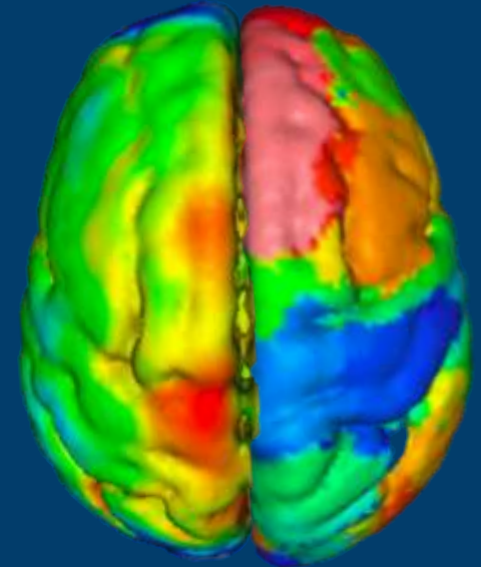
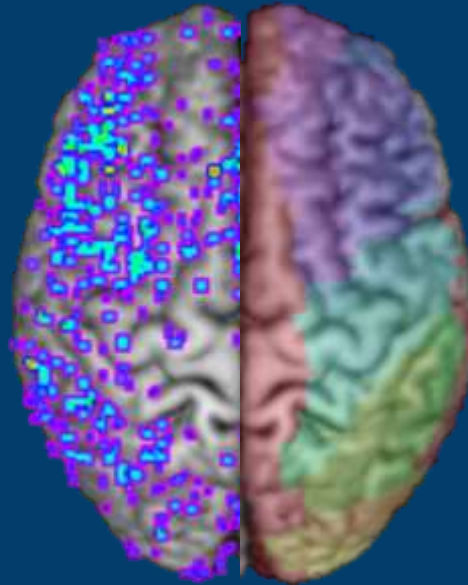
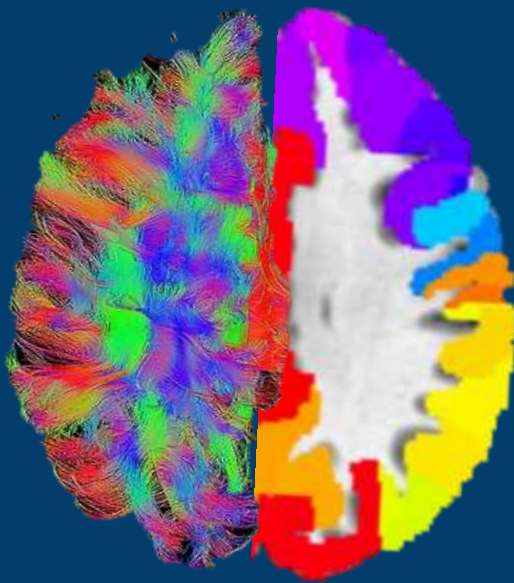


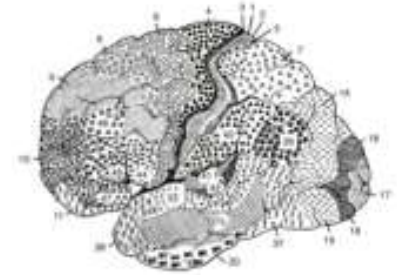
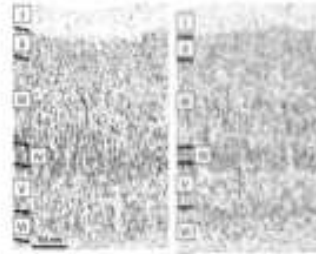
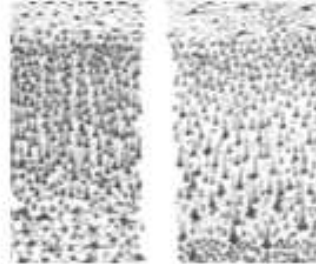
Introduction to brain parcellation



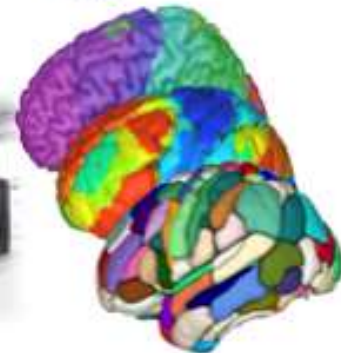
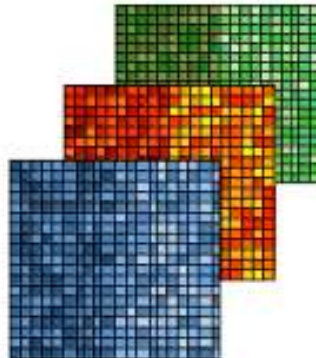
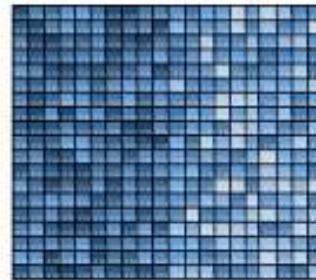
Sarah Genon
Cognitive Neuroinformatics Lab


