

## Admission Round 2019

<b>Project Title</b>	<b>VirtualBrainCloud: Linking systems biology and computational neuroscience</b>
Project leads / supervisors	Prof. Dr. Petra Ritter (MDC, Helmholtz) Prof. Dr. Ulf Leser (HU, ECDF)

### Project description

While the prevalence of neurodegenerative diseases (NDD) increases, we lack knowledge about how sub-cellular and network changes interact in the emergence of neuropathology. In addition, the emergence of pathology is highly variable and thus individualized diagnostics and interventions are required. The project addresses the need for computational whole brain modelling to capture individual differences. We will develop a computational modeling system that is tailored to the individual, and bridges multiple scales to identify key mechanisms that predict NDD progression and serves as Precision Decision Support System. Central to this project is The Virtual Brain (TVB) simulation platform. It allows connectome-based modelling of human and rodent whole brain dynamics, and enables the “integration” of brain dynamics at different levels: from cellular to whole brain. Our goal in this project is to bridge the gap between computational neuroscience and subcellular systems biology by integrating both research streams into a unifying computational model that is at the same time a software product for systems biomedicine. We present a concept to combine large-scale brain simulation and biological pathways into a mechanistic dynamic model that transcends different levels of organization. The project integrates existing software tools and platforms to provide access to high quality clinical multi-disciplinary data to integrate them and make them useful in clinical practice. The result will be a cloud-based brain simulation platform to support personalised diagnostics and treatments in NDD. This is a highly interdisciplinary project where the PhD candidate has the opportunity to work at the interface of software engineering, computational neuroscience and systems biology. The candidate will be involved with large-scale consortia in the field. For more information see:

[https://brainsimulation.charite.de/;](https://brainsimulation.charite.de/)

[www.thevirtualbrain.org;](http://www.thevirtualbrain.org;)

<https://www.humanbrainproject.eu/en/>

### References

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