



Fourth BigBrain Workshop: Launch of the Helmholtz
International BigBrain Analytics Learning Laboratory (HIBALL)
- 26 June 2020



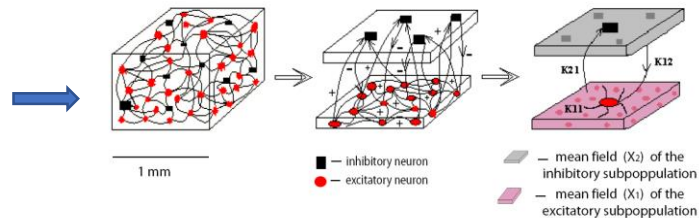
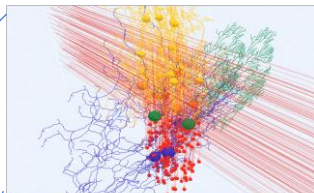
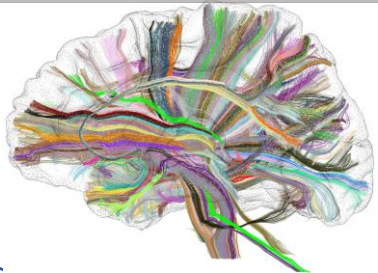
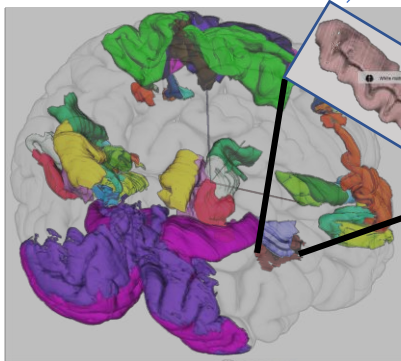
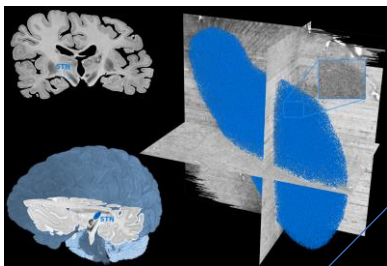
Workflow integrating The Virtual Brain (TVB) with data features of the BigBrain

Huifang Wang



Institut de
Neurosciences
des Systèmes



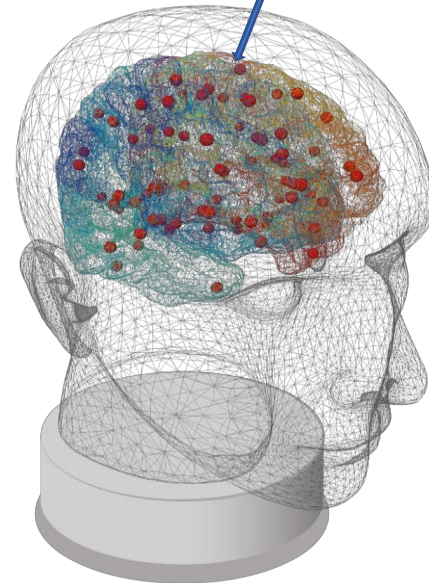


$$\dot{x}_i = f(\theta_i, x_i, C_i^l, \sum C_{ij}^g x_j)$$

PROOF OF CONCEPT

Region specific information from the Big Brain Atlas changes the network dynamics sufficiently to improve the model inversion of human brain imaging data.

The workflow integrates Big Brain data as a prior into a Bayesian Inference frame work.



