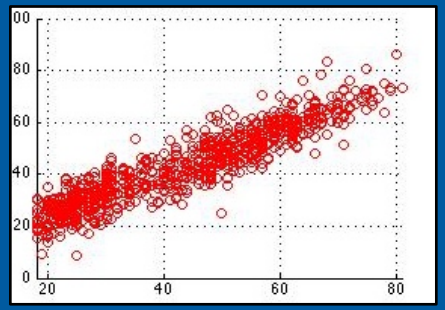
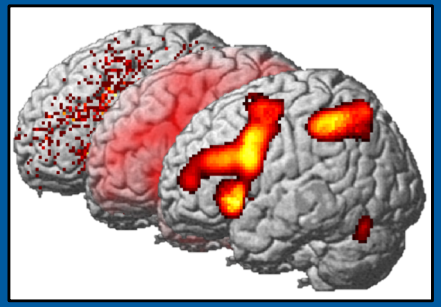
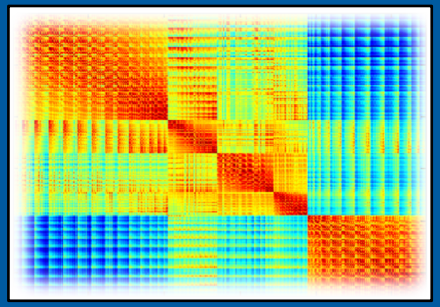
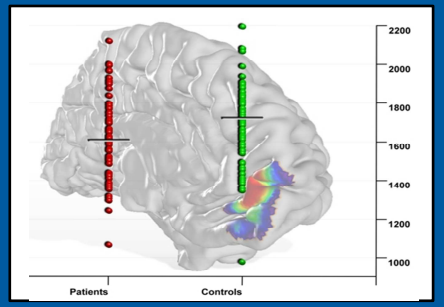
Bridging the gap: From large-scale aggregation to individual prediction

