Agenda

9:00 AM - 9:20 AM: Introduction to NSG

9:20 AM - 10:20 AM: Hands on Demo - How to use NSG

Speakers: Amit Majumdar, Subhashini Sivagnanam,
San Diego Supercomputer Center, UCSD
Ted Carnevale
Yale School of Medicine

Abstract of talk: We will introduce the Neuroscience Gateway (NSG) and mention what capabilities it provides, what neuronal simulations tools it provides for running free of charge on US NSF funded supercomputers.
We will show how users can easily upload models, choose some parameters (e.g. number of cores, runtime etc.), run a simulation on parallel machines, and download results.

10:20 AM - 10:30 AM: Break

10:30 AM - 11:00 AM: Using models from the Open Source Brain repository on the NSG portal infrastructure

Speaker: Dr. Padraig Gleeson, Department of Neuroscience, Physiology and Pharmacology, University College, London, UK

Abstract of talk: This presentation will give an overview of the Open Source
Brain initiative (OSB), which aims to create a repository of open source, collaboratively developed models in computational neuroscience. The models can be downloaded in simulator independent NeuroML format, which can then be mapped to run on multiple simulation platforms. This also facilitates extraction of the physiological and anatomical properties of the models for presentation in more accessible forms through the OSB website. In addition to visualization of the structure of models in 3D, we have recently added the ability to simulate models from OSB on our servers and visualise resultant behaviour through the browser. We will present current options for stimulating OSB models on the NSG infrastructure as well as ongoing work to offer this through the OSB 3D browser interface.

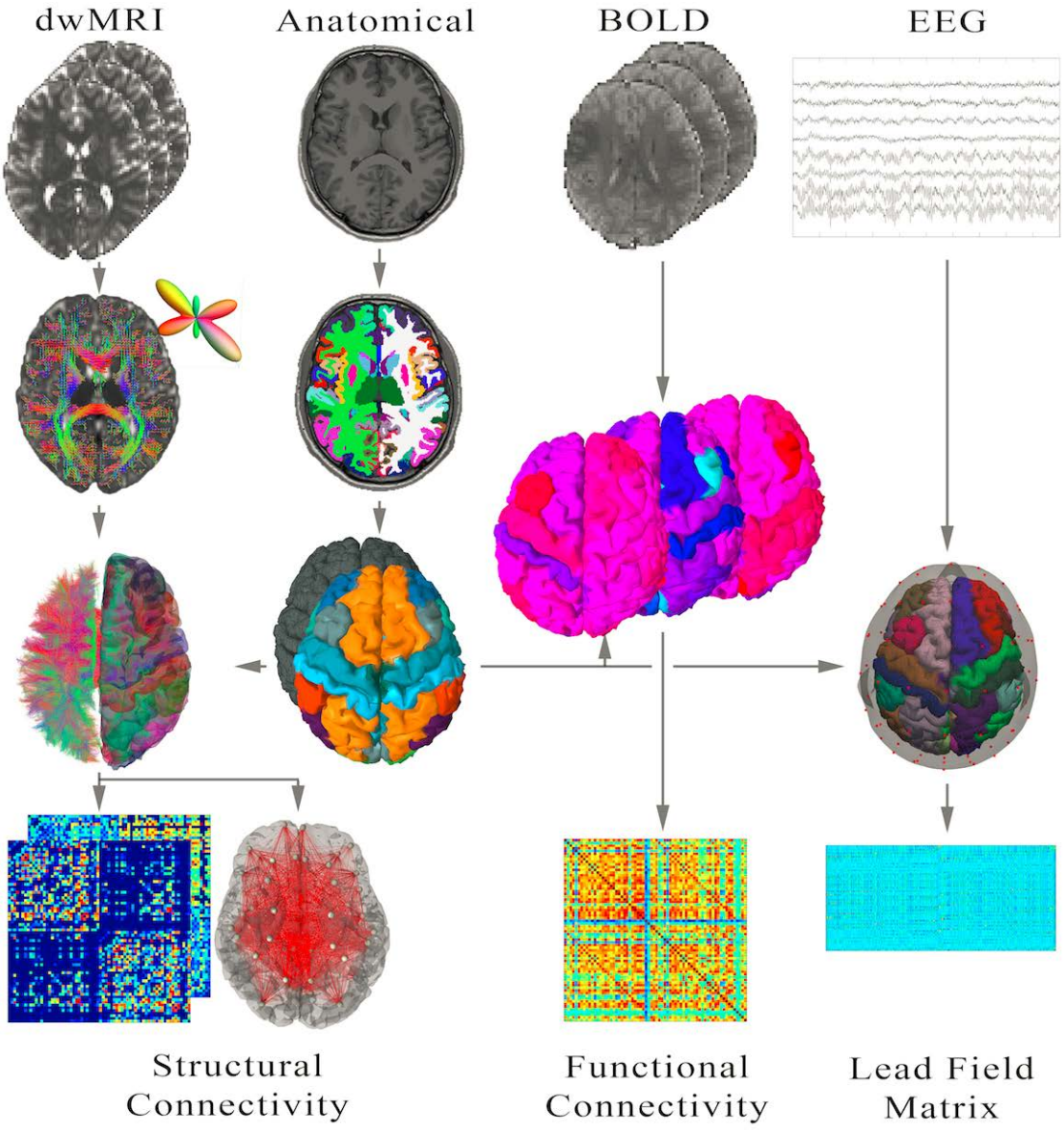
11:00 AM - 11:30 AM Extracting Personalized Virtual Brains From Multimodal Neuroimaging Data

