## 7th BigBrain Workshop: Challenges of big data integration



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## Leveraging the BigBrain for Electrophysiology

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Zoom webinar:

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Electrophysiology is an imaging technology with a high temporal resolution that is cost-effective and widely deployable in any economic setting. It is therefore of great interest to global public health. Electrophysiological Source Imaging (ESI) estimates the neural primary current densities that produce the observed EEG/MEG. While ESI is closer to the underlying neural processes of interest, there remain some critical underdeveloped research areas to fully interpret the data.

In this presentation, we facilitate the use of BigBrain project to address some of these issues with the following developments:

- Development of workflow to obtain ESI projected to the BigBrain atlas space.
- A toolbox, CITFITSTORM that produces BigBrain compatible ESI obtained with a diversity of availability of MRI data to compute the lead yield. These are HCP-compatible MRI collections, Legacy datasets, with only T1, as well as when there is no MRI available [1].
- We have developed methods and a toolbox to integrate external high-dimensional neural mass models with great accuracy and computational efficiency. A main feature of this approach is to allow a general model of disturbed conduction delays between neural masses via a Connectome Tensor formulation [2].

With this work, we aim to facilitate biophysical models for principled multimodal data fusion in the framework of the BigBrain Project.

## References:

[1] Areces Gonzalez, Ariosky; Paz-Linares, Deirel; Riaz, Usama; Li, Min; Wang, Ying; Kpiebaareh, Michael Y.; et al. (2023). Multimodal pipeline for HCP-compatible processing and registration of legacy datasets (MRI, MEG, and EEG). TechRxiv. Preprint. https://doi.org/10.36227/techrxiv.22276549.v1

[2] Mitjans, A. G., Linares, D. P., Naranjo, C. L., Gonzalez, A. A., Li, M., Wang, Y., ... & Valdes-Sosa, P. A. (2023). Accurate and Efficient Simulation of Very High-Dimensional Neural Mass Models with Distributed-Delay Connectome Tensors. NeuroImage, 274, 120137. https://doi.org/10.1016/j.neuroimage.2023.120137

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