node names that are available in the network.

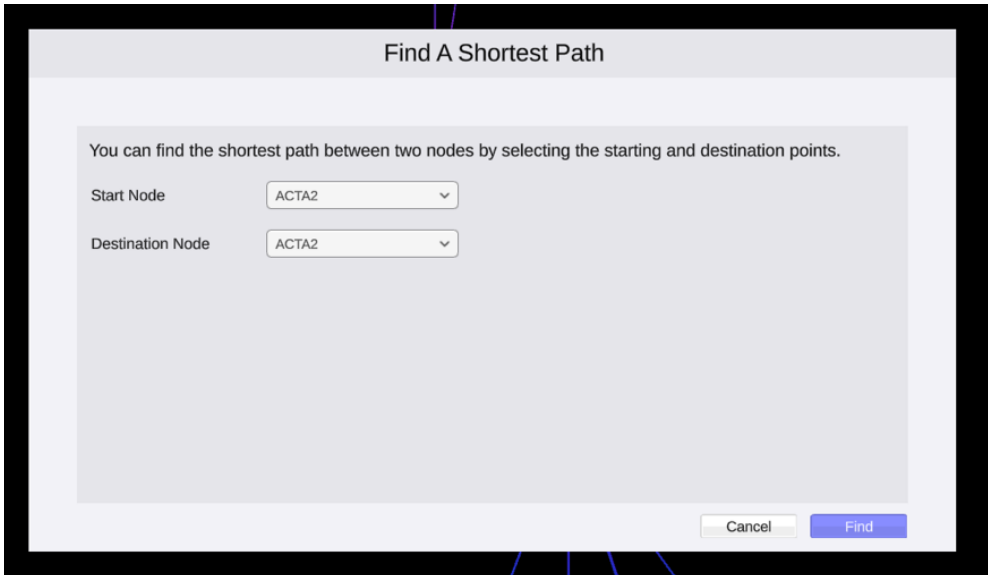

Figure 22

- As in Figure 23, select nodes for a start point and a destination point.

Figure 23

- After node selection, click the Find button.
- The nodes on the path are colored red, and the edges that connect them are colored pink. Other nodes and edges are shown more transparent to highlight the route. When a path is not found, just the selected nodes are colored. You can see how the shortcut found as a result of the selections in Figure 23 is visualized.