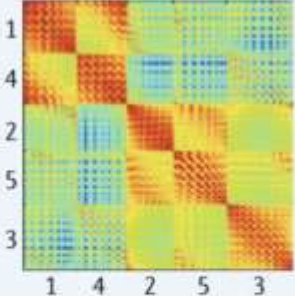
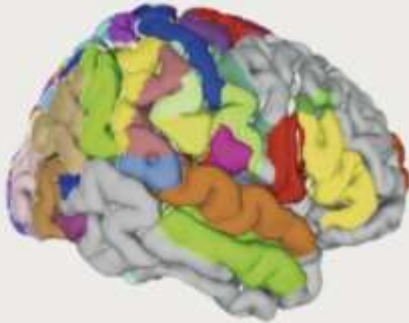
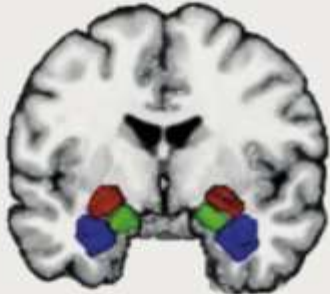
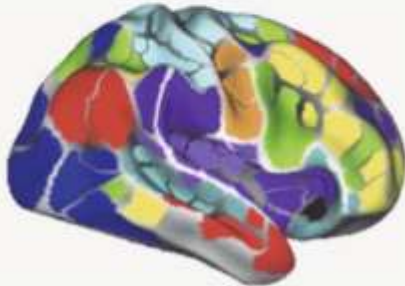
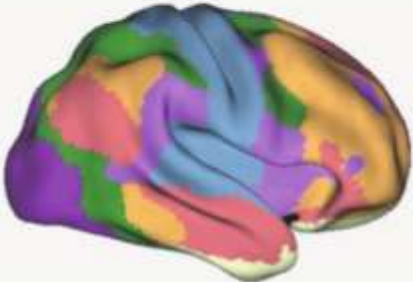
Brain parcellation

From histology



To multimodal
MRI



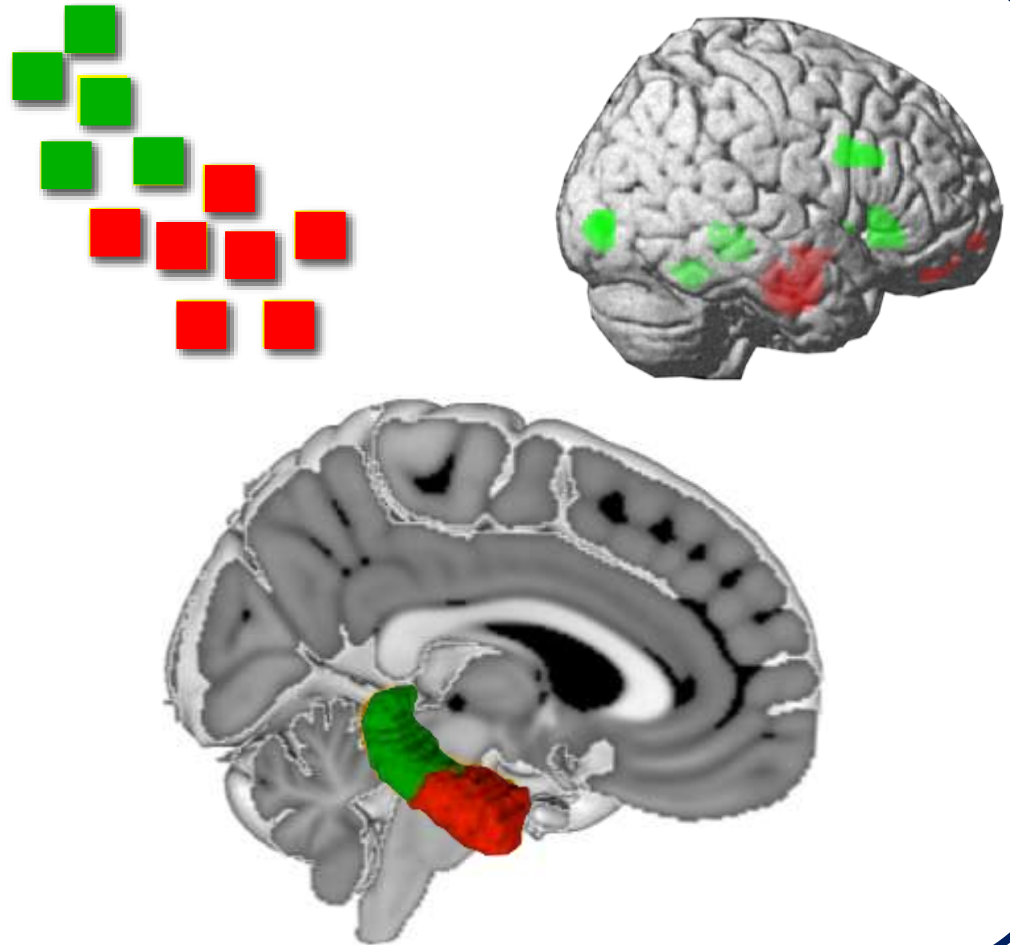
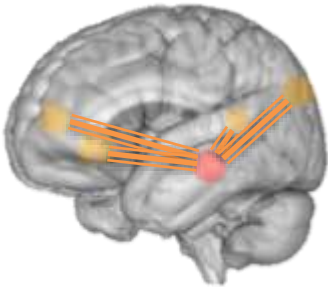
| <p>Algorithm</p> <p>Markers</p> | <p>Boundary mapping</p>  | <p>Clustering or factorization</p>  |
|--|--|---|
| <p>Local</p> <p>Histology-based:</p> <ul style="list-style-type: none"> • Cytoarchitecture • Receptors • Myelin <p>MRI-based:</p> <ul style="list-style-type: none"> • Myelin • Meta-analytic activation modelling | <p>Border detection in cortex based on cytoarchitecture</p>  | <p>Clustering of amygdala voxels based on their activation in behavioural paradigms</p>  |
| <p>Global</p> <p>MRI-based:</p> <ul style="list-style-type: none"> • Resting-state functional connectivity • Meta-analytic connectivity modelling • Diffusion tractography • Structural covariance | <p>Boundary mapping of resting-state functional connectivity of cerebral cortex</p>  | <p>Clustering of cerebral cortex based on resting-state functional connectivity</p>  |