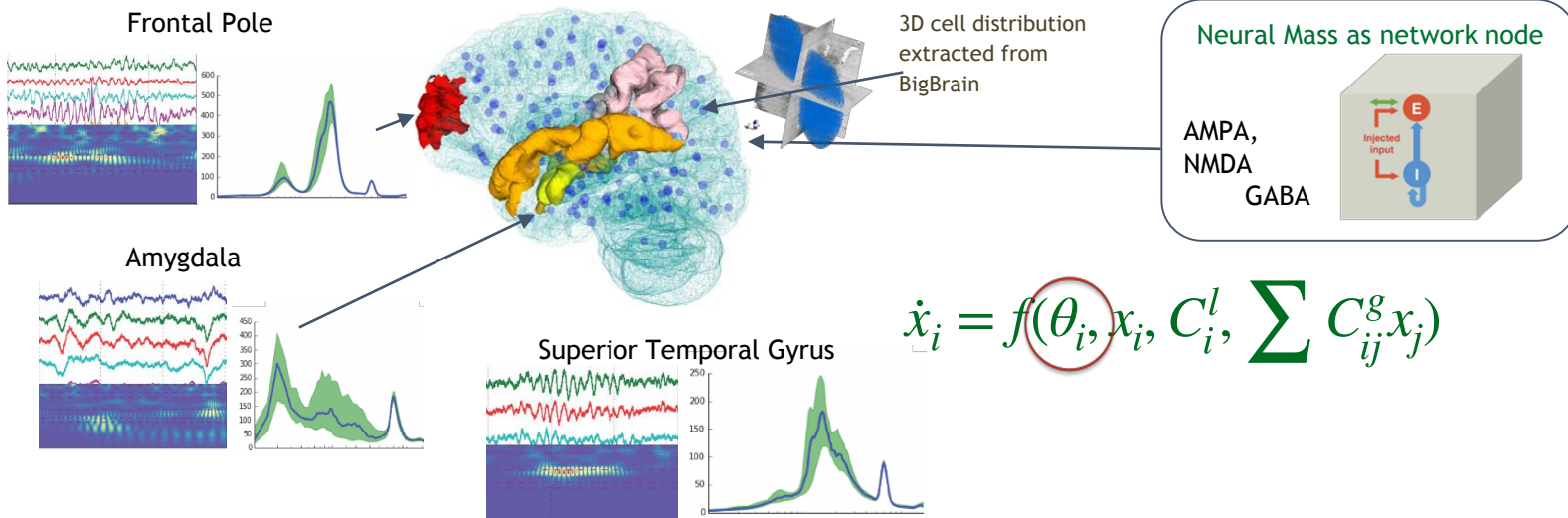
SGA2 SGA3

CDP3 WP1

April, 2020



Outline: Today's talk



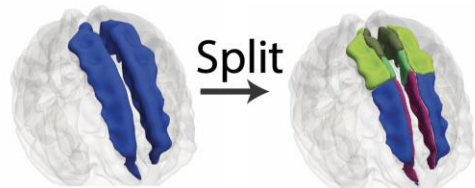
- VEP Atlas --- Anatomic and functional
- Functional regional variance :
 - Mapped upon neural mass parameters enabling TVB simulations/inference
 - Validation of anatomical region variance
- VEP pipeline --- ongoing trial to find EZ
 - VEP – region variance version: Showcases 2 of WP1 in SGA3 of HBP



