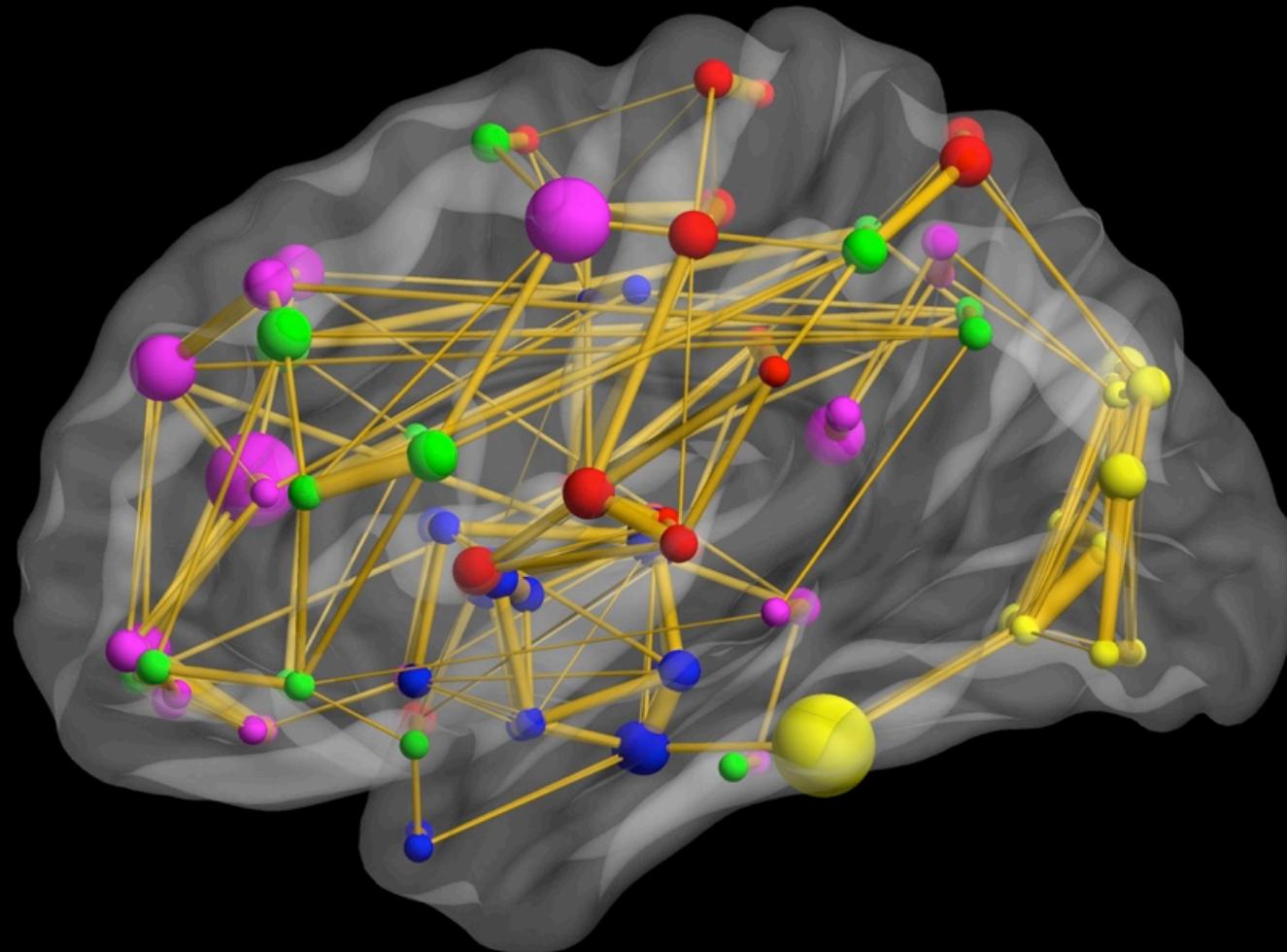


# BrainNet Viewer

A Network Visualization Tool for Human Brain Connectomics

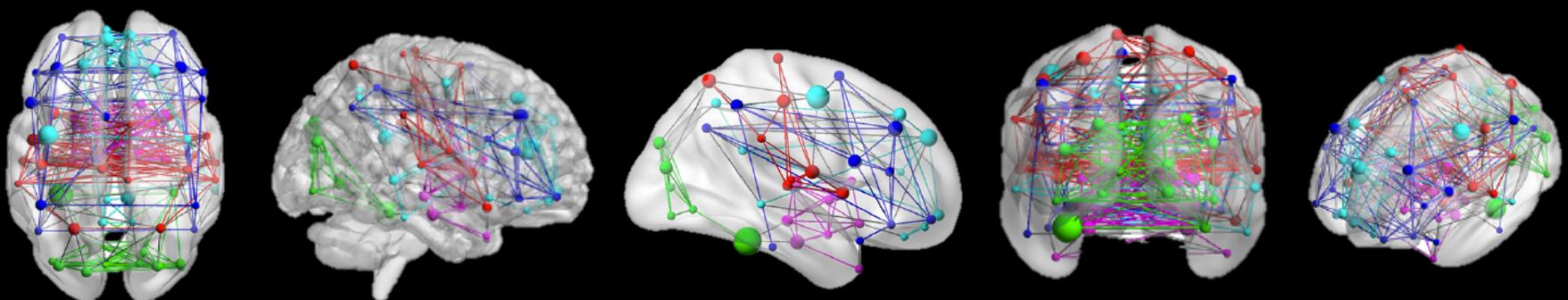
By Mingrui Xia, Jinhui Wang, Yong He



Augusto Ramirez