Connectivity-based parcellation (CBP)

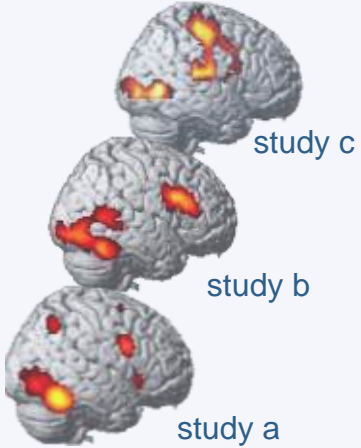
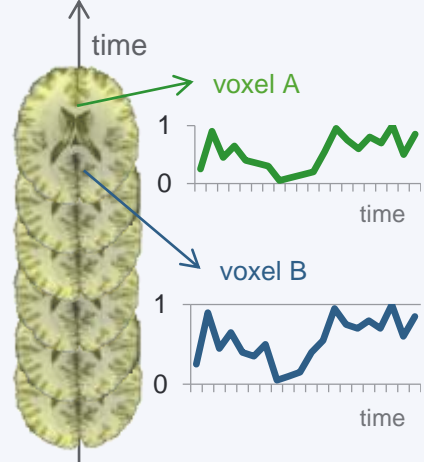
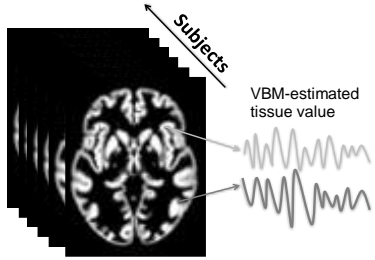
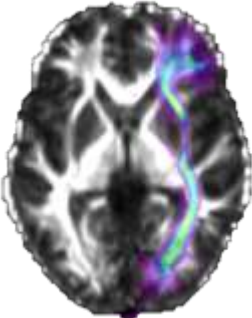
Neuroimaging scanner