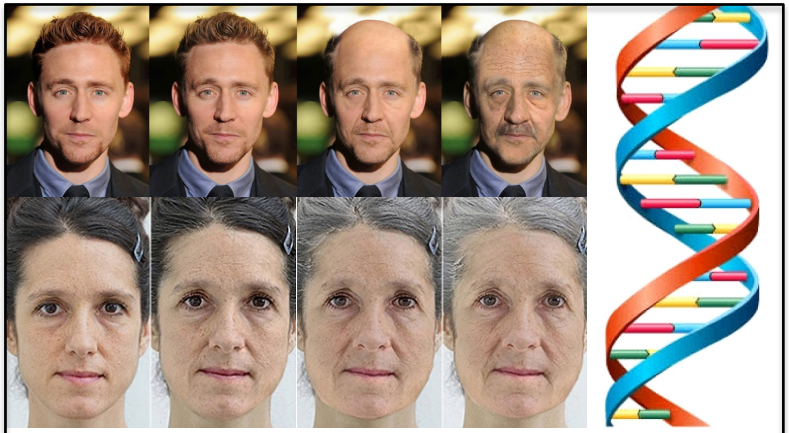
HEINRICH HEINE UNIVERSITÄT DÜSSELDORF
SYSTEMS NEUROSCIENCE



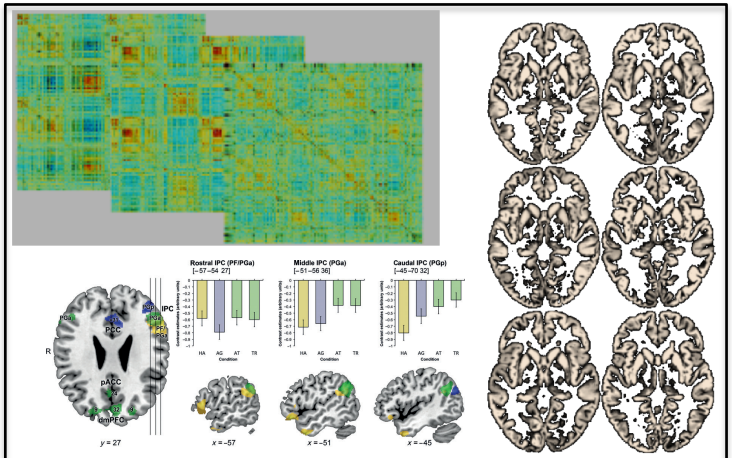




Simon B. Eickhoff
INM-7, Brain & Behaviour
Systems Neuroscience, HHU Düsseldorf

JÜLICH Forschungszentrum



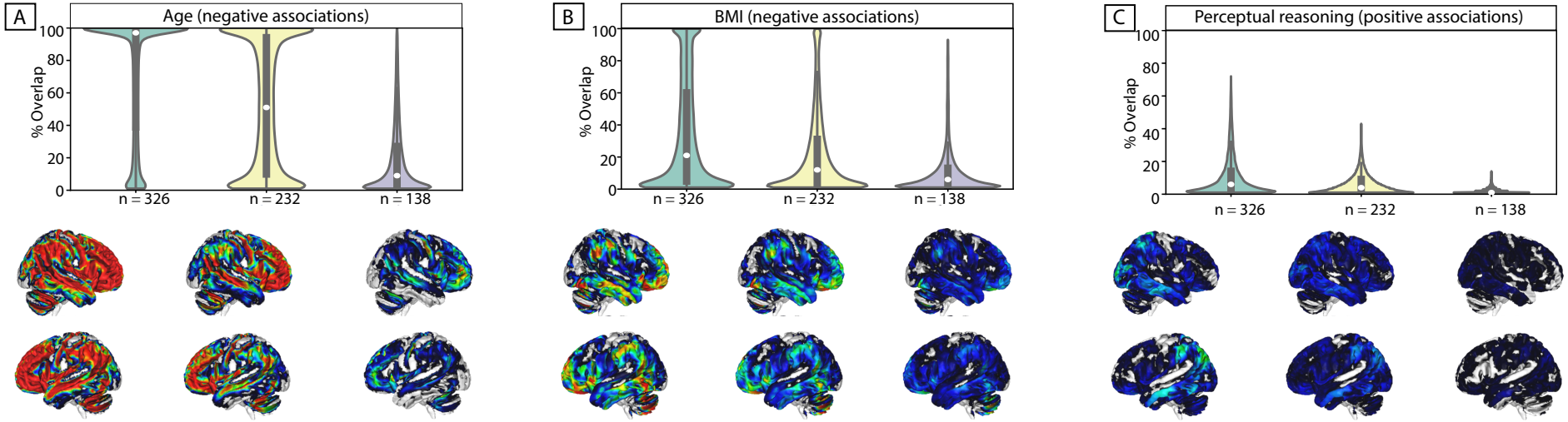
Experience, Health, Lifestyle ...



Structure, Function, Connectivity

Cognitive performance, socio-affective functions, (psycho-) pathology

Brain-phenotype association need large samples

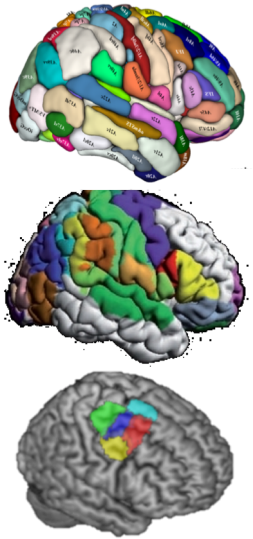


Clear gradient of replicability across phenotypes

Previous studies for cognitive traits likely underpowered

Kharabian et al., submitted

Atlases and Parcellations



Prior knowledge on brain organization

Imaging
Behaviour
Genetics

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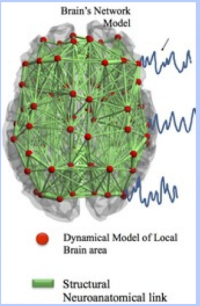
NAKO GESUNDHEITS-STUDIE

Standardized Processing Pipelines

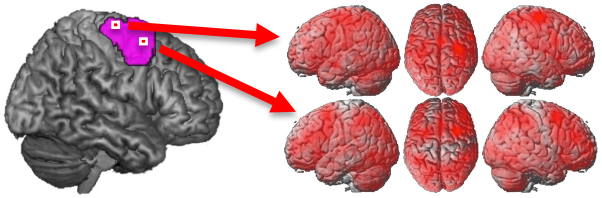
HBP Human Brain Project

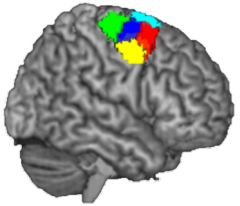


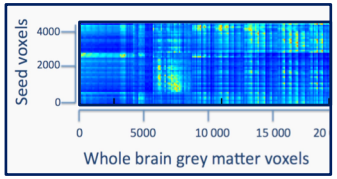
High-throughput analytics & Simulation

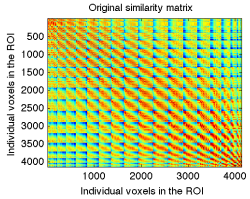
Machine-learning of variability & brain-behaviour relations in health and disease