# Summary

- **Visualizing** brain-networks lead to better understanding of **topological properties**.
- Programs do this, but **too abstract**.
- Presenting **BrainNet Viewer!**



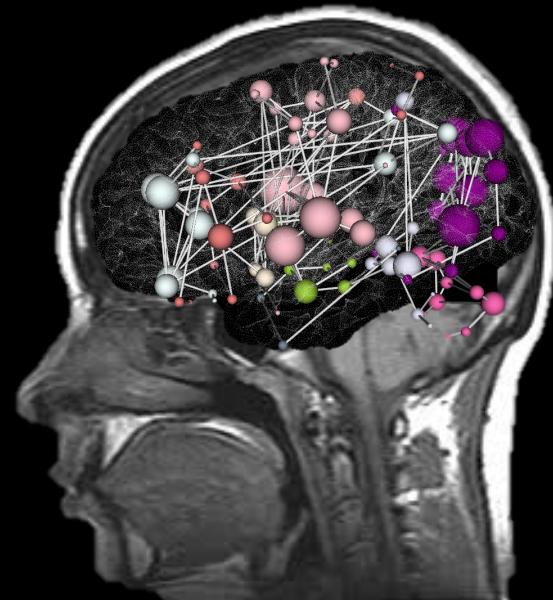
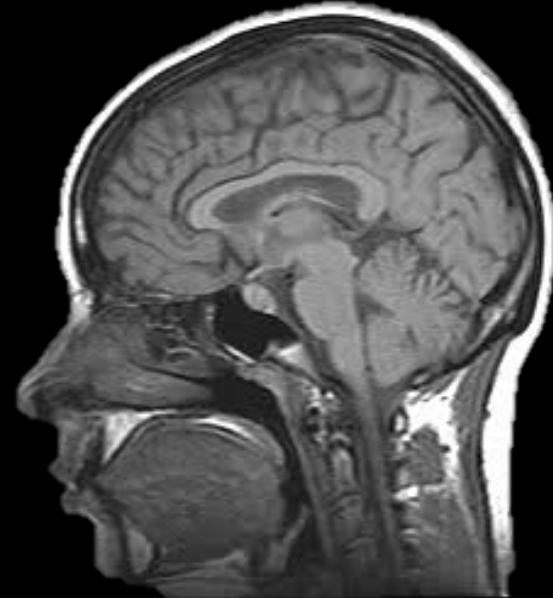
# Opportunity