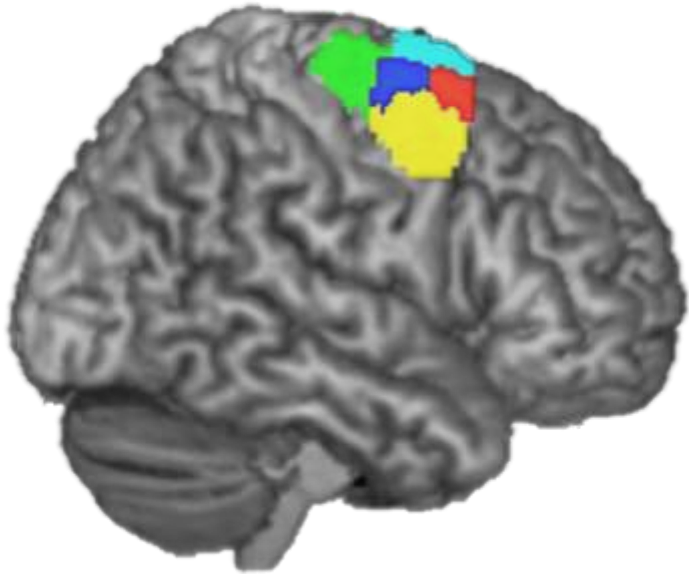
Connectivity



How to estimate connectivity ?

| Type of connectivity | Functional | | Co-plasticity | Structural (white matter) |
|----------------------|--|---|--|--|
| Data | Task-based fMRI | Resting state fMRI | Anatomical MRI | Diffusion MRI |
| Approach | Task-based: Activation during task | Resting-state: Signal fluctuations at rest | Morphometry-based: Structural co-variation in the population | Diffusion-based: Estimation of fiber direction |
| Main method | Meta-Analytic Connectivity Modeling (MACM) | Cross-timepoint correlation in signal fluctuations (RSFC) | Correlation of local GM across subjects (SC) | Probabilistic diffusion tractography (PDT) |
| |  |  |  |  |

CBP: how ?

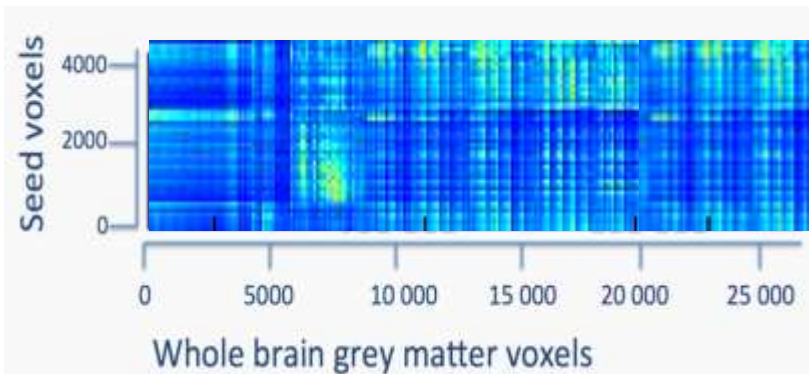


1) Region of Interest:

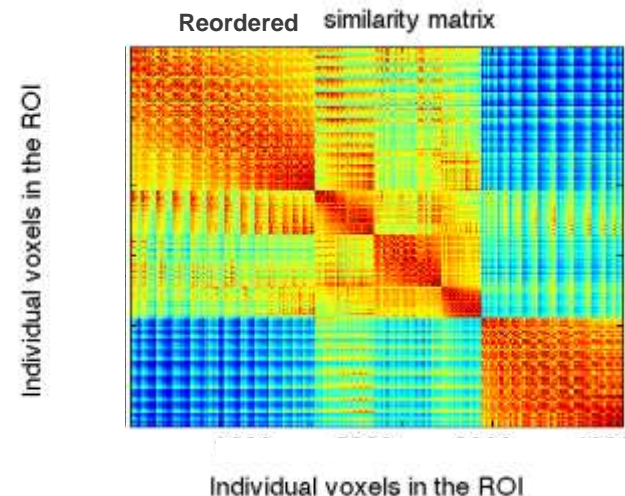
Dorsal Premotor Cortex:

Interface between prefrontal and primary motor

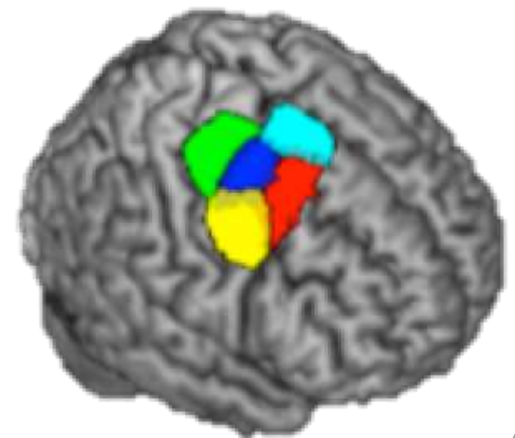
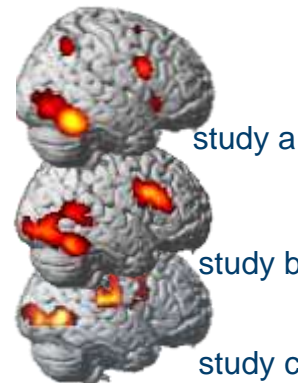
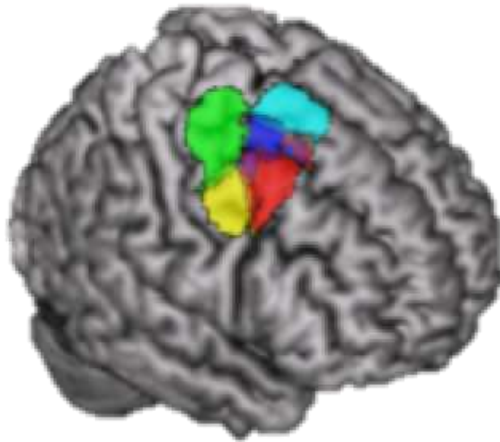
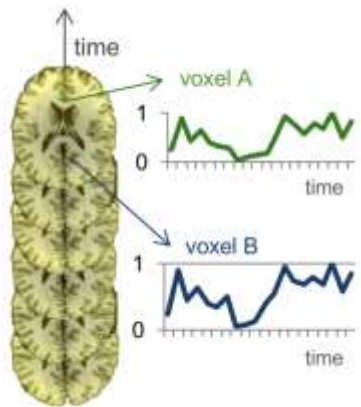
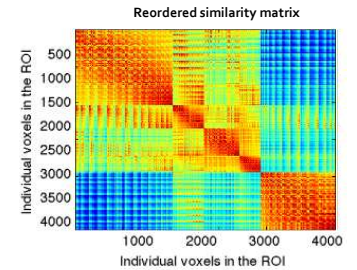
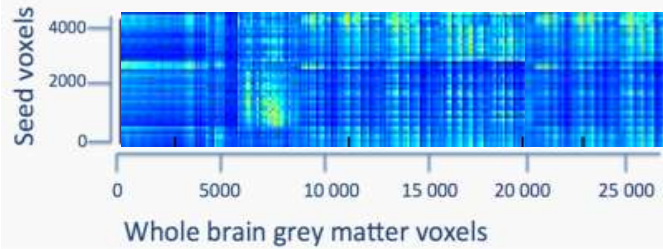
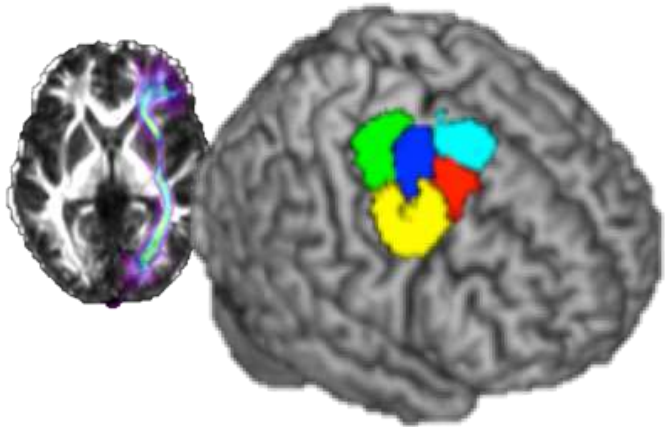
2) Connectivity matrix



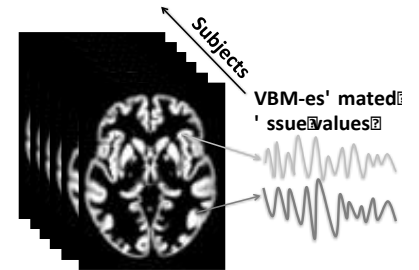
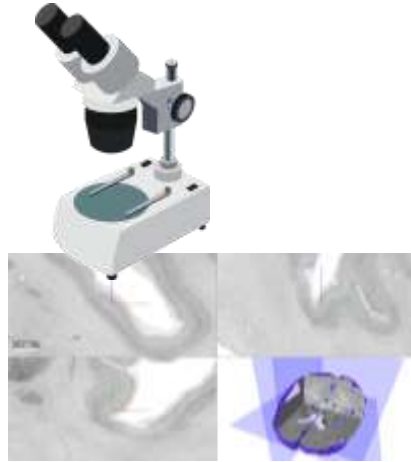
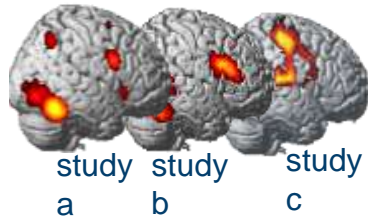
3) Clustering/factorization