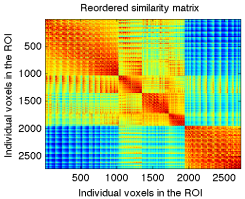
Mapping brain areas across scales and features

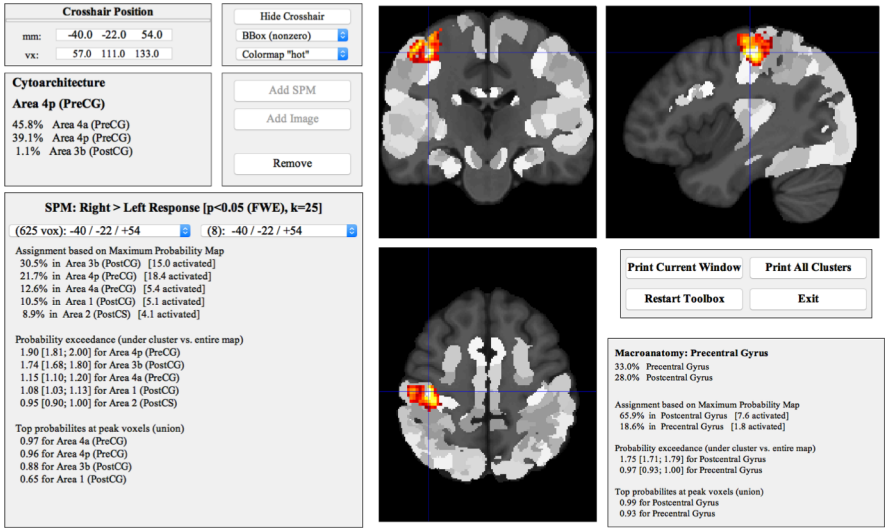


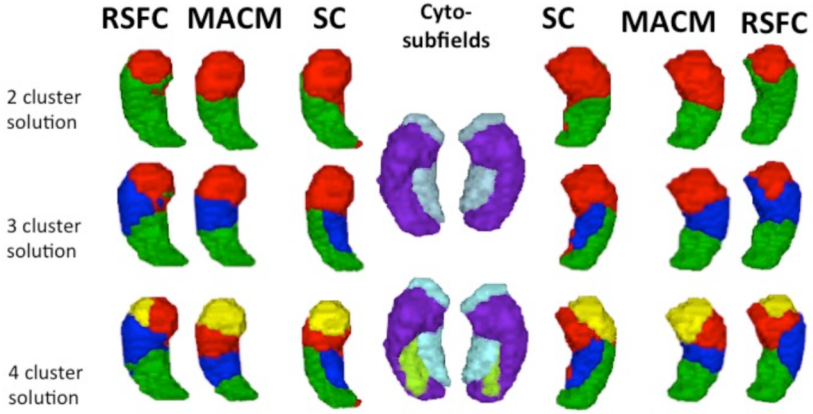






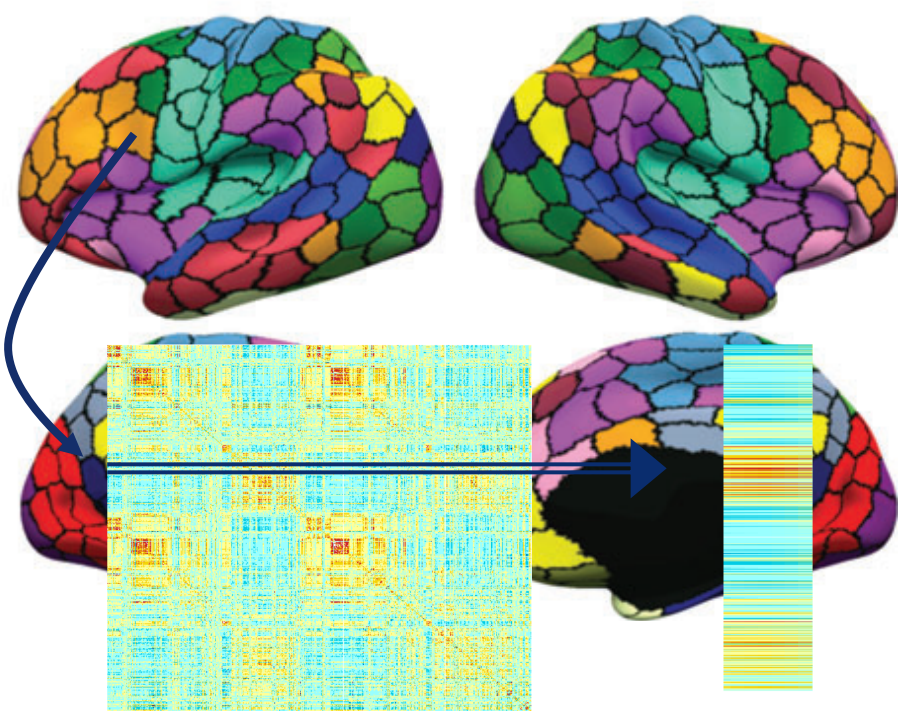


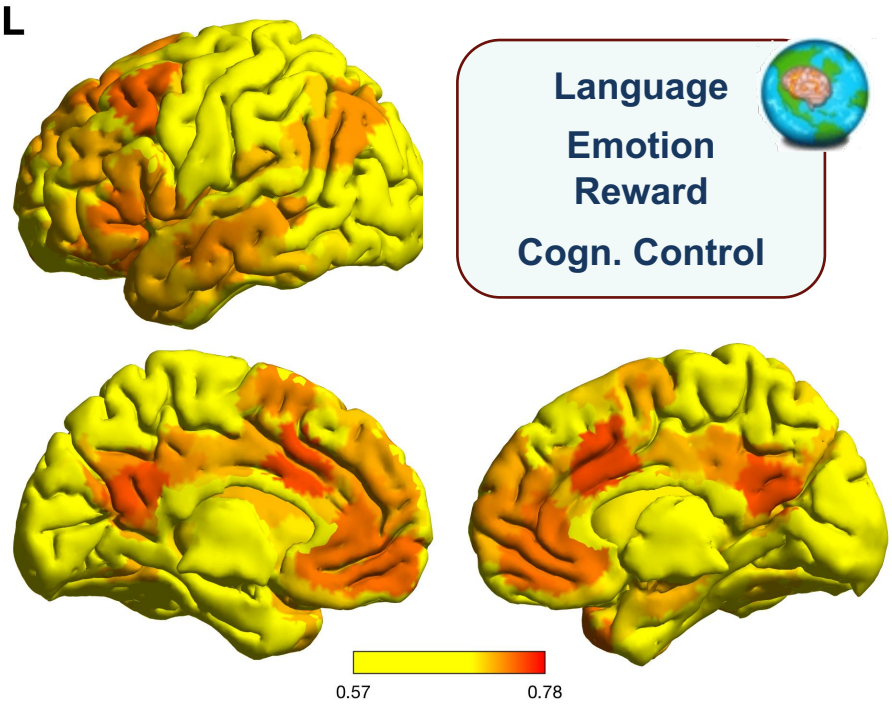




Eickhoff et al., Nat Rev Neurosci 2018, Neuroimage 2017

Mapping fingerprint – phenotype relationships

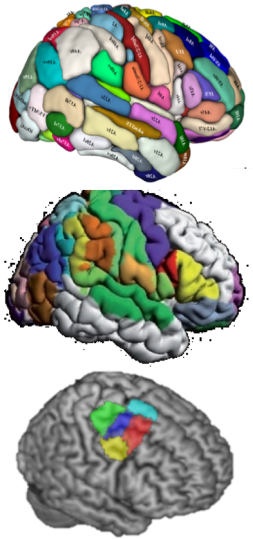




Can we accurately predict sex of a new subject from region-wise FC profiles?
(SVM, nested optimization, between-sample prediction, N=434 / 310)

