



Uncovering the asymmetry of common temporal lobe folding variants

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1. Summary

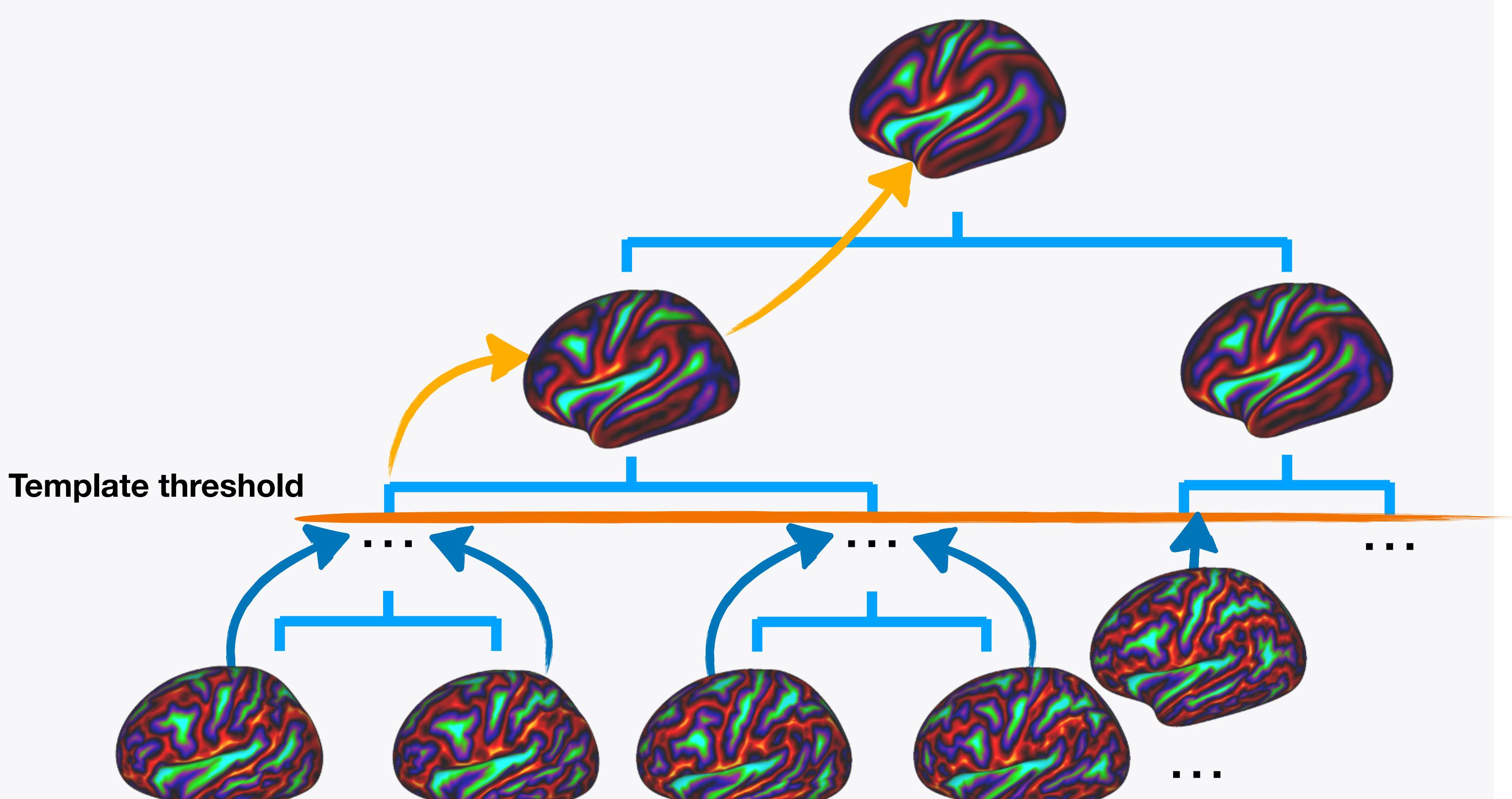
- Hierarchical registration reveals that the temporal lobe has greater cortical folding asymmetry than the rest of the brain, which may play a crucial role in functions such as language processing.