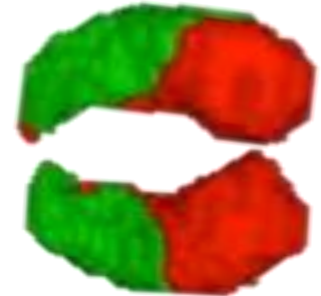
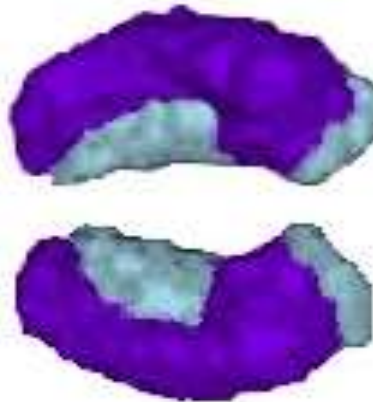
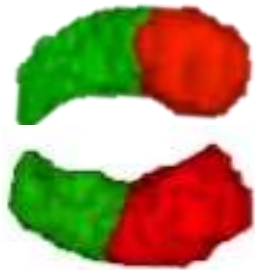
Convergence between connectivity modalities



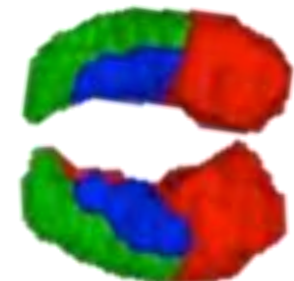
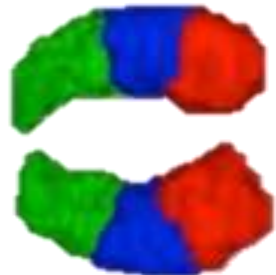
Local microstructure and large-scale functional integration



