Do Baby Brain Cortices that Look Alike at Birth Grow Alike During The First Year of Postnatal Development? (Supplementary Material)

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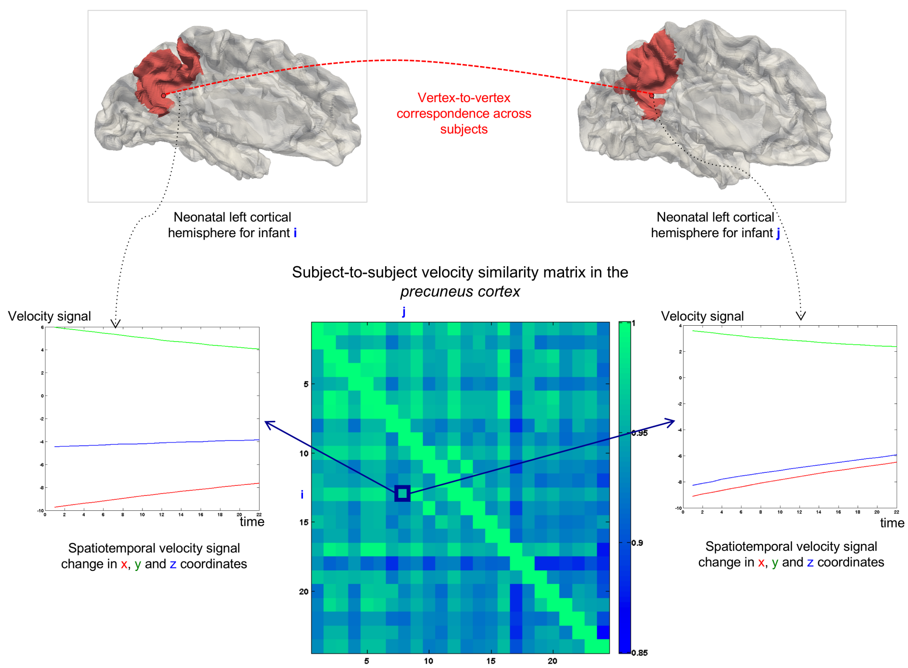

Fig. 1: *Subject-to-subject velocity similarity matrix in a representative cortical region (the precuneus).* The multidirectional varifold-based shape regression model enables to estimate for each subject the spatiotemporal deformation velocity $v(x,t)$ which is computed at each vertex x of the cortical surface and at any timepoint t between birth and 12 months. Then, for each cortical region, we generate a velocity similarity matrix that computes the Pearson correlation coefficients between corresponding vertices in two infants i and j averaged across the selected region.

