Characterization of the patterns of healthy cortical myelination
Nicolas HONNORAT & Christos DAVATZIKOS
1Center for Biomedical Image Computing and Analytics, Department of Radiology

Introduction
A combination of T1 and T2 weighted magnetic resonance imaging (MRI) can be used to estimate the amount of myelin in the brain. This approach allowed, for instance, to associate schizophrenia with pronounced myelin abnormalities. However, a better modeling of myelin variations in a reference healthy population would help quantifying and understanding these abnormalities.

Data
- 100 unrelated HCP subjects [1] (age 22 to 35)
- minimal processing based on MsMall registration [2] (multimodal registration)
- ICA+FIX denoising [2]
- projected onto 360 HCP parcellation [3]

Patterns of Variation
- three modalities used:
  - myelin (from T1 and T2 MRI)
  - cortical thickness (T1 MRI)
  - cortical areal distortion (T1 MRI)
- Pearson correlation between the values computed for the different parcels, over the population (structural covariance)

Comparison
- Pearson correlation between the extra-diagonal terms (captures linear relations)
- Spearman correlations (to capture non-linear monotonic relations)

Data preparation:
- 100 unrelated HCP subjects
- minimal processing based on MsMall registration
- ICA+FIX denoising
- projected onto 360 HCP parcellation

Patterns of Variation
- three modalities used:
  - myelin (from T1 and T2 MRI)
  - cortical thickness (T1 MRI)
  - cortical areal distortion (T1 MRI)
- Pearson correlation between the values computed for the different parcels, over the population (structural covariance)

Comparison
- Pearson correlation between the extra-diagonal terms (captures linear relations)
- Spearman correlations (to capture non-linear monotonic relations)

Conclusion
- strong patterns of variations for myelin, cortical thickness and cortical areal distortion
- strong and significant overlap between the patterns of variation found for myelin variations and cortical thickness, and myelin and cortical areal distortion

Future work
- partial correlations
- mutual information to compare patterns
- full brain resolution
- multimodal analysis

References