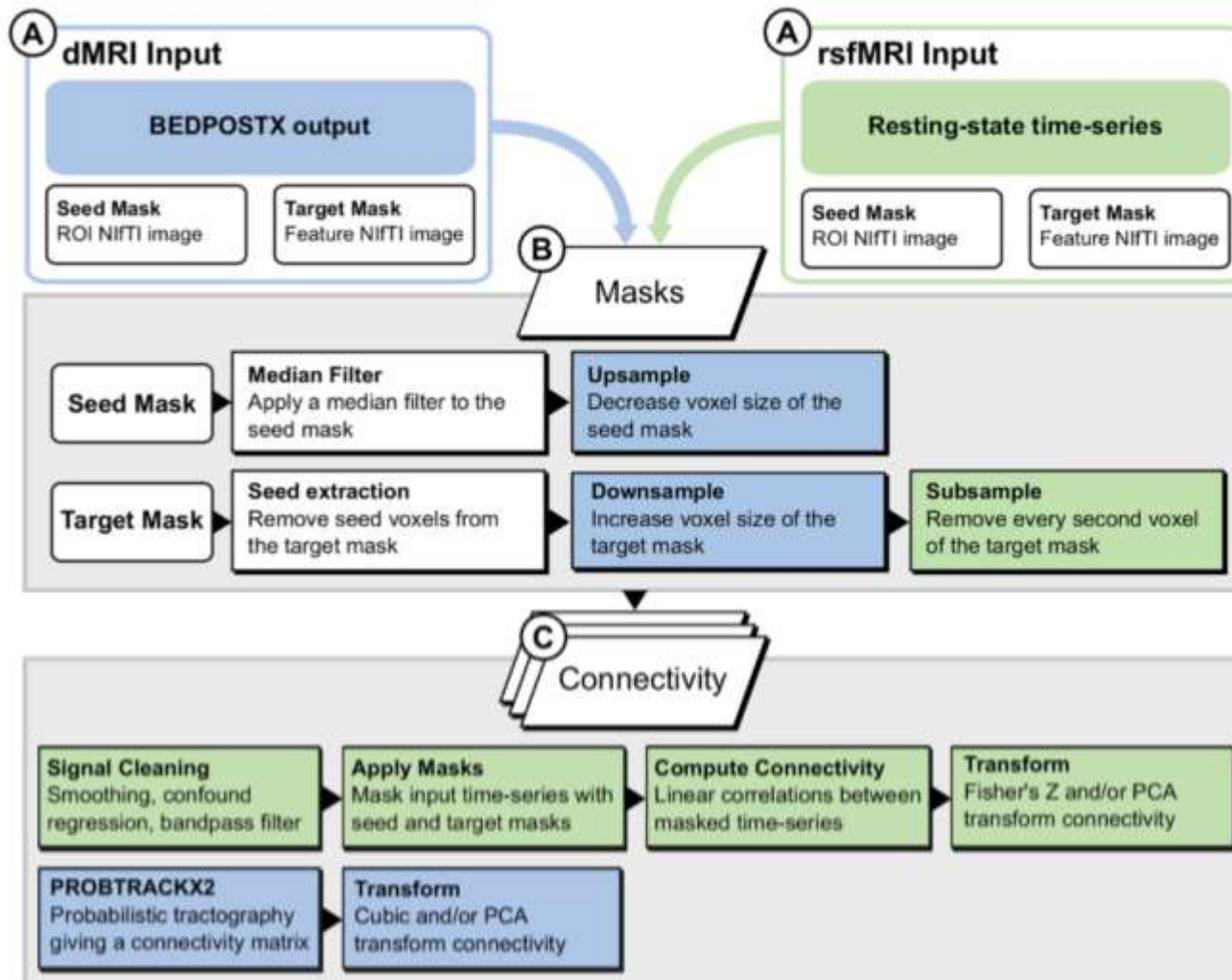
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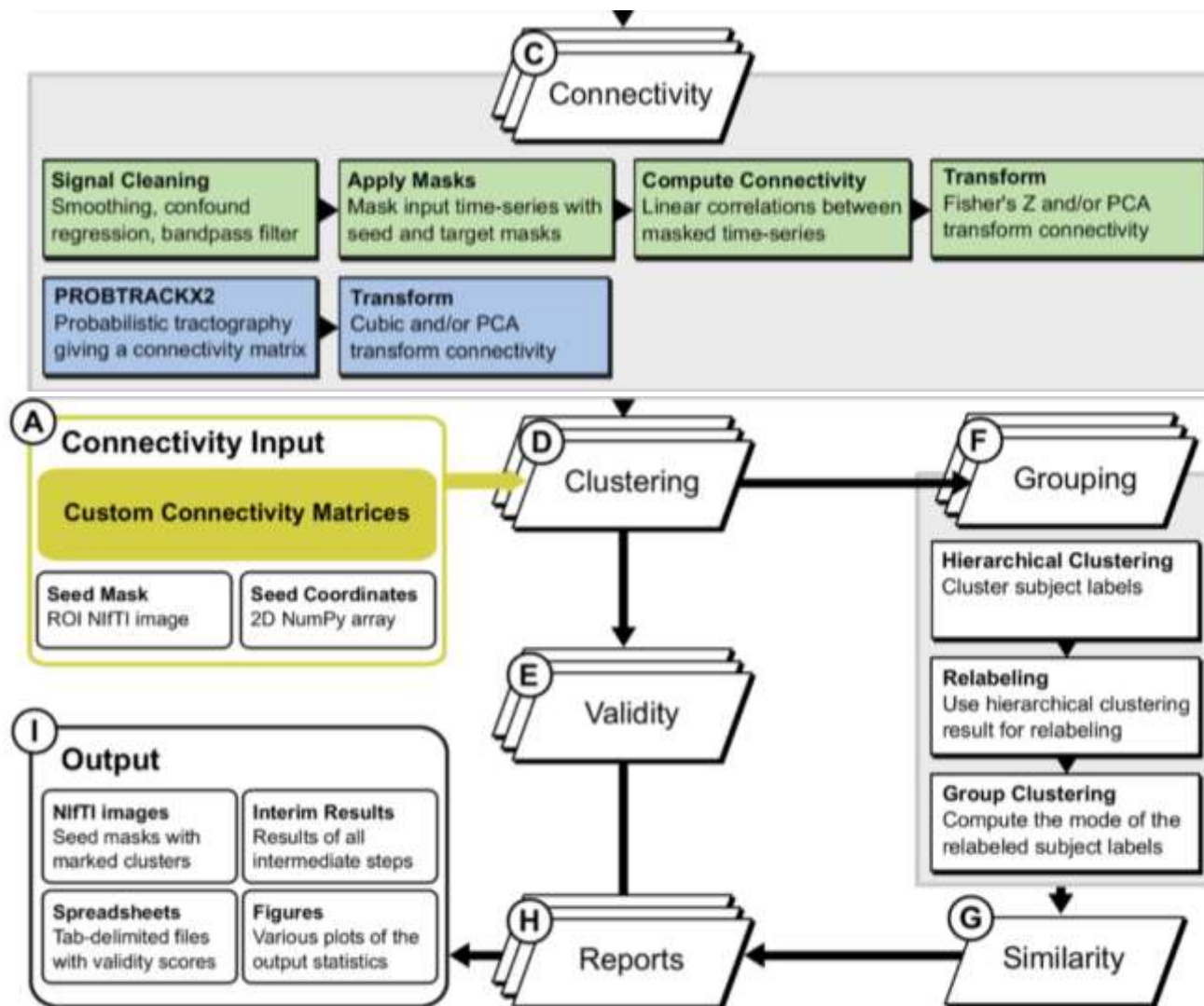
3k



