THE VIRTUAL EPILEPTIC PATIENT WORKFLOW

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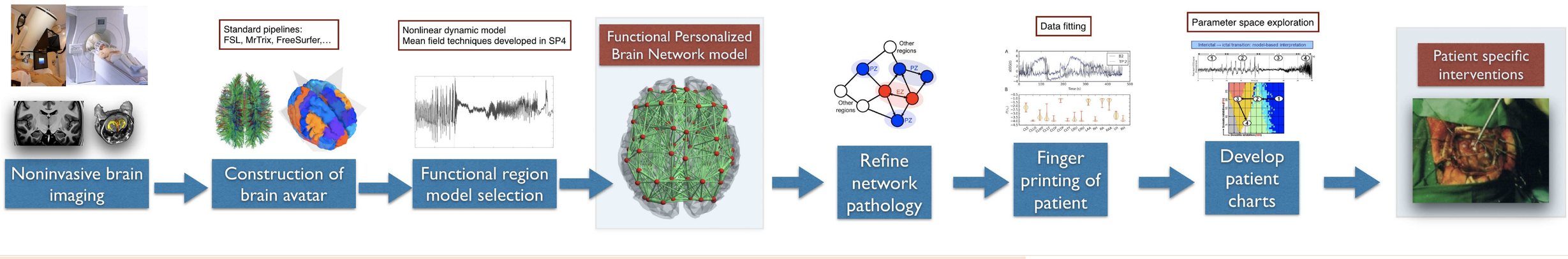
OVERVIEW

We developed a workflow of Virtual Epileptic Patient (VEP) brain model to brain interventions based on personalized brain network models derived from non-invasive structural data of individual patients with drug-resistant epilepsy (Jirsa et al., 2017)

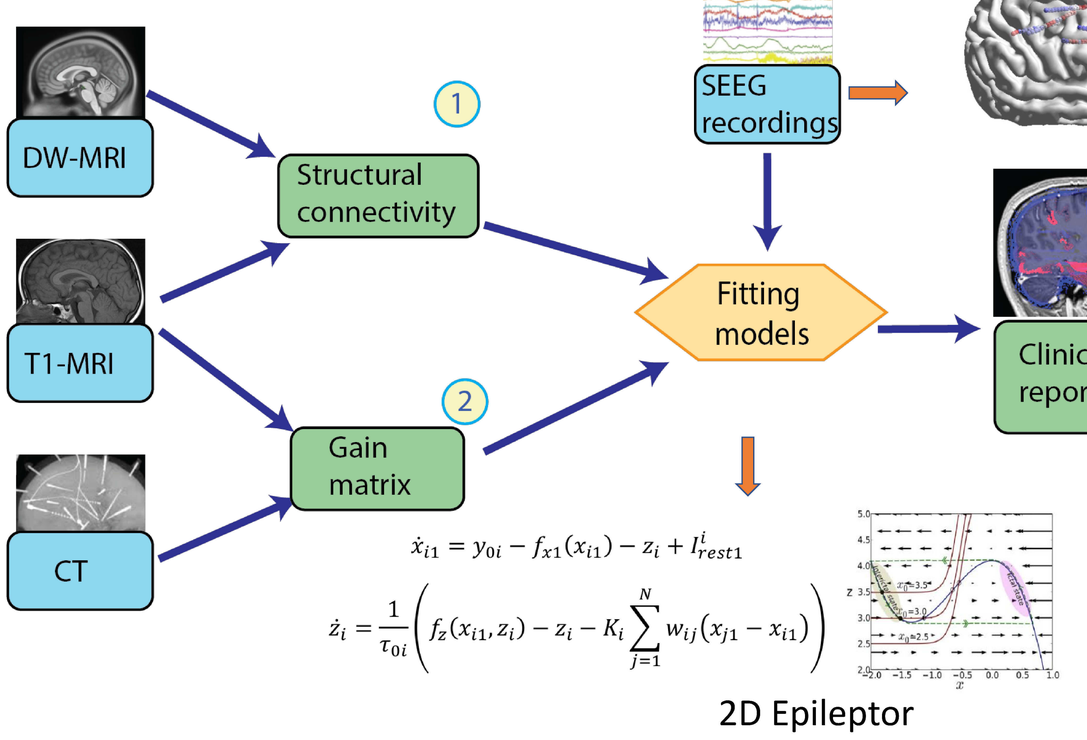


THE VIRTUAL PATIENT FOR CLINICAL TRIALS (EPINOV PROJECT)

For a given patient VEP combines structural information with large-scale brain modelling based on The Virtual Brain (TVB) technology and produces a clinical report depicting specific heat maps estimating the degree of epileptogenicity projected on the patient's brain anatomy. Evaluation on the retrospective patients shows the potential:

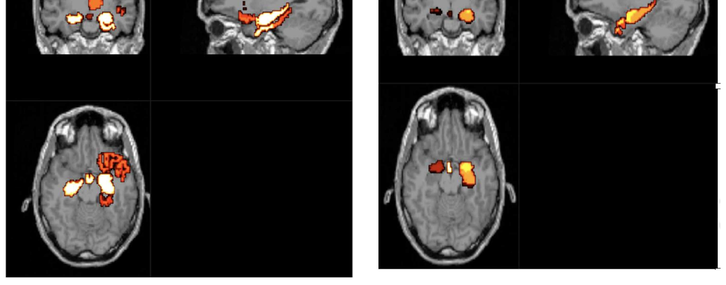
- Improving success rate in epilepsy surgery
- Minimizing invasiveness
- Improving diagnosis

