

Making image databanks work: Problems for image analysis & atlas creation

- 1) Atlas creation tools and registration issues – dealing with brain variability
- 2) Outputs: data sharing/citation/storage, how to share individual & study data securely
- 3) User interface function & delivery. Preventing unwanted use (eg trying to recreate original data)

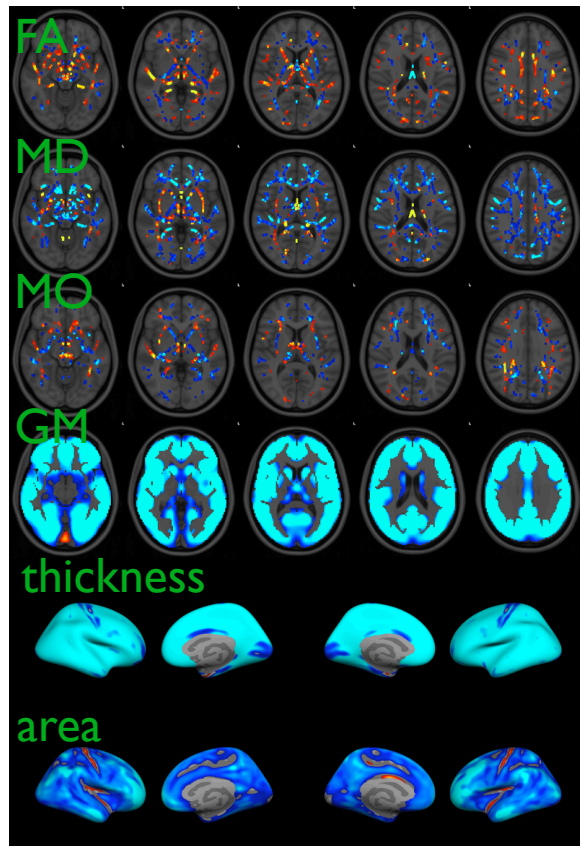
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- heterogeneity across acquisitions/studies (and when to give up)
 - need objective (invariant) imaging-derived phenotypes
 - artefact removal / modelling
 - qualitative (non-diffeomorphic) subject differences (and distinct subject sub-groups)
 - warp-free correspondence of function/etc ("hyper-alignment")
 - pros & cons of different atlases for different (e.g. age) sub-groups
 - cross-modality integration
 - age-dependent (etc) atlases:
 - univariate variability
 - multivariate model-based modes of variability
 - multivariate multimodal data-driven identification of modes of variation and/or sub-groups
 - co-modelling with genetics, behaviour, lifestyle, long-term health outcomes

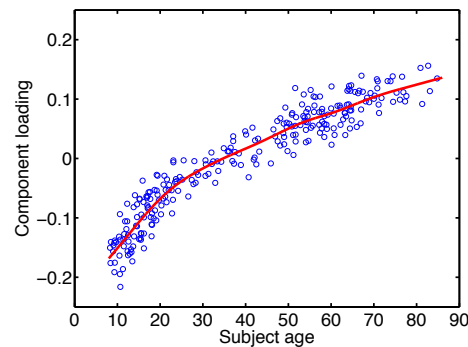
data-driven analysis - multimodal, multivariate "population modes"