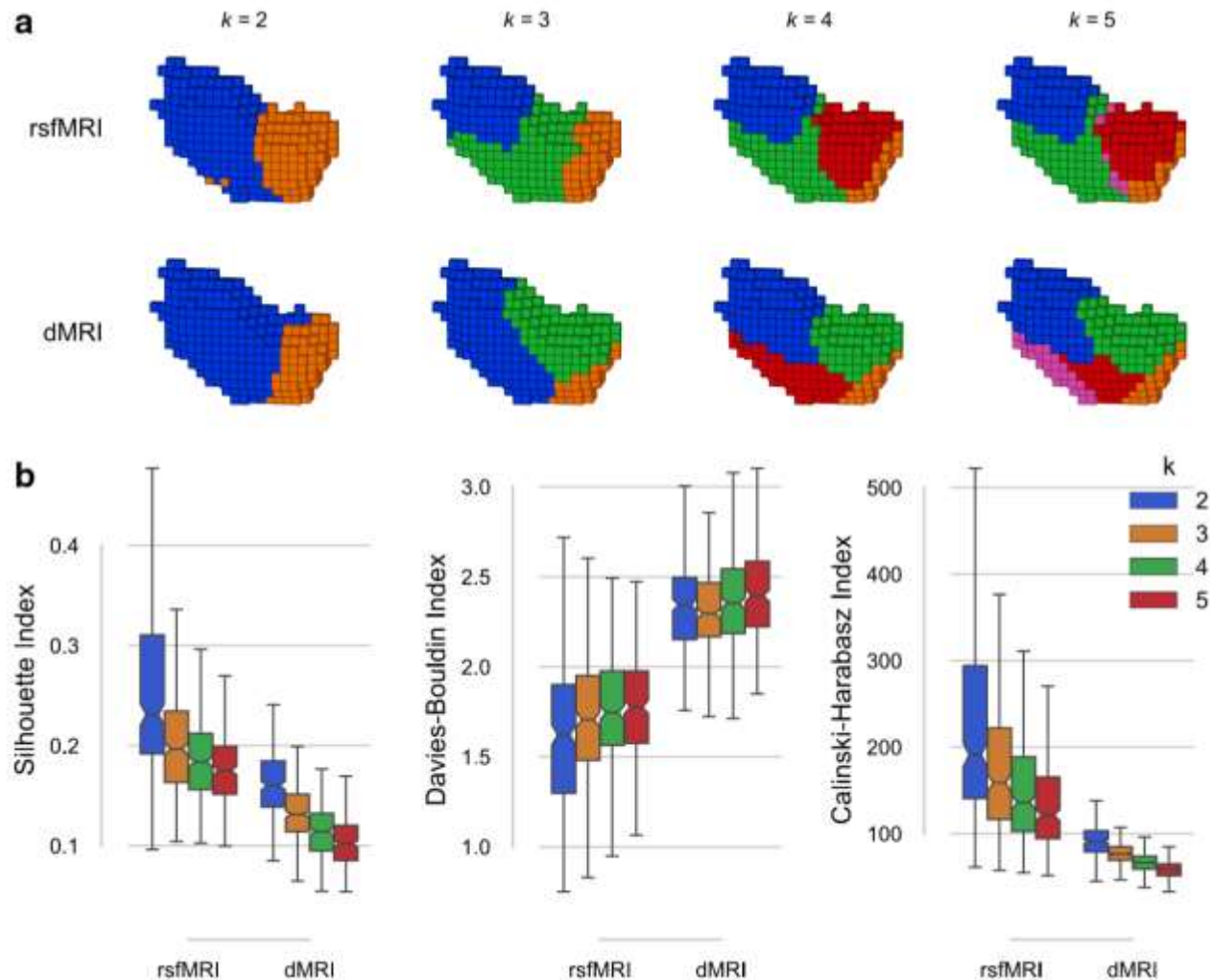
CBPtool for different connectivity modalities:



CBPtool for different connectivity modalities:



CBPtool for different connectivity modalities:



Take home messages

Brain parcellation

= a very wide **set of methods** to identify brain regions and/or networks

From histology to MRI-based connectivity

To **understand** and/or to **represent** brain organization and data

Convergence and divergence between mapping features

Resource for CBP:

CBPtool, user-friendly and flexible pipeline for connectivity-based parcellation <https://github.com/inm7/cbptools>

THANK YOU

Cognitive Neuroinformatics Lab



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Düsseldorf

Katrin Amunts

WashU

Aris Sotiras

CASIA Beijing

Lingzhong Fan

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