# Comparing Functional Networks of the Brain: An Introductory Tutorial using Python

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The analysis of brain networks is a challenging endeavor, even for experienced researchers. For younger students, the concepts, mathematical formulations, data formats, and variety of software tools can be especially daunting. In addition, the software may be commercial, making it less accessible; it may only work on certain operating systems or only be provided as source code that requires compilation; or it may have a user interface with a steep learning curve. The BioVis data contest, comparing resting state functional connectivity networks of the human brain, provides an opportunity to demonstrate the freely available, open source Python scripting language for such analyses. We provide an easy to follow tutorial, with simple scripts and explanatory documentation, that will hopefully encourage students to take an active, hands-on approach to understanding how brain networks can be analyzed and visualized. Using a Python distribution that includes many useful scientific packages, we begin by visualizing various anatomical representations of the brain, in different data formats. Next, we show how the functional network datasets can be visualized as both color-coded connection matrices and graphs. Finally, we demonstrate how one might approach the challenging problem of comparing pairs of networks. To address the primary challenge of the data contest, we discuss and propose a mapping from 30 *unknown* test subjects to 18 *known* contest subjects. Our primary goal is to help students feel more empowered to perform brain network analysis, as well as other, more general, data analysis projects.

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