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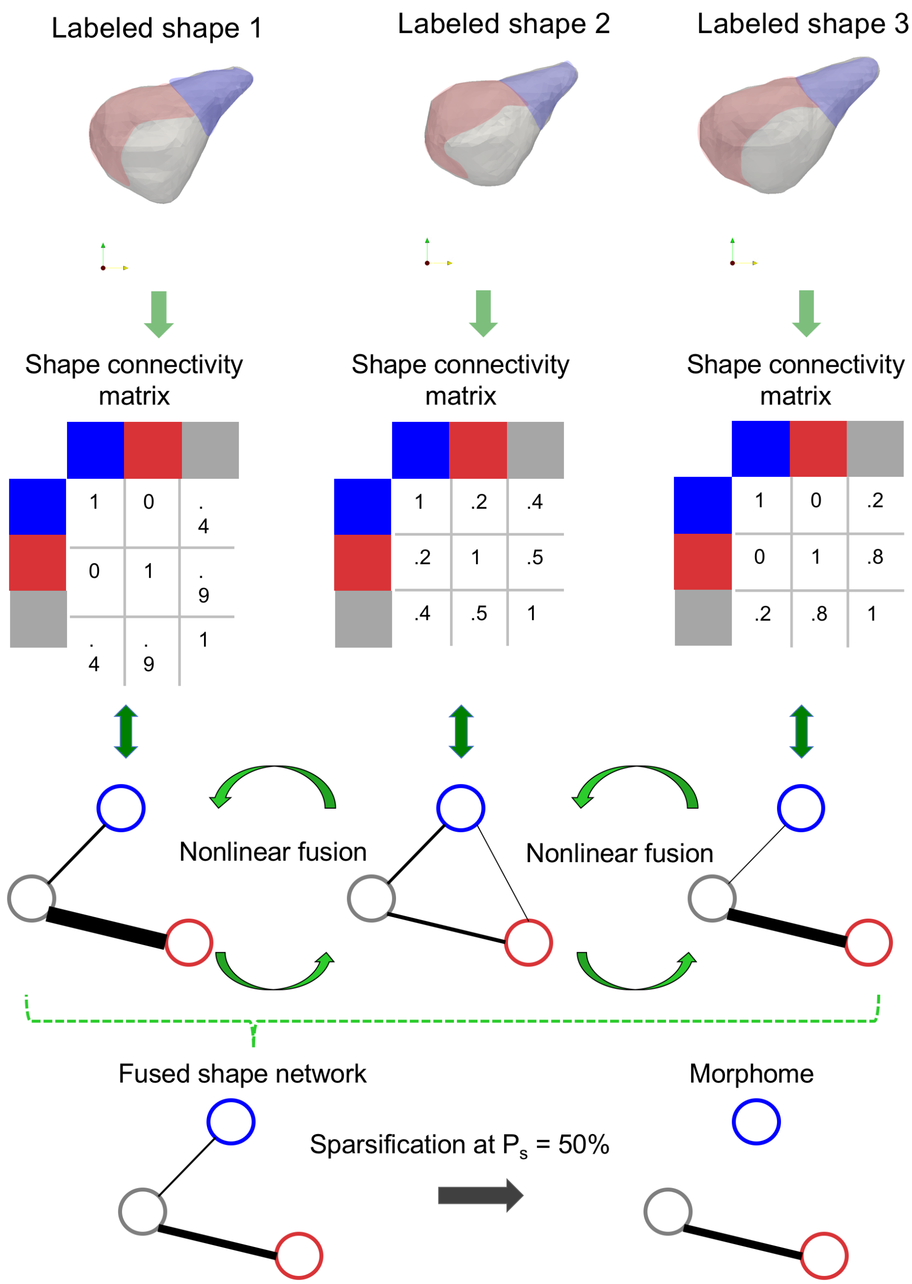


Fig. 2: *Generic shape similarity networks fusion and morphome construction.* Giving a set of labeled shapes measured at a single timepoint, we use the multi-directional varifold similarity distance to compute pairwise similarities between different labeled regions for each shape. This produces a shape connectivity matrix for each labeled shape. Next, we use the non linear similarity network fusion method described in [4] to generate the 'mean' shape network. Ultimately, through removing 50% of the remaining connections, we generate a morphome at a sparcification level $P_s = 50\%$.