2. Motivation

- The temporal lobe is an asymmetric structure with a leftward bias *on average*.
- However, actual asymmetry is often obscured by the large natural cortical folding variability.

3. Method

- A hierarchical surface registration framework (MSM-HT) [1] is applied to 1110 subjects from the Young Adult HCP to parse temporal lobe anatomical variability into discrete variants, providing a family of folding templates.



- The asymmetry of these variants is quantified by the proportion of left hemisphere examples in each template, and compared with other lobes.
- Surface area of the temporal region, normalised by the total ipsilateral hemispheric surface area, is compared between leftward- and rightward-asymmetric folding variants.

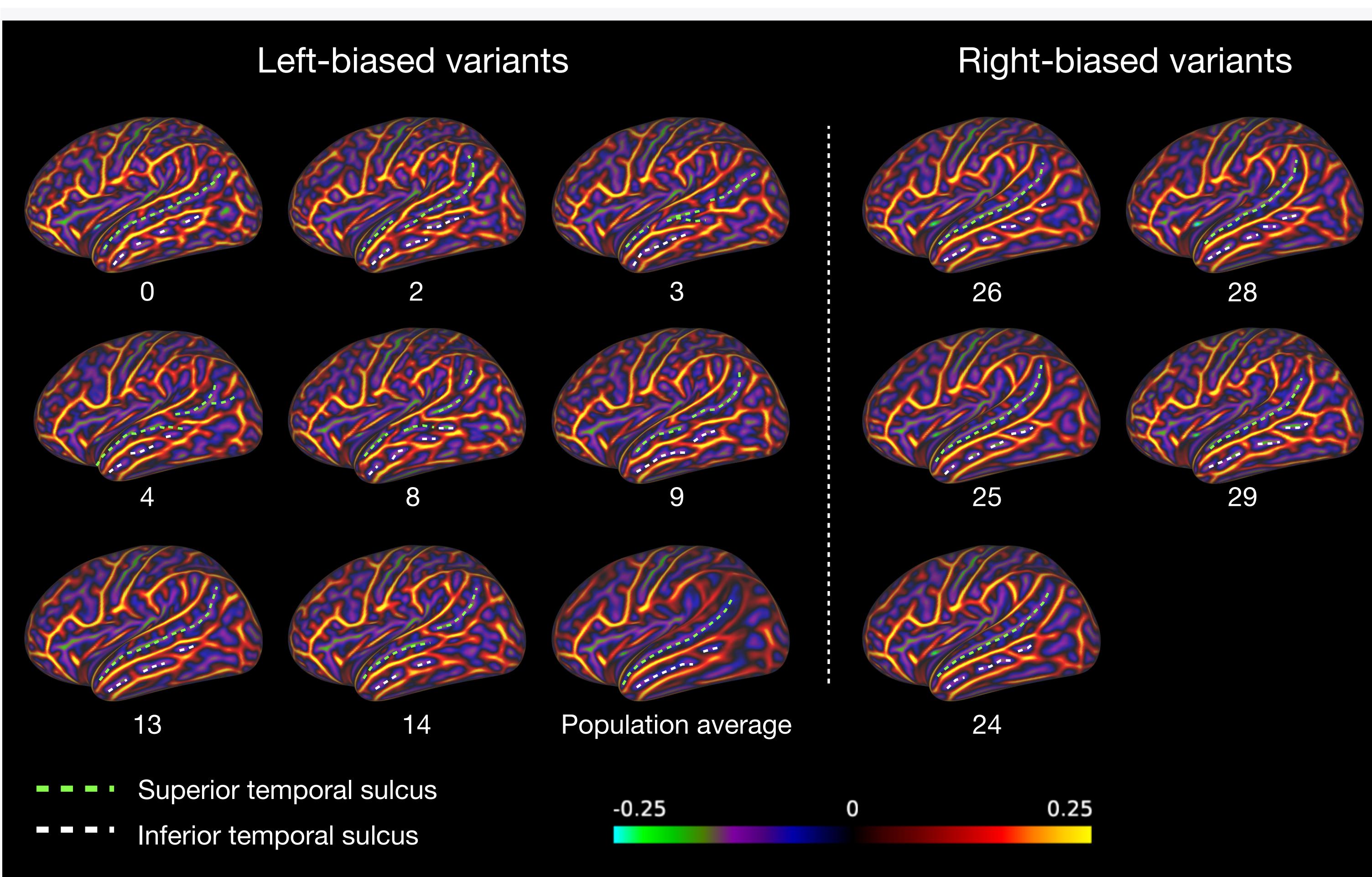
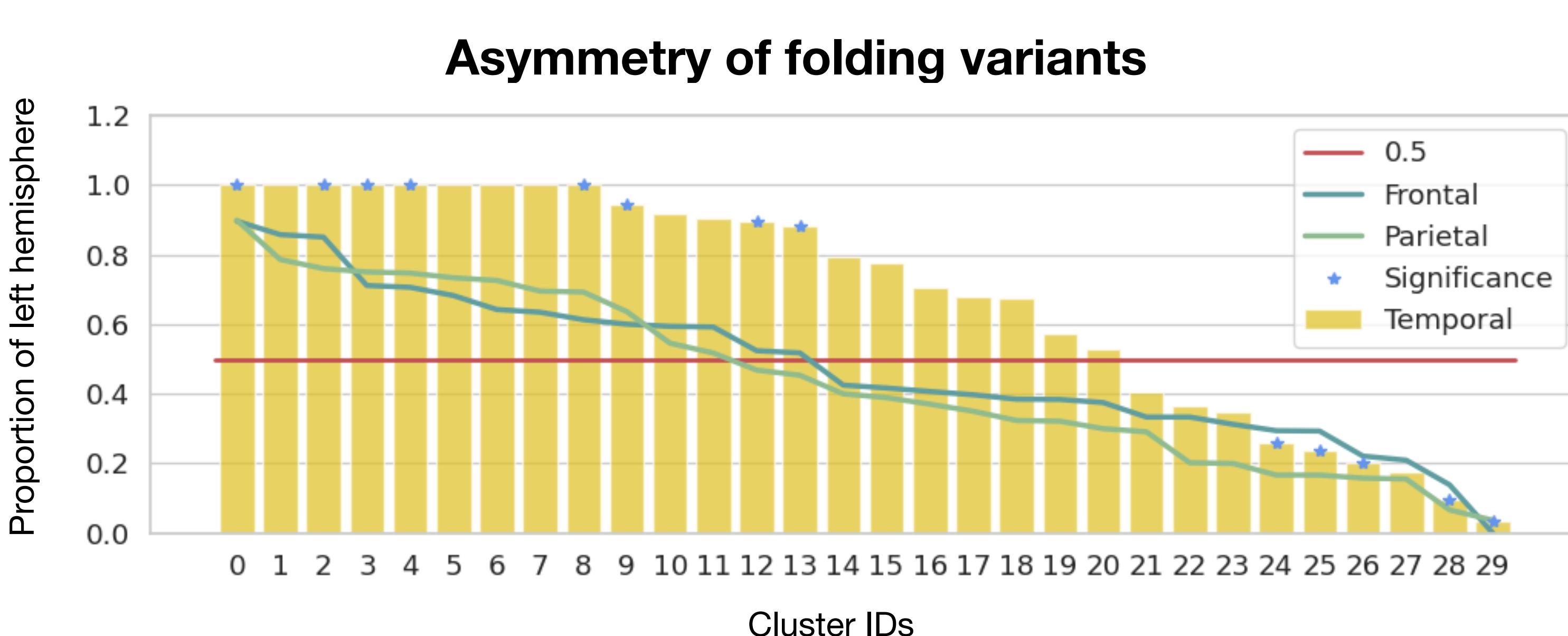
5. References

- Guo, Y. (2023). Uncovering common variants of cortical folding through hierarchical surface registration. OHBM2023.
- Bodin, C. et al., (2021). Plis de passage in the superior temporal sulcus: morphology and local connectivity.
- Ono, Michio. 1989. Atlas of the Cerebral Sulci

4. Results

Cortical folding patterns

- A higher proportion of temporal lobe clusters were leftward-asymmetric compared to other lobes.
- Leftward-asymmetric templates present more anatomical heterogeneity, including interruptions and branching of the superior temporal sulcus [2-3]



Surface area

- The proportion of temporal lobe surface-area in leftward-asymmetric folding variants was significantly larger than rightward-asymmetric folding variants ($p<0.001$)