Speaker: Simon Rothmeier
Dept. Neurology, Charité - University Medicine Berlin, Germany

Abstract of talk: In today's neuroscience, large amounts of multimodal data are recorded every day. For coherent analyses, multimodal datasets need to be spatiotemporally registered and processed in a standardized manner.
Based on those information, individual brain models can be created and used in computational neuroscience to simulate and explore behavior of individual brain activity. By analyzing those models and the simulated activity, brain mechanics can be unveiled which are currently hidden behind the fact that they are either happening to fast, to complex or on a scale to weak for current measurement-methods to fully capture. Using The Virtual Brain (TVB) software simulation platform, one can easily perform full-brain model simulations. TVB uses empirical structural and functional data for building full-brain models of the human brain.

We developed a fully automatic processing pipeline to create brain models, which can be used within TVB from individually recorded multimodal datasets. Utilizing state-of-the-art toolboxes like Freesurfer, FSL, MRTrix and Brainstorm, the pipeline can process anatomical MRI data, diffusion data (dwMRI), functional imgaging data (fMRI) and optionally electroencephalography (EEG) data. The output dataset of the pipeline consists of structural and functional connectomes, cortical- and subcortical volume parcellations, surface tessellations, region-wise aggregated blood oxygen level dependent (BOLD) time series of brain activity, lead-field matrices and EEG source activity. For seamless integration along TVB, the resulting files can be directly uploaded into the platform via the GUI.

Furthermore, we developed a novel measure of connectivity strength in structural connectome matrices based on white-matter tractography. Resulting structural connectomes achieved superior robustness in testretest analyses.



11:30 AM - 12:00 PM Simulating large neuronal networks with NEST
Speakers: Alex Peyser and Hannah Bos
Forschungszentrum Jülich (Research Centre Jülich)
Abstract of talk: We will provide a short overview over the design principles and capabilities of NEST, The Neural Simulation Tool, and current record-holder for large-scale network simulations. As a real-world use case, we will discuss a detailed model of a cortical microcolumn (Potjans & Diesmann, 2014) available from OpenSourceBrain. Finally, we will give a short introduction of NEST's brand-new gap junction support.

12 PM – LUNCH PROVIDED