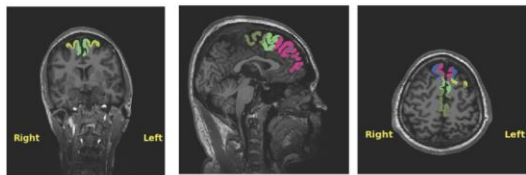
VEP anatomical Atlas



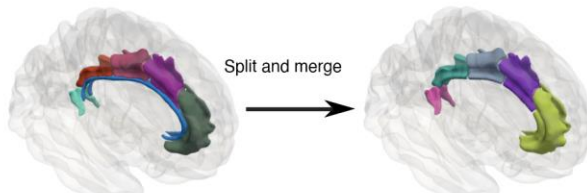
Destrieux atlas VEP atlas



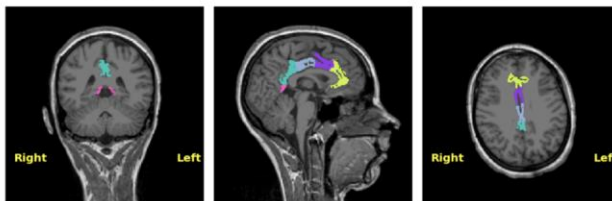
Split



Destrieux atlas VEP atlas



Split and merge



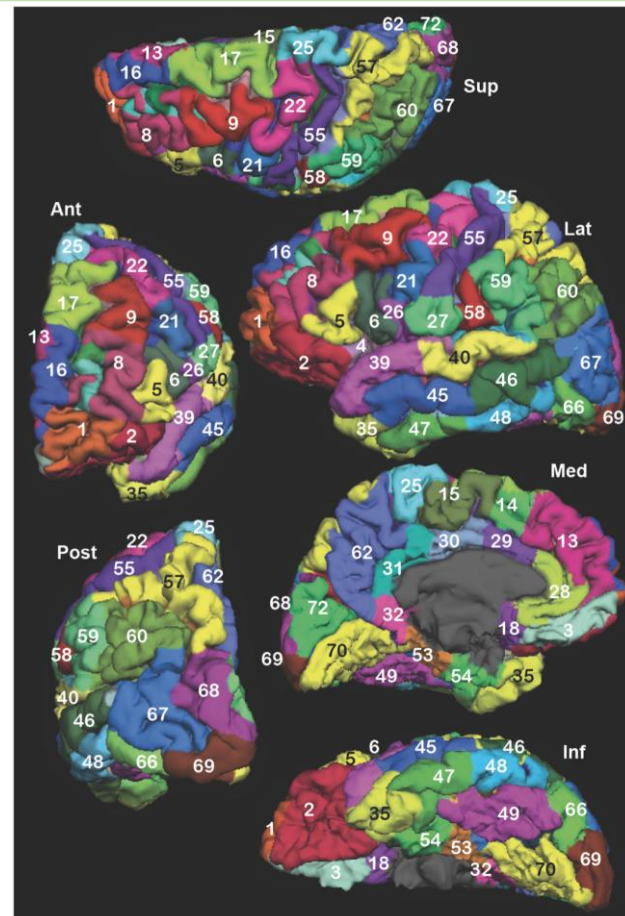
- SMA
- F1-mesial-prefrontal
- PreSMA
- F1-lateral-premotor
- F1-lateral-prefrontal

- Posterior-cingulate-cortex-retrosplenial-gyrus
- Middle-cingulate-cortex-posterior-part
- Posterior-cingulate-cortex-dorsal
- Middle-cingulate-cortex-anterior-part
- Anterior-cingulate-cortex

- Automatic labelling, personalization
(Based on Freesurfer Destrieux atlas)
- Modified to match clinical practice
- Improved the forward model
- Number of regions: 162

