Data Viz: Visualizing Metabolic Pathways

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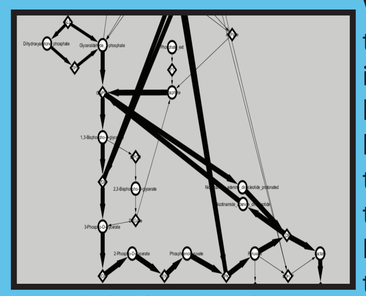
MOTIVATION

As the amount of data in the field of bioinformatics becomes increasingly complex, the breadth of the software needed to visualize this data must change accordingly. Current software tools are becoming more versatile, but still have limitations and are not easy to use (Mirel, 2009). Our research investigates the effects that result from modifying the way graph edges are displayed.

RELATED WORK

FluxViz is an open-source plug-in used with Cytoscape (Konig & Holzhutter, 2010). The program is used to visualize flux distributions in molecular networks.

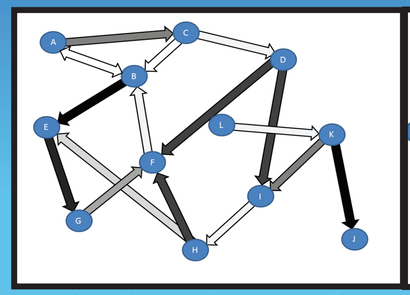


Metabolic Flux using FluxViz

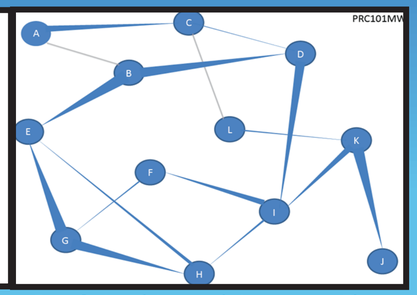
VisANT is a visualization application that provides many different interfaces; a completely online, but limited, web application, a downloadable version that allows customization, and allows visualization of larger networks (Hu,2004). NetworkX is a software package that provides much needed tools for analysis of networks and visualizations of their algorithms (Hagberg,2008).

FUTURE WORK

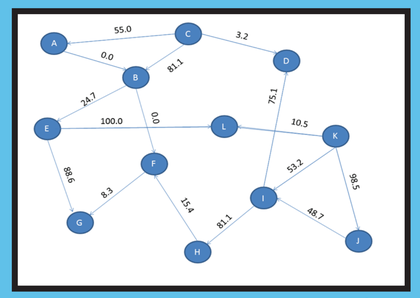
Our research will allow scientists to visualize metabolic flux more effectively and intuitively. We also hope that our results will be of some use when creating or modifying tools that will visualize metabolic pathways.



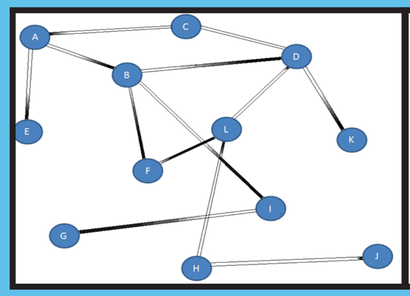
Graph 1- This graph interprets Flux with color intensity as in FluxViz.



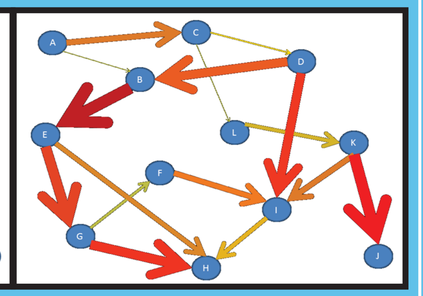
Graph 2 - This graph interprets Flux with line width at the base of the triangel.



Graph 5 - This is a standard visualization of flux . We will be using this as our control.



Graph 3 - This graph interprets Flux with color blended lines. It displays magnitude and directionality on the edge.

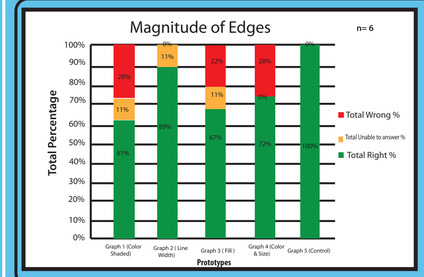


Graph 4 - This graph interprets Flux with color and width . Color and width depict magnitude on the edge

METHODS

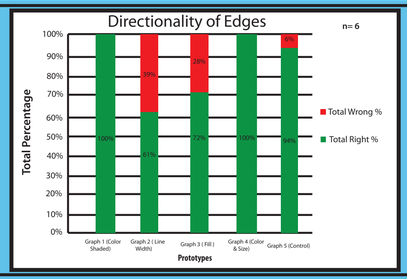
Our study involved a comparison of five separate graphs that each depict flux data differently. For each graph, users were asked a series of questions to determine their ability to distinguish graph magnitude and direction. They were also asked to evaluate ease of use and level of confidence in performing tasks on each graph.

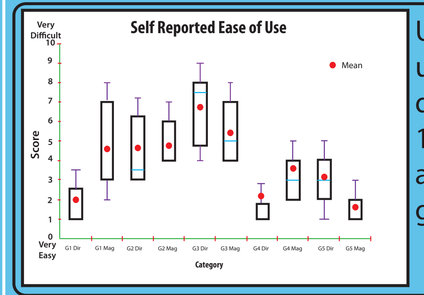
RESULTS



Users determined magnitude most successfully on graph 5 and 2, suggesting numbers and line width may be the preferred methods for showing magnitude.

Graph 1 and 4 are the most effective in determining direction, suggesting that larger arrows may help in determing directionality.





Users were asked to rank ease of use in determining magnitude and direction on a scale of 1 to 10, with 10 being the most difficult. Graph 4 and 5 were reported to have the greatest ease of use.

Based on the users ability to determine magnitude and direction graph 5, had overall, the least amount of error. However, our prototypes were limited to simple networks, where as most networks would be more complex. In addition, our participants were not timed. In the future it may be beneficial to see how time on task affects the data.

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