Neuroimaging Technologies  
+ Sophisticated Analytic Strategies

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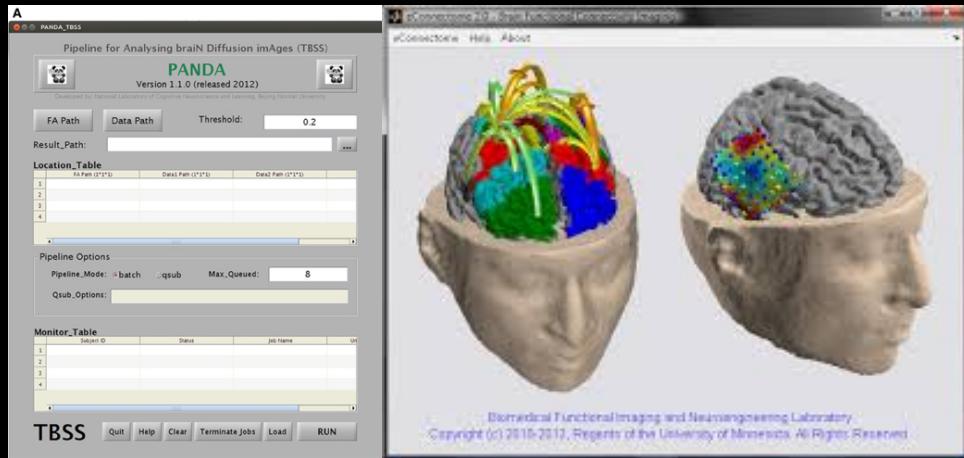
## Human Brain Connectome

- Topological architecture of brain networks **in vivo**.
- **Growing** field & research community.



# Challenge

- Visualization is **difficult**:
  - Complex methodology
  - Abstract nature of graph theoretical approaches
  - Intricate brain networks
- Graph-based network toolboxes are **lacking** (in 2013):
  - Intuitive GUI
  - Simple “ball-and-stick” models
  - Convenient settings and display property modifications



 **Brain Connectivity Toolbox**

**eConnectome**

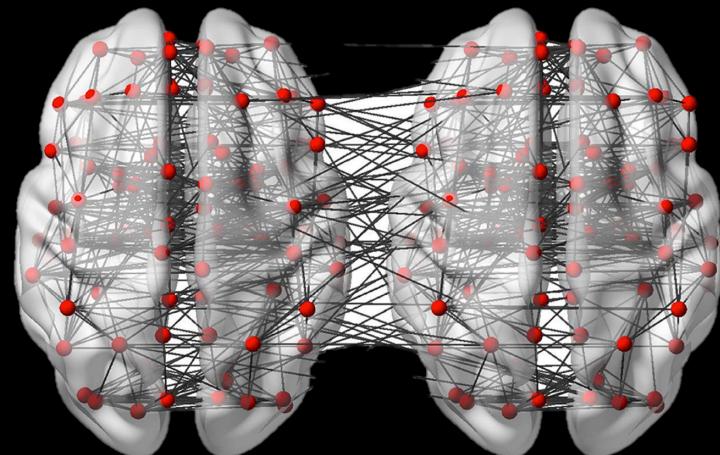
**NetworkX**



# Action

## BrainNet Viewer

- Create MATLAB brain network visualization toolbox along with **Graphical User Interface**.
- Develop **flexible**, **responsive**, and **convenient** platform for researchers.
- **Interactive** and **modifiable** output.