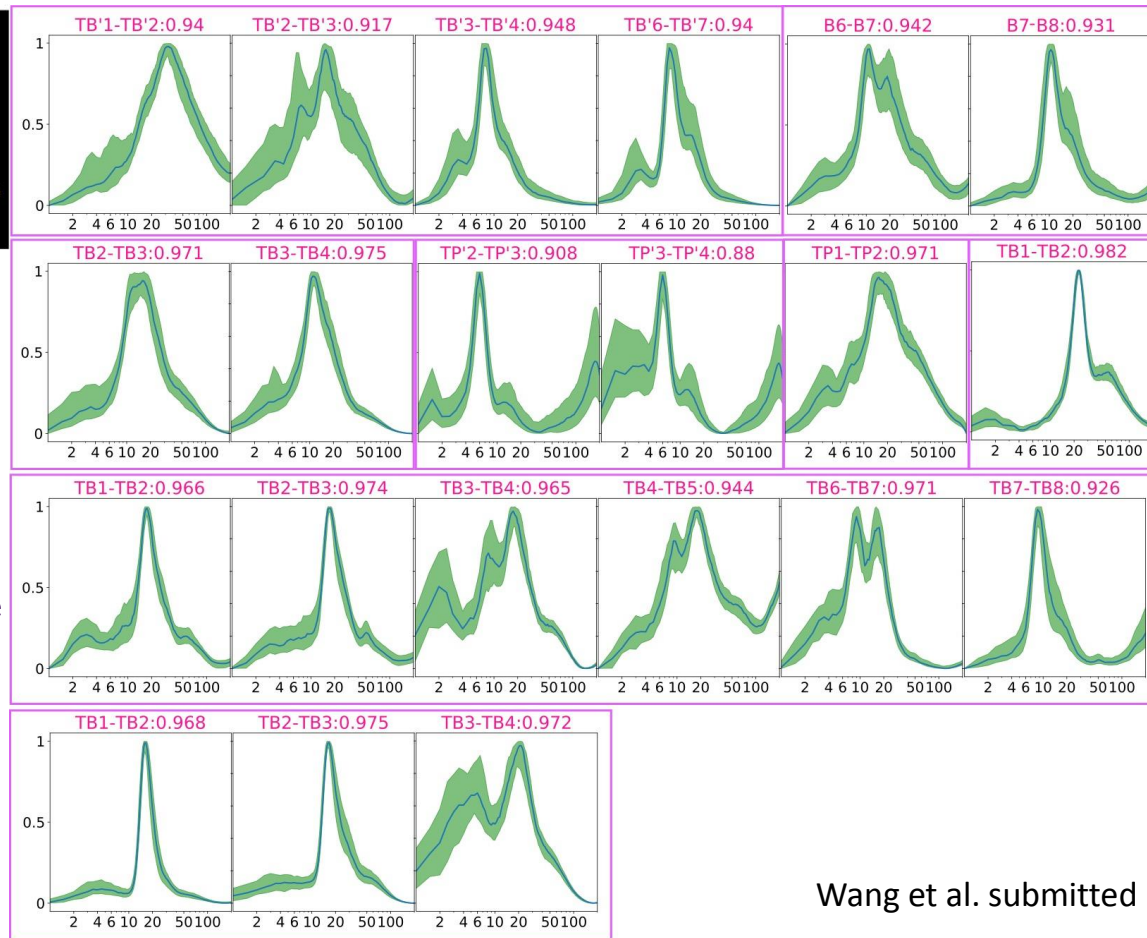
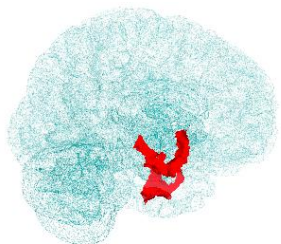
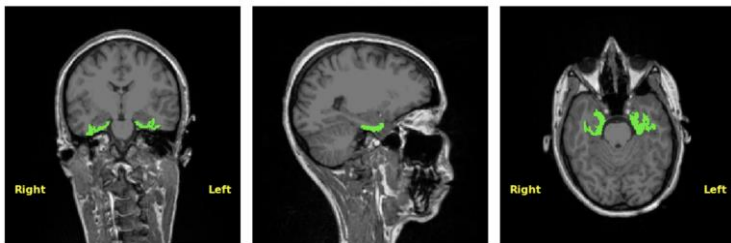
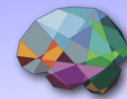
- 50 cohort patients
- 400 Trial patients
- Routine use in Marseille