Weis et al., submitted

Atlases and Parcellations



Imaging Behaviour Genetics

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brainmap.org

ANIMA

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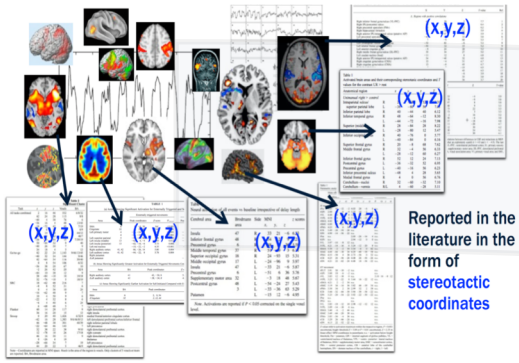
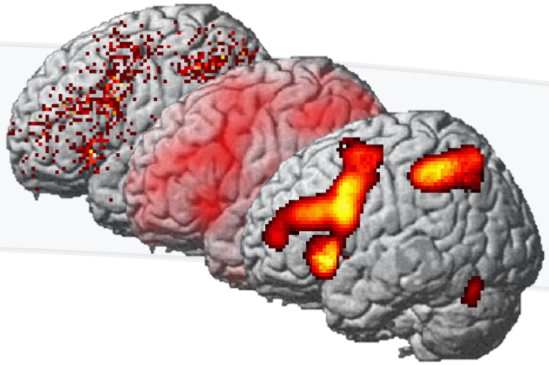
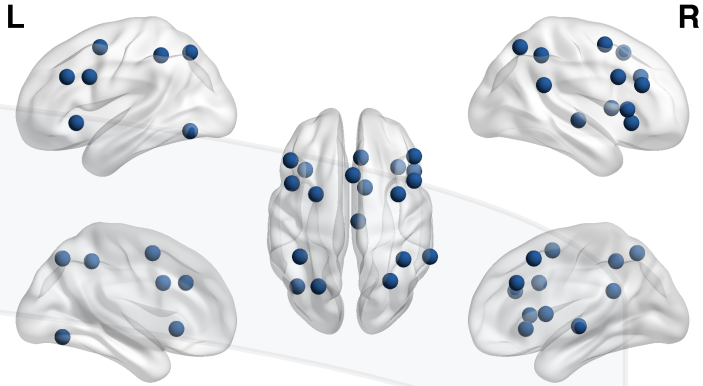
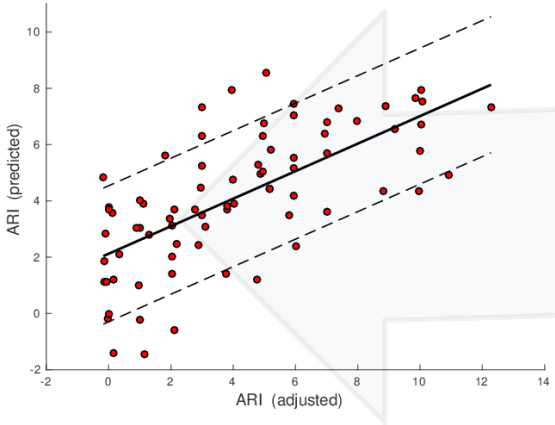
Meta-Analyses: Priors for individual prediction