File Option Visualize Tools Help



# BrainNet Viewer

Version 1.41 Released 20120918

A flexible and rapid network mapping tool

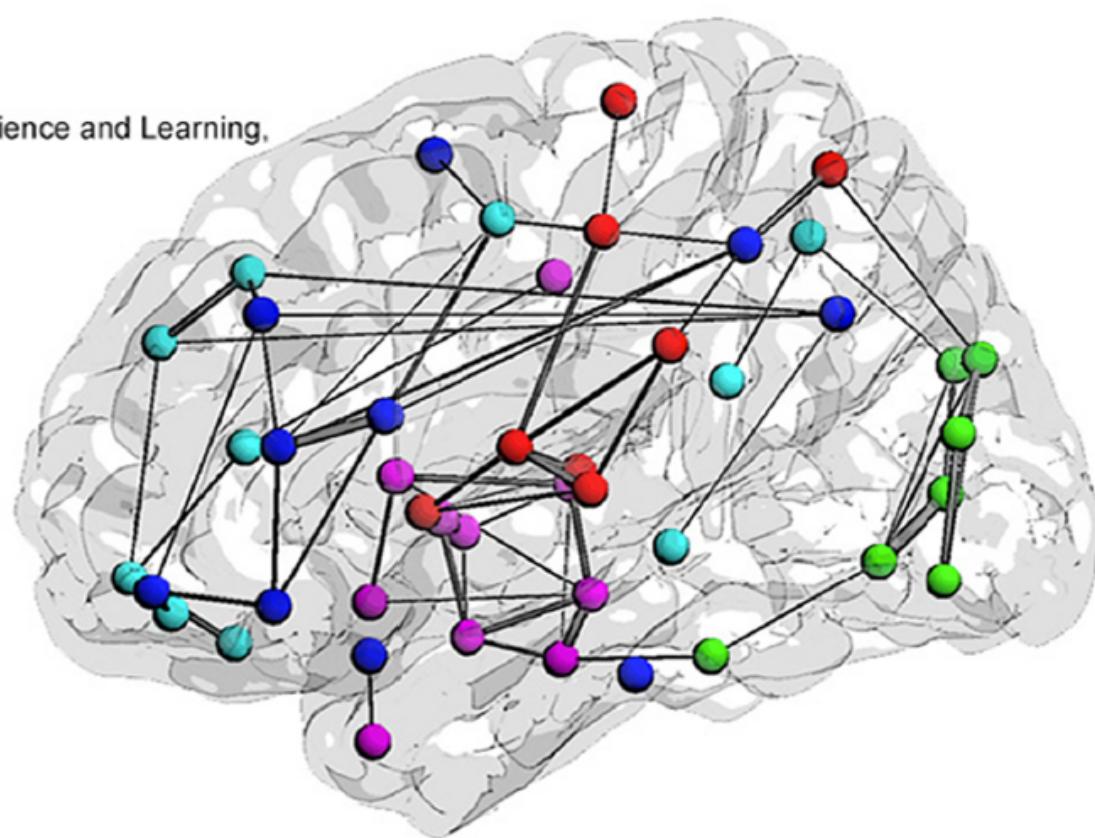
National Key Laboratory of Cognitive Neuroscience and Learning,

Beijing Normal University.

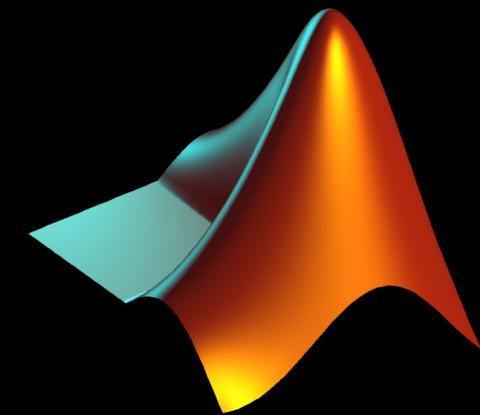
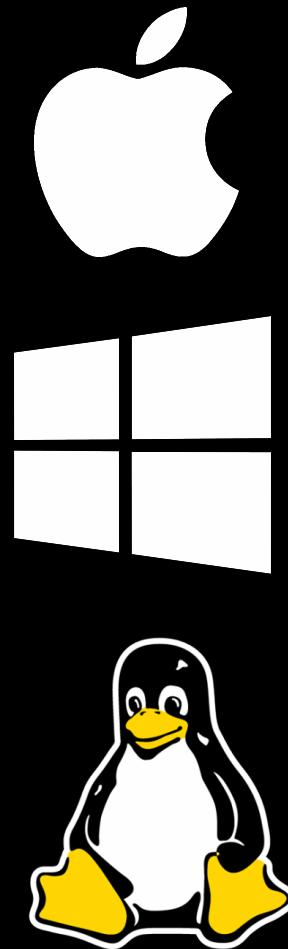
Contact Information:

Mingrui Xia: mingruixia@gmail.com

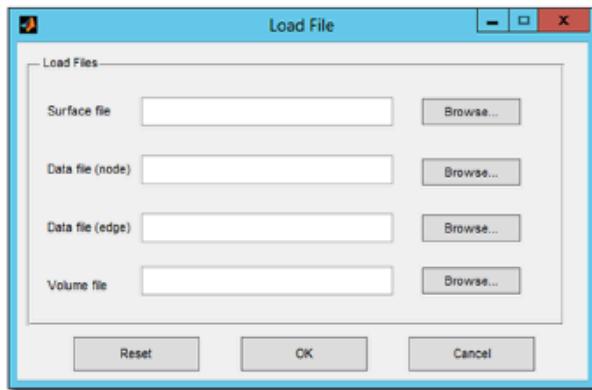
Yong He: yong.h.he@gmail.com



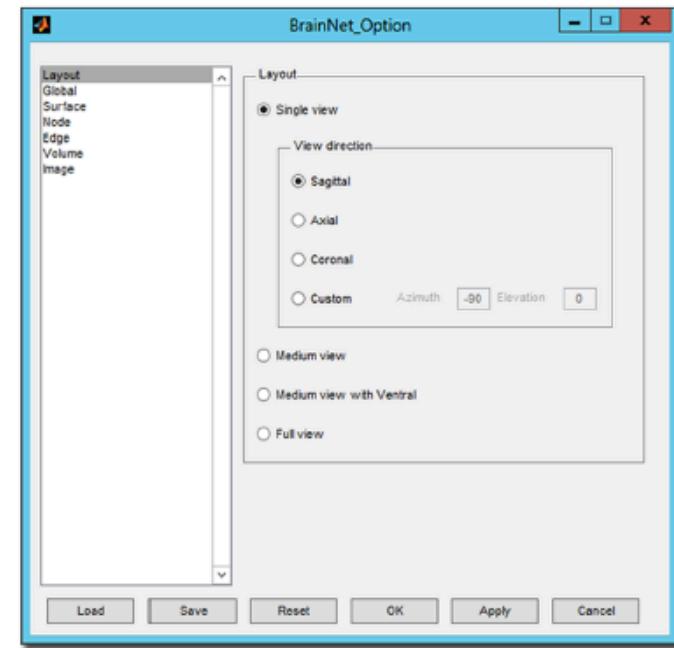
# How Do I Start?



.nv  
.node  
.edge  
.nii  
.img

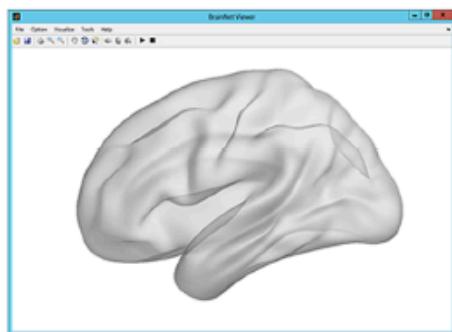


*Load files &  
Identify file combination*

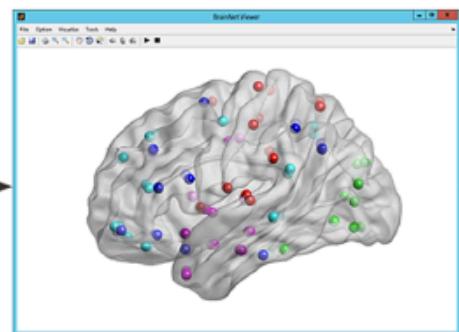


*Set graph configurations*

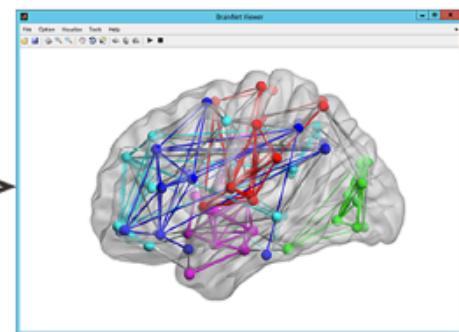
## Visualization flowchart of BrainNet Viewer