Wang et al. submitted





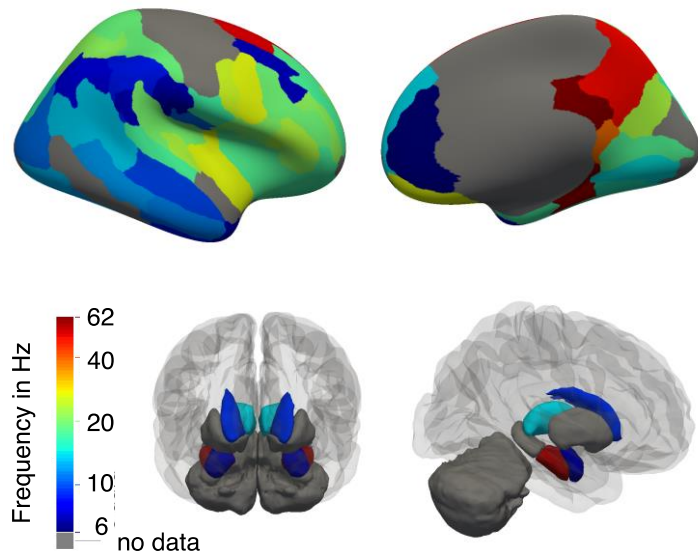
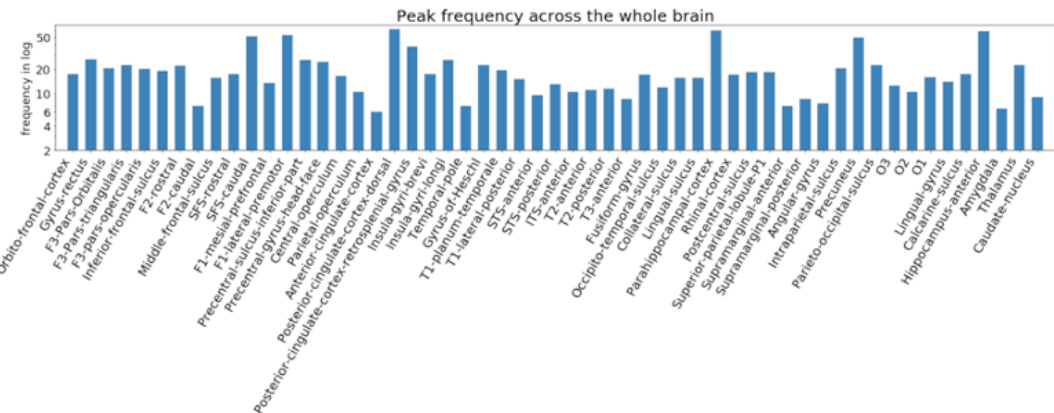
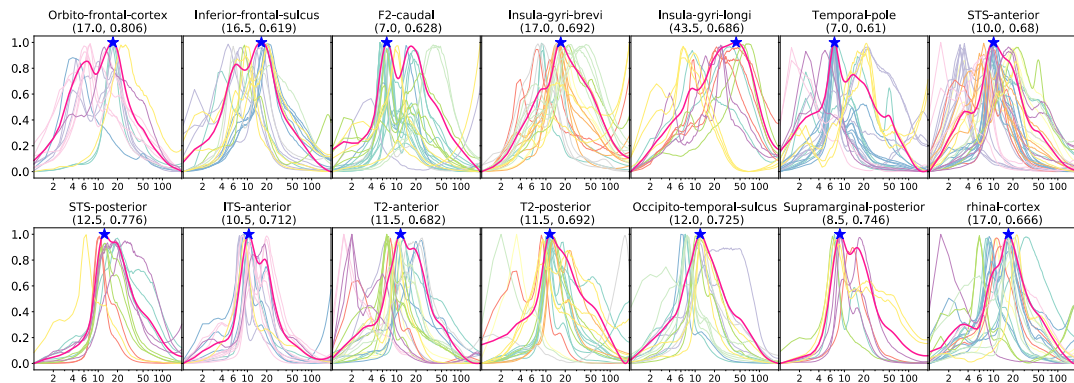
Example: Rhinal cortex



The power spectral density was stable over time
but may vary between different depths of
the same electrodes



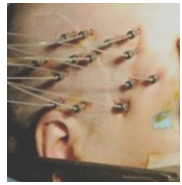
VEP functional Atlas



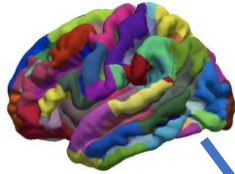
Spectral regional variation of resting state activity in SEEG



