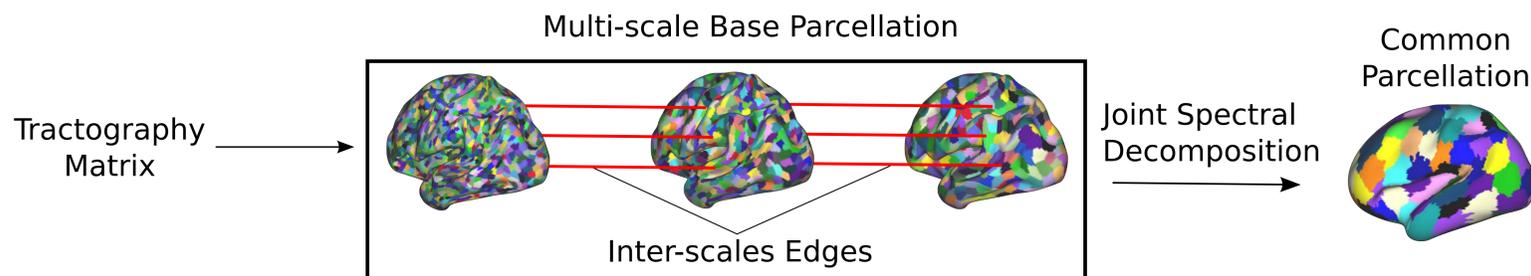


Overview



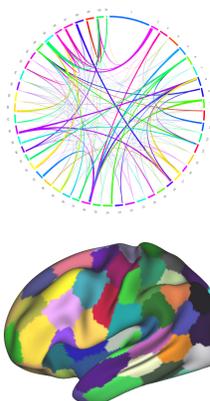
Introduction

Context

- Brain connectivity studies can provide key insight into the brain's organisation.
- Parcellation of the cortical surface is essential for the construction of connectivity networks.

Highlights

- Whole cortex parcellation method.
- Captures multi-scale information through a spectral clustering formulation.
- Extension to groupwise parcellation is straightforward.
- Application to tractography-driven parcellation.



Joint Spectral Decomposition

We seek to obtain a **common parcellation** across the different supervertex parcellations.

Inter-scales Edges

- Connect two supervertices if they share vertices on the original mesh.
- Strength of connection: amount of overlap.

Spectral Decomposition [5]

- Inter-scales edges are embedded in a constraint matrix.
- Global affinity matrix: block matrix of all scales' merged affinity matrices.
- Spectral Decomposition of the global matrix subject to the inter-scales constraints.

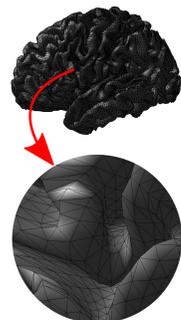
Database

Data

- Human Connectome Project database [1].
- Cortical surface represented as a 32k vertices mesh.

Tractography matrix

- Obtained from FSL's bedpostX and probtrackX [2].
- Matrix Row describes how a vertex is connected to the rest of the cortical surface: **Connectivity profile**.
- Affinity between vertices: Pearson's correlation between connectivity profiles.



Multi-scale Base Parcellation

Supervertex Parcellation

- Capture local connectivity boundaries at different resolutions.
- High resolution parcellations where the vertices in each parcel or **supervertex** are very correlated.
- Similar to the SLIC superpixels approach [3].

Iterative approach

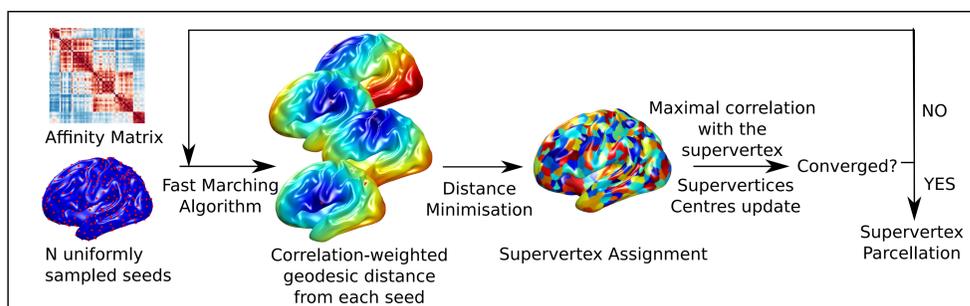
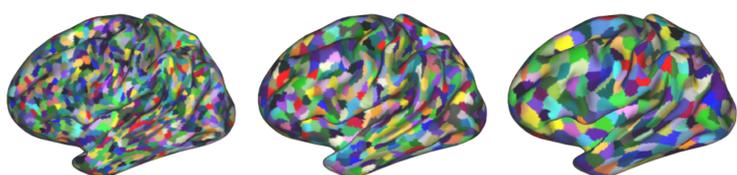


Figure 1: Convergence of a base parcellation scale. Evolution of the number of seeds reevaluated (left) and the average correlation within a supervertex (right).



Figure 2: Example of a multi-scale base parcellation: from left to right 2000, 1000 and 500 supervertices.



Results

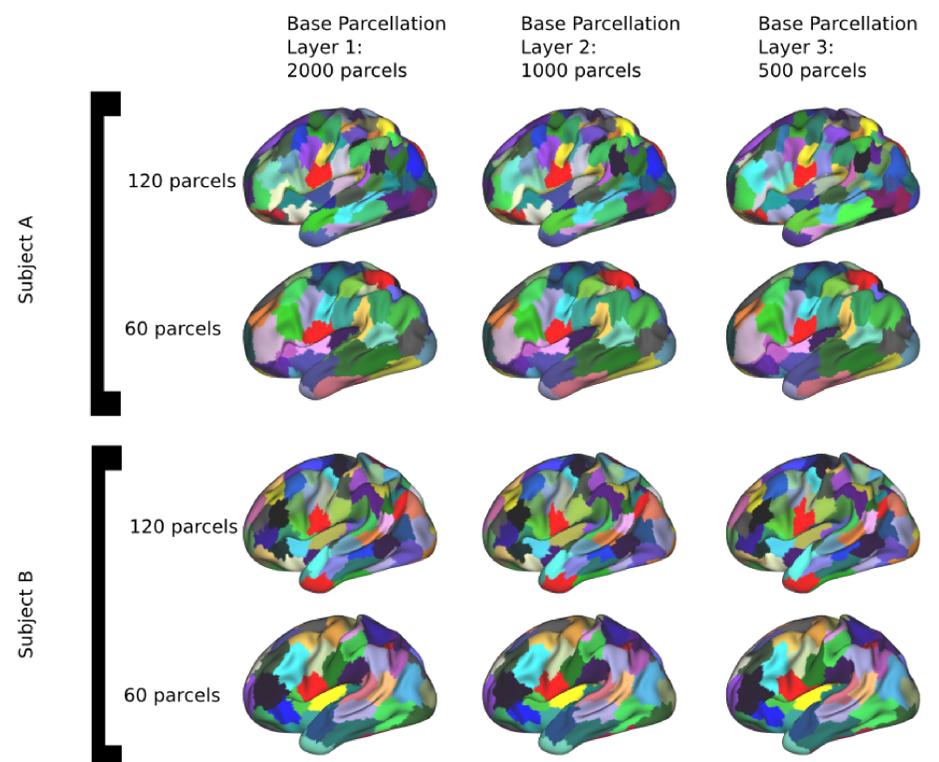


Figure 3: Parcellation results for two different subjects and the three different base parcellation scales.

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