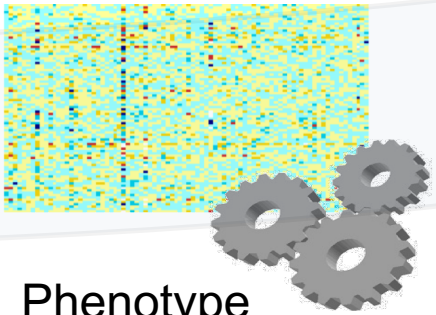




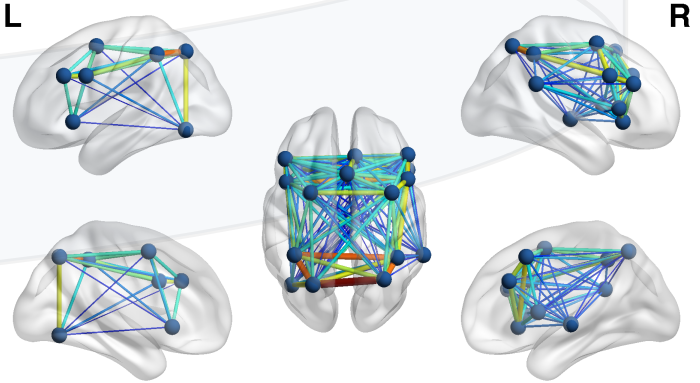




Connectivity

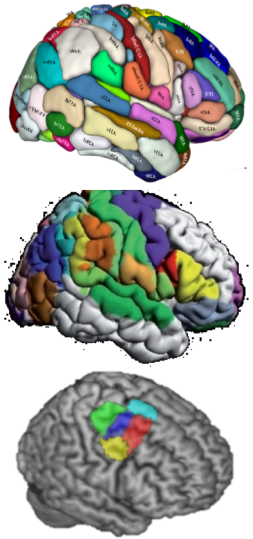


Phenotype



Nostro et al., 2018, Pläschke et al., 2017, cf. Schilbach et al., 2014

Atlases and Parcellations



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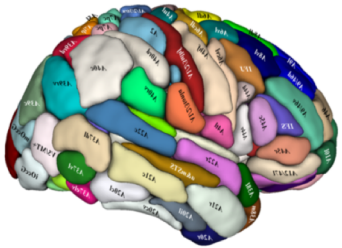
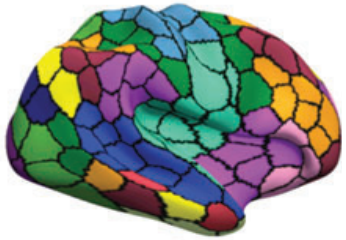
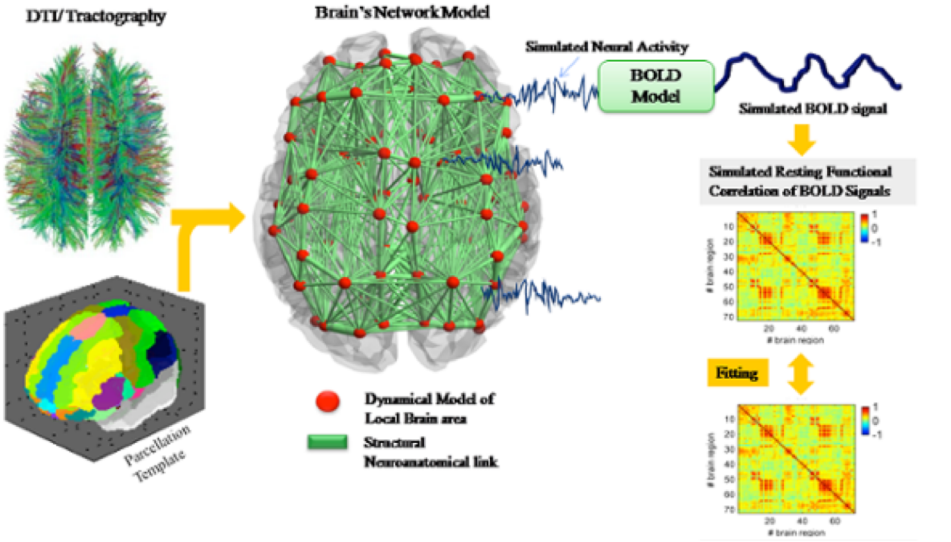
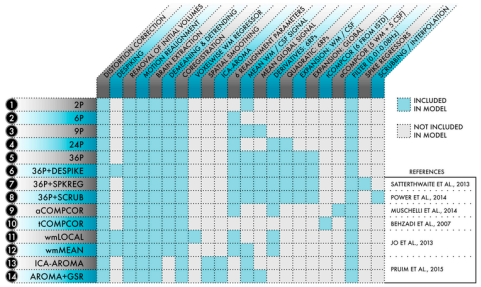
Mesoscopic modelling of whole-brain dynamics



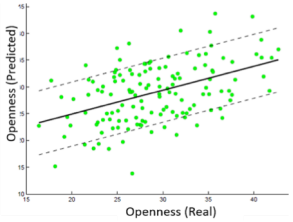


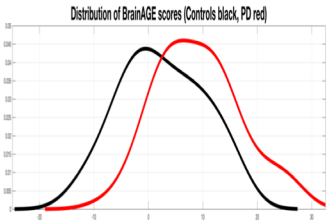
Evaluation of parcellations and granularities



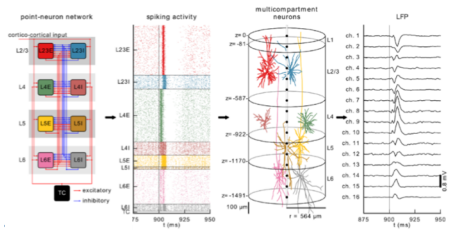


Comparison of pre-processing pipelines





Dynamic features of variability



Bridging the scales

NIH
DFG
HBP
HORIZON 2020
Helmholtz Portfolio Theme SMHB Supercomputing and Modeling for the Human Brain
国家留学基金管理委员会 CHINA SCHOLARSHIP COUNCIL

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