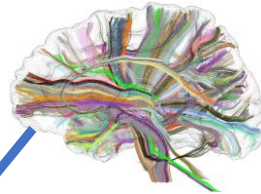
Workflow of VEP



VEP atlas

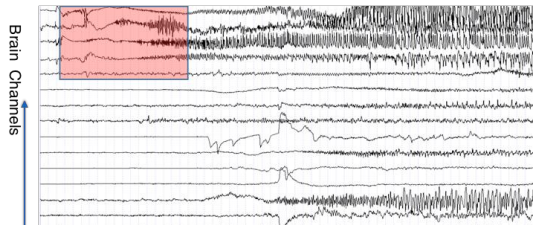


connectivity



Personalization of virtual brain model

- Individual cortical geometry
- Individual connectivity
- Links source signals to individual brain imaging signals



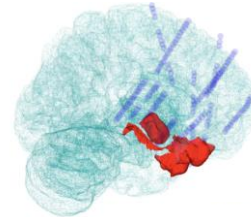
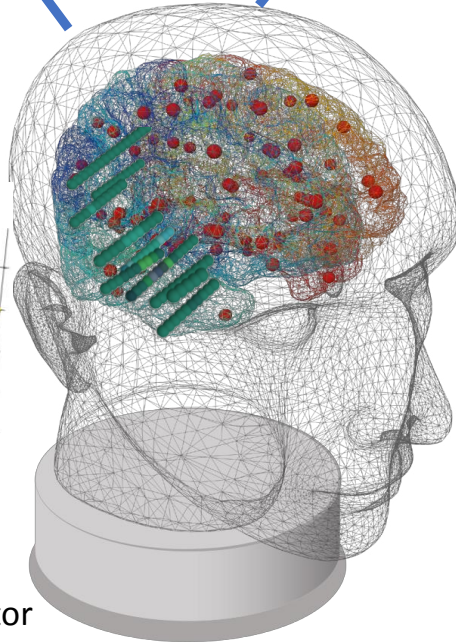
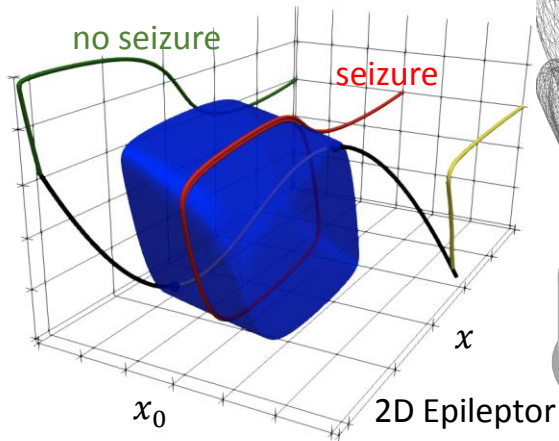
Clinical trial:

randomized parallel-group study trial
(Coordinator F. Bartolomei; Scientific Director V. Jirsa)