*Draw surface*



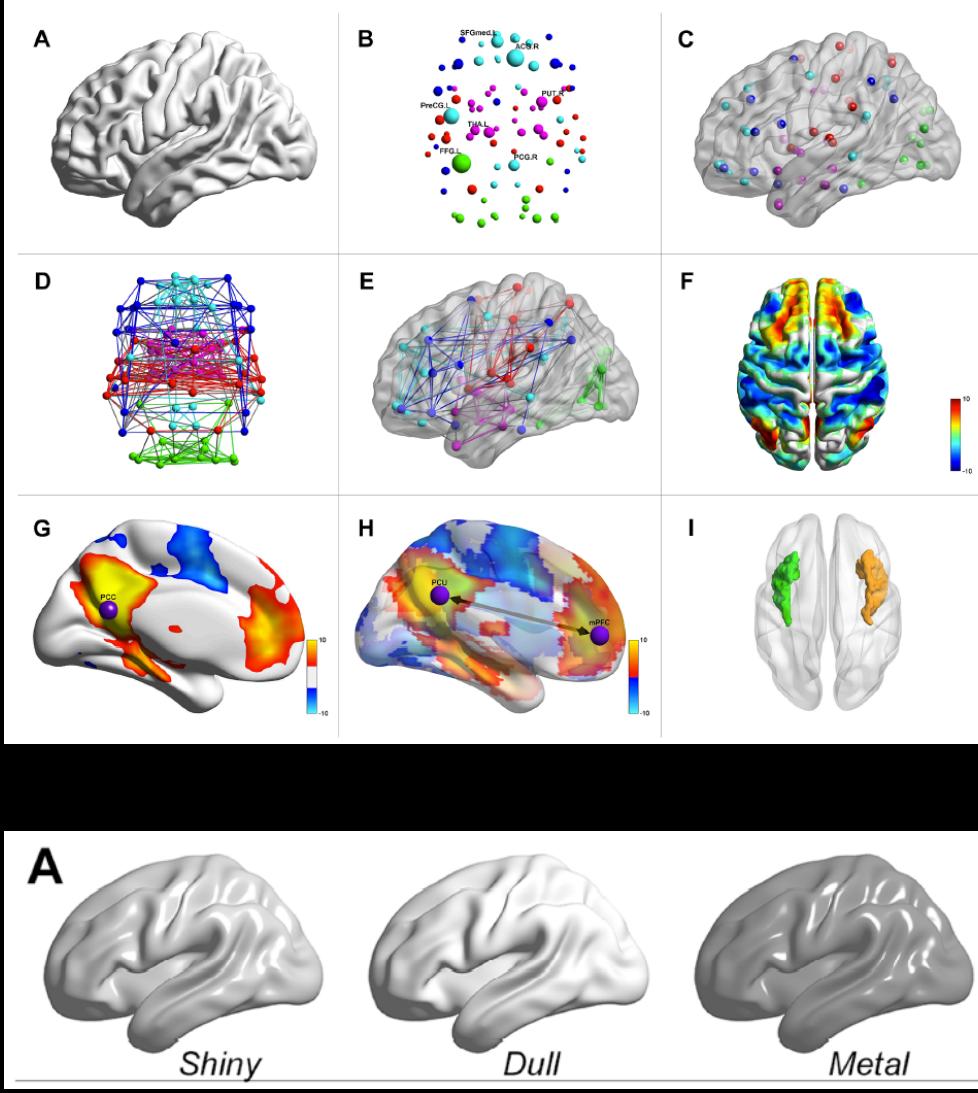
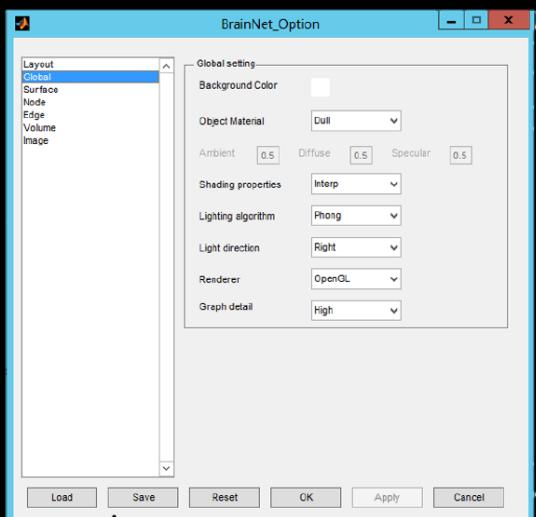
*Draw nodes*



*Draw edges*

# How Does It Work?

- 3 Graphing Methods
  - Ball-and-stick models
  - Volume-to-surface mapping
  - ROI (regions of interest) clusters
- Option panel



# Resolution & Future Work

- Available to install from **NITRC**.
- Allows for **interactive multi-view** brain network visualization.
- Used to analyze real data from the **1000 Functional Connectomes Project** .
  
- Fix performance issues.
- Translate source code to **Python** or **C**.
- Provide more **realistic** connection visualization.

# Discussion

## Pros

- Allows batch brain-network image and video automation.
- Interactive 3D display of brain-networks.
- Many researchers have adopted the toolbox.
- Compatible with other similar toolboxes.

## Cons

- Can only visualize macro-scale brain networks.
- High memory consumption.
- Slow looping features.
- Limited by MATLAB framework.