Workflow

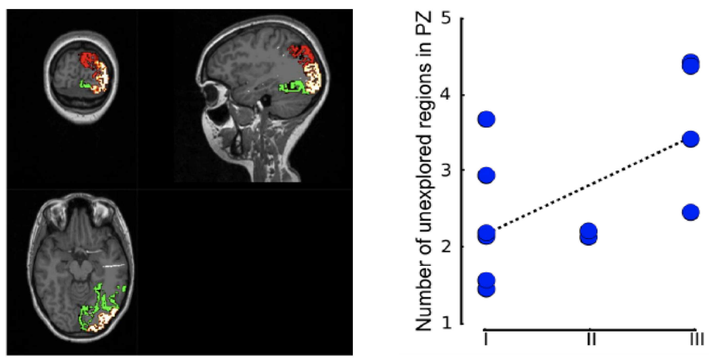


EVALUATION

A. Clinician EZ prediction B. Data fitting excitabilities



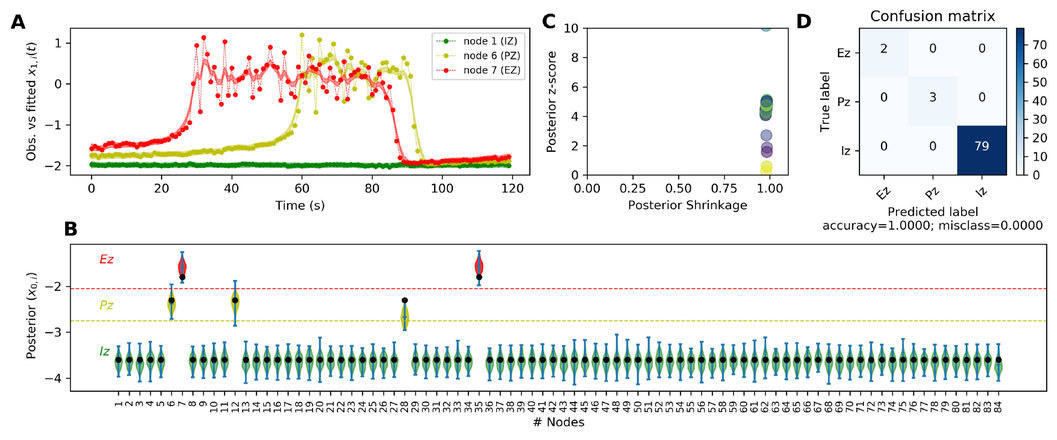
Comparision A & B



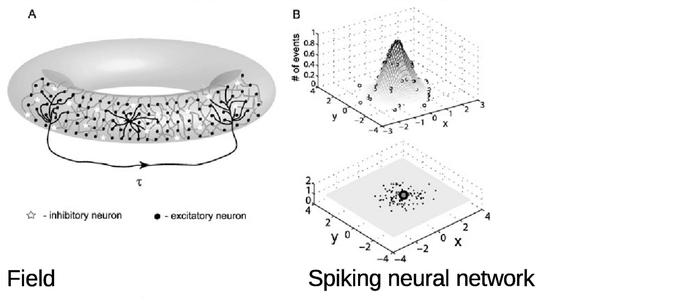
ALGORITHM INVESTIGATION

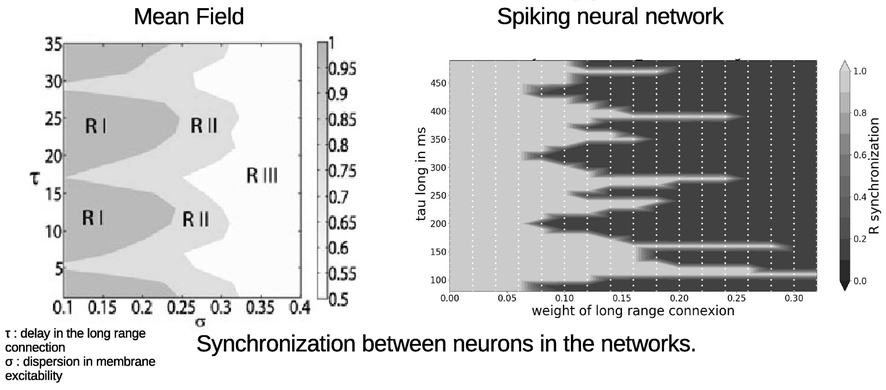
Inversion of Bayesian VEP model using NUTS algorithm

A. The simulation as the observation data versus the prediction for three selected nodes B. Violin plots of the estimated densities of the epileptogenicity (C) (C) the distribution of posterior z-scores vs posterior shrinkages for all the estimated excitability parameters. (D) The calculated confusion matrix for the estimated spatial excitabilities.



Importance of tracts in neural network





τ : delay in the long range connection
σ : dispersion in membrane excitability

Synchronization between neurons in the networks.

Main Reference:

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This project/research has received funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under the Specific Grant Agreement No. 785907 (Human Brain Project SGA2) and Specific Grant Agreement No. 720270 (Human Brain Project SGA1).