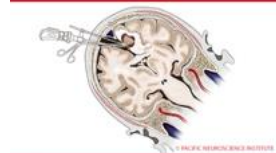


13 French clinical centers

400 prospective patients during 2019 – 2022

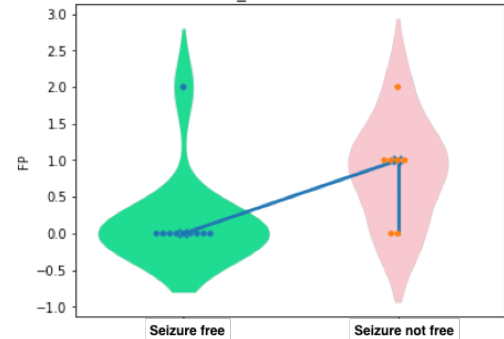


Epileptogenic zones



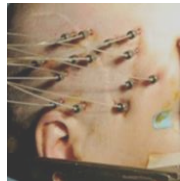
Performance Evaluation

FP values in a function of Engel class for 17 patients,
P_value is 0.01

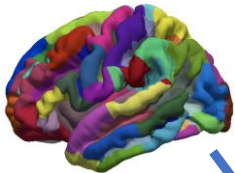




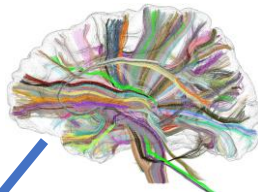
VEP : Region variance version



VEP atlas



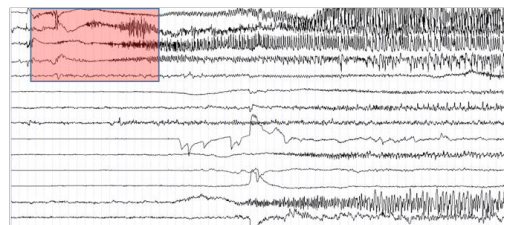
connectivity



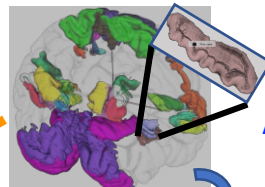
Personalization of virtual brain model

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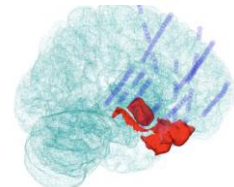
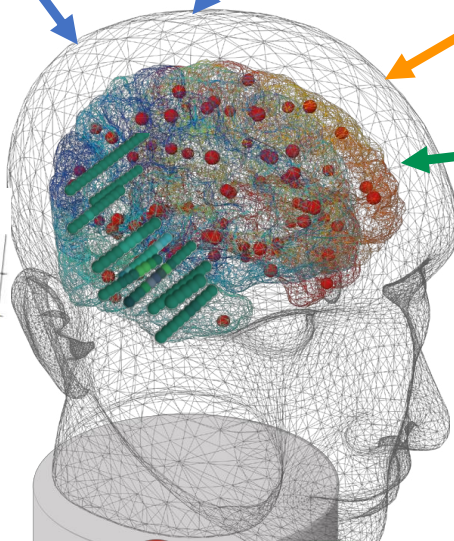
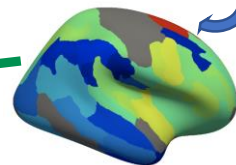
Brain Channels



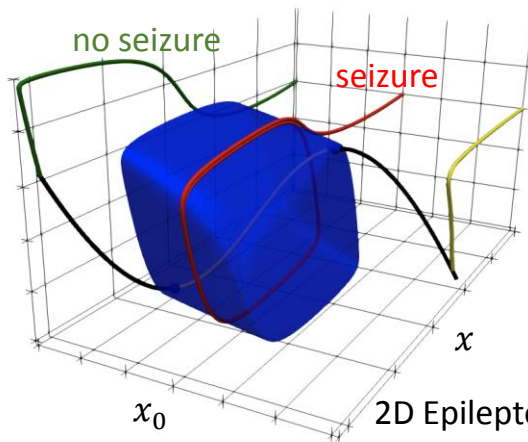
Anatomic region variance



Functional region variance



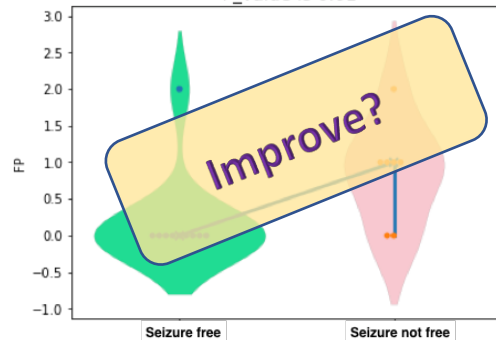
Epileptogenic zones



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Performance Evaluation

FP values in a function of Engel class for 17 patients, P_value is 0.01





THANK YOU!

Viktor Jirsa
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Julia Scholly

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Spase Petkoski
Francesca Melozzi

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Anirudh Nihalani Vattikonda
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