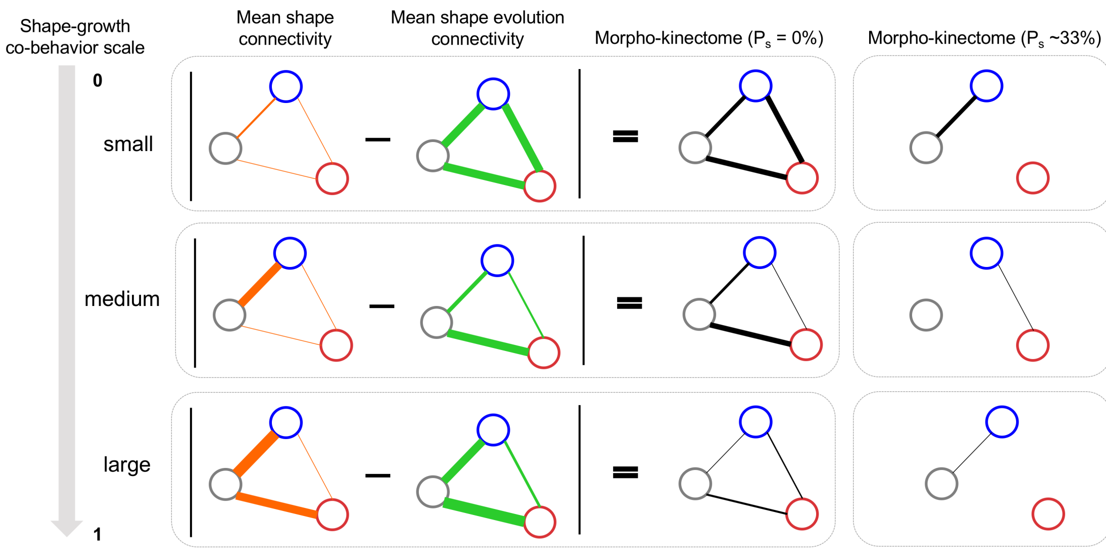
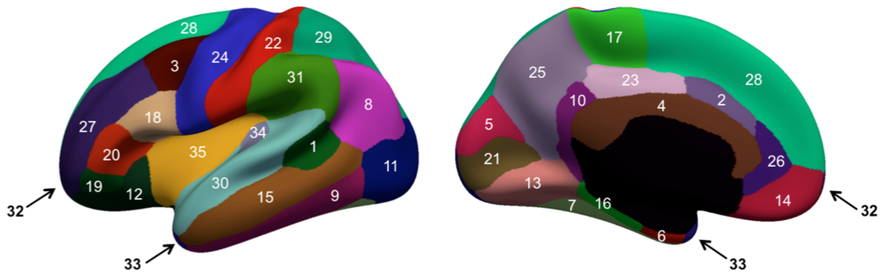


Fig. 3: *Morpho-kinectomes generation scenarios at different sparsification levels P_s.* To better explain the intuition behind introducing the concept of the morpho-kinectome in this paper, we illustrate three cases that represent different levels of shape-growth consistency in similarity patterns, each respectively drawn from an observed population of longitudinal shapes. Each node represents a labeled anatomical region in the observed shape. The width of each edge quantifies the similarity between two nodes in the network. The mean shape connectivity network is estimated at baseline timepoint whereas the mean shape evolution connectivity network is estimated across later acquisition timepoints. The shape-growth consistency level or co-behavior ranges between a scale of 0 and 1. As the shape-growth co-behavior scale increases, the fully connected weighted morpho-kinectome (i.e., $P_s = 0\%$) involves weaker connections between its nodes. Notably, the stronger the connections in the morpho-kinectome, the less coordinated are similar labeled shape regions in appearance and evolution. We also demonstrate how the sparsification level influences the sparsity of the estimated morpho-kinectome, which is defined as a weighted sparse network at $P_s > 0$.



1. Bank of the Superior Temporal Sulcus	**2.** Caudal Anterior-cingulate Cortex
3. Caudal Middle Frontal Gyrus	**4.** Unmeasured Corpus Callosum
5. Cuneus Cortex	**6.** Entorhinal Cortex
7. Fusiform Gyrus	**8.** Inferior Parietal Cortex
9. Inferior Temporal Gyrus	**10.** Isthmus-cingulate Cortex
11. Lateral occipital cortex	**12.** Lateral orbital frontal cortex
13. Lingual gyrus	**14.** Medial orbital frontal cortex
15. Middle temporal gyrus	**16.** Parahippocampal gyrus
17. Paracentral lobule	**18.** Pars opercularis
19. Pars orbitalis	**20.** Pars triangularis
21. Pericalcarine cortex	**22.** Postcentral gyrus
23. Posterior-cingulate cortex	**24.** Precentral gyrus
25. Precuneus cortex	**26.** Rostral anterior cingulate cortex
27. Rostral middle frontal gyrus	**28.** Superior frontal gyrus
29. Superior parietal cortex	**30.** Superior temporal gyrus
31. Supramarginal gyrus	**32.** Frontal pole
33. Temporal pole	**34.** Transverse temporal cortex
35. Insula cortex	

Fig. 4: *Cortical regions of interest index.* Each cortical hemisphere is parcellated using Desikan-Killiany cortical atlas. We display the cortical regions' names and their respective labels on the surface.