Multimodal Bayesian ICA

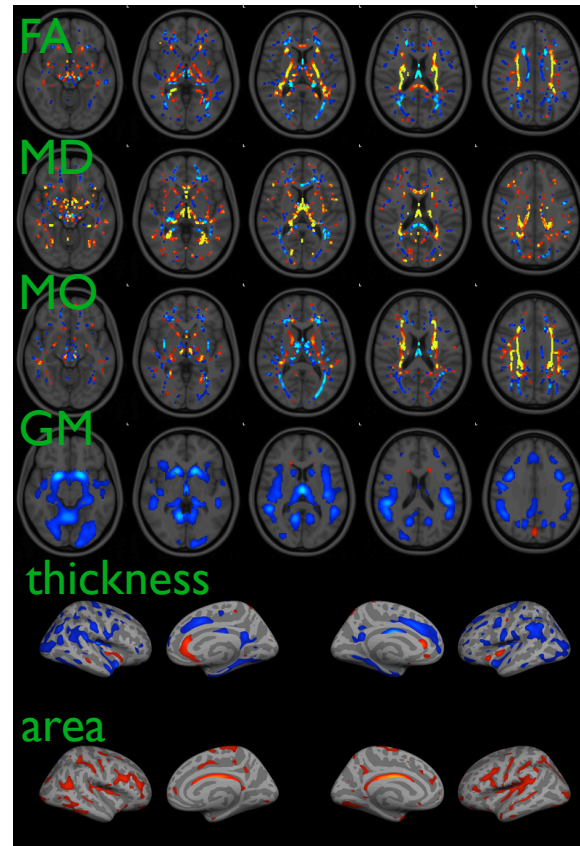
early-age development



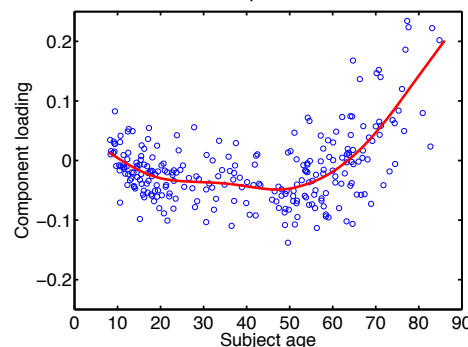
Component 1



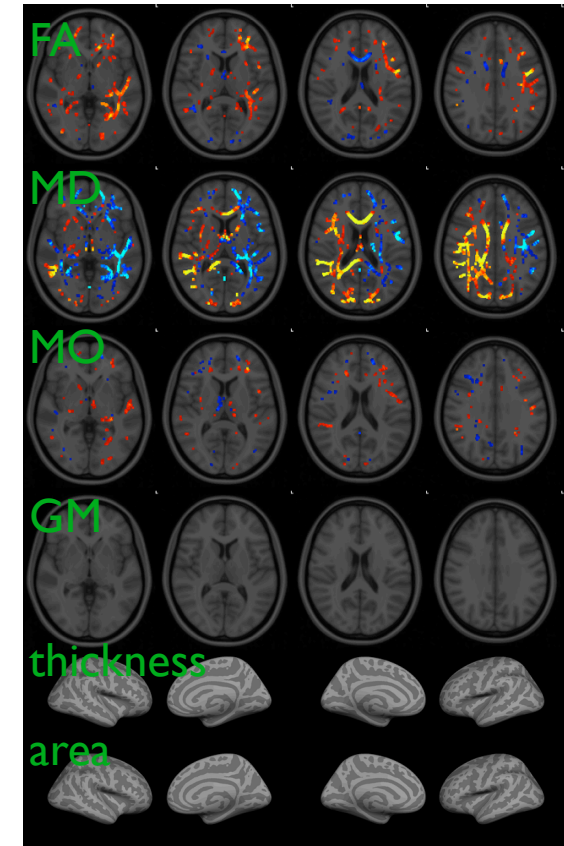
aging



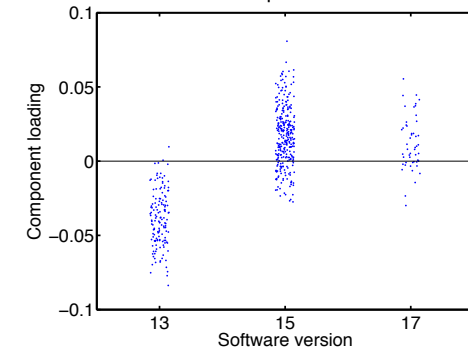
Component 2



artefact



Component 4



484 healthy subjects, ages 8-85y (Fjell et al.)

[Groves...Woolrich, NeuroImage 2011]

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- when should data be released (in batches during study, after completion, never?)
 - should study researchers get preferential access?
 - when data is released, is re-release allowed?
 - encourage researchers to leave data inside database, and use database's own compute facilities to do their analysis?
 - should researchers be forced to feed their analysis outputs back into database?
 - if so: how to do QC / etc.?
 - should the study/collaboration insist on co-authorship?
 - alternative mechanisms for getting credit / reward

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- database-creation & database-interface complexity: power/reliability vs simplicity ?
 - how much high-level functionality to offer on the database interface (e.g. correlate images against non-imaging subject measures such as IQ / age / disease)
 - just a natural extension of doing preprocessing in database, or is this making fishing-trips too easy?
 - or go even further - and do all the correlations in advance.... (HCP MegaTrawl)
 - too much fishing?
 - insist researchers explain plans / register hypotheses, before getting access?
 - encourage researchers to leave-out a