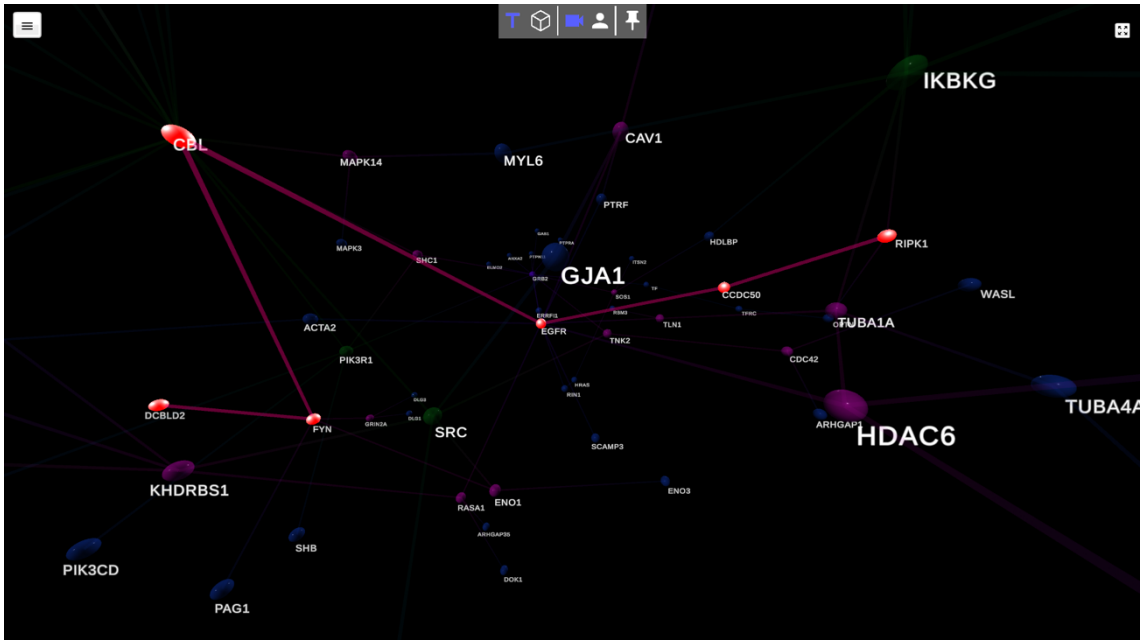

Figure 24

- You can reset all visual changes by clicking the Reset Button shown in the red rectangle in Figure 25. For example, when the Reset button is clicked, the changes in Figure 24 will be reversed as in Figure 26.

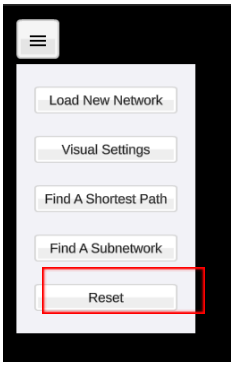

Figure 25

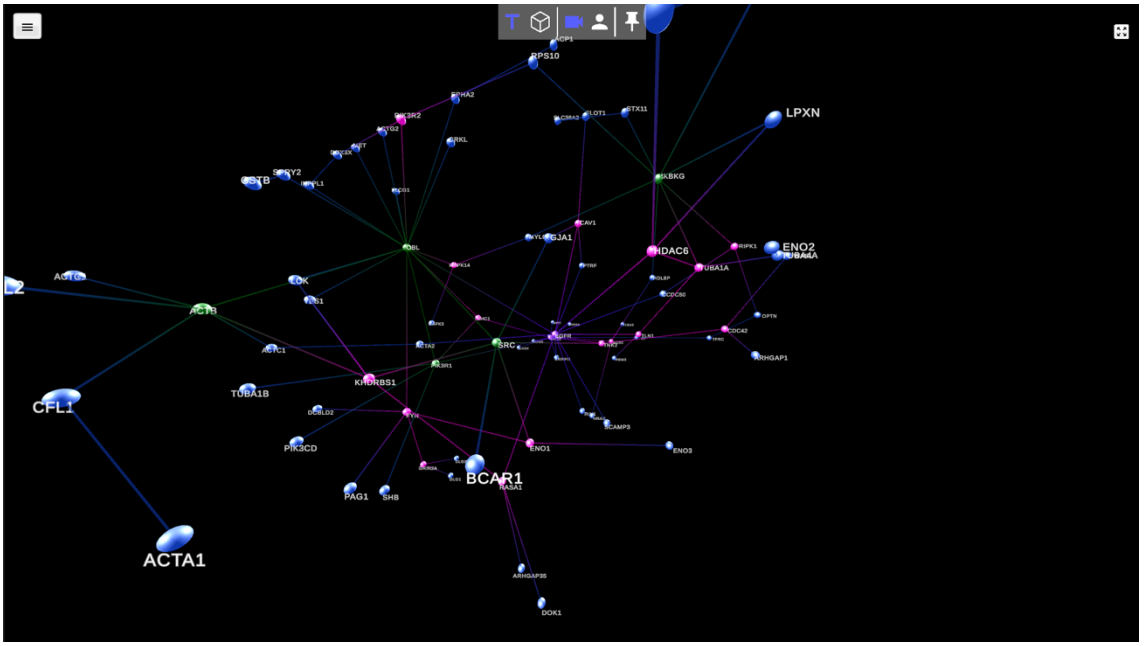

Figure 26

Finding The Subnetwork

- Click the navigation button and click the Finding A Subnetwork button.
- In the Algorithm tab shown in Figure 27, a dropdown lists the available algorithms. You can use three algorithms to find a subnetwork.

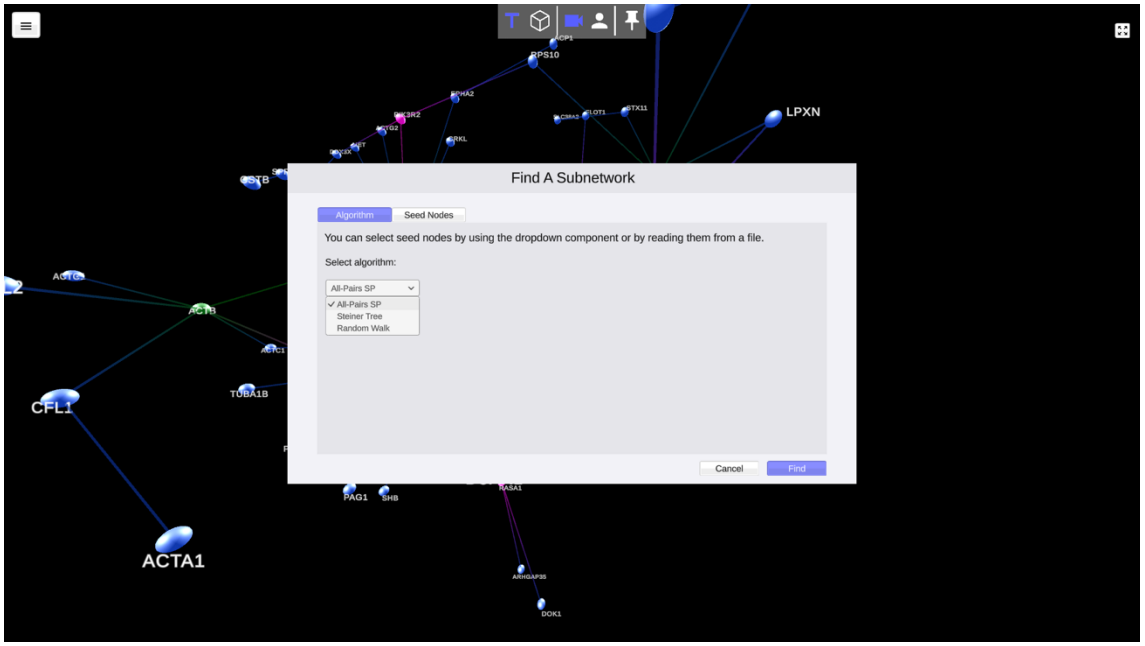

Figure 27

- In the Seed Node tab shown in Figure 28, the nodes that the subnetwork is required to include can be selected in two different ways. You can choose one by one among all the listed nodes, or you can load from a file.

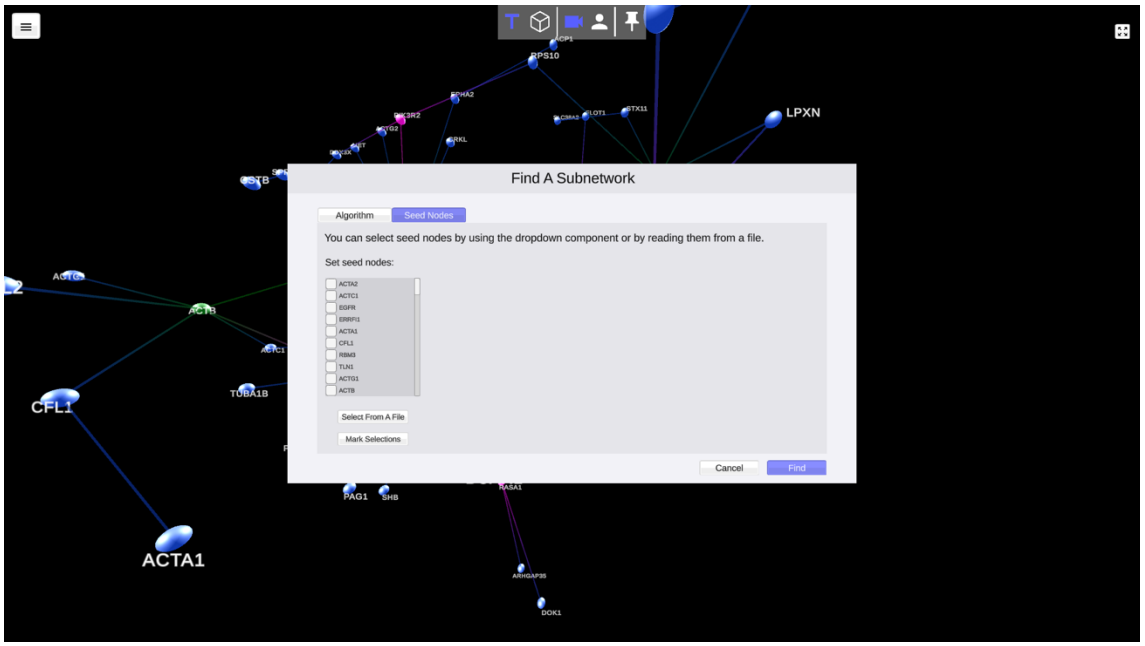

Figure 28

- Click the Select From A File button to load from a file. A file browser is opened, as in Figure 29. The file to be specified here must be in .txt format where the node names are listed one under the other.

Figure 29

- When the file is selected by double-clicking, the nodes it contains are automatically marked in the list, as seen in Figure 30.

Figure 30

- You can preview the selected nodes before starting the subnetwork finding process. To do this, click on the Mark Selections button. Then click Cancel to close the panel. (Your selections remain the same when the panel is opened again). The nodes that

are colored in red are the nodes selected as seed nodes. The previewed nodes look like Figure 31.

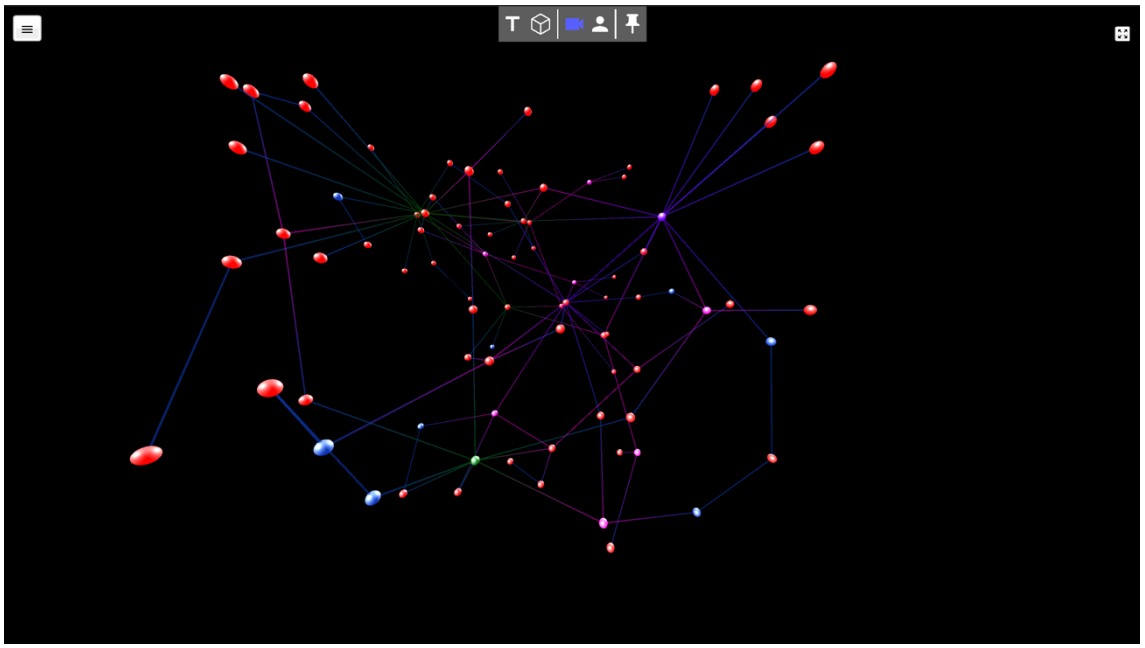

Figure 31

- When you open the panel again and click the Find button, a subnetwork will be created. You can see the result of finding a sample subnetwork in Figure 32.

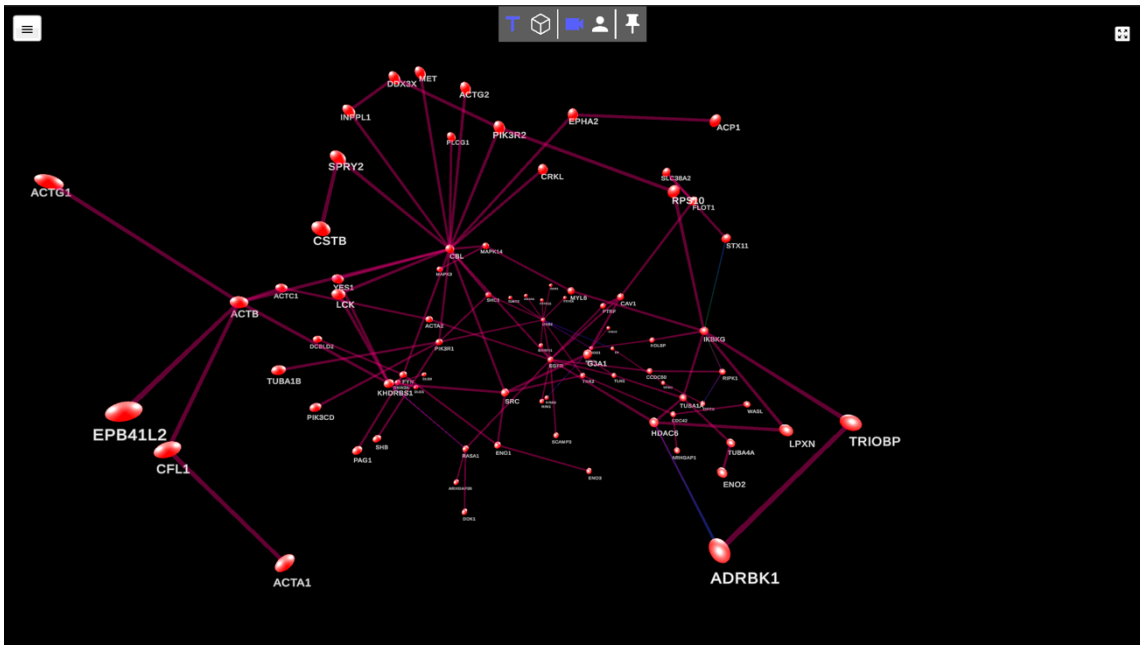

Figure 32

Operations Specific to MXR

Exporting A Network for MXR

- Click the E button on the keyboard when a network is loaded. A JSON file named BionetXRNetwork will be created on the desktop.
- Each new export attempt overwrites the file on the desktop. If you preserve an exported file from overwritten, you should move to another folder.

Importing BioNetXRNetwork.json to MXR Build

- For Hololens to find and read a file, the file must be in a particular folder called StreamingAssets within the project. For this, search for the StreamingAssets folder inside the Build-MXR folder for MXR. Copy the exported file into this folder.

Deploying to Hololens

- Connect your Hololens device with a USB cable to the computer that you will get the deployment.
- Click on the Visual Studio project file with the .sln extension in the given Build-MXR folder.
- In Visual Studio, select the processor architecture as x86 and the platform to run as Device. Press the Run button. Once the deployment process is complete, the project will be launched automatically on Hololens.

Controls

- The network can be moved, rotated, and resized. These are done with the default Hololens gestures. You can learn these gestures at the following links depending on your device:
  Hololens 1:
  https://docs.microsoft.com/en-us/dynamics365/mixed-reality/guides/authoring-gestures
  Hololens 2:
  https://docs.microsoft.com/en-us/dynamics365/mixed-reality/guides/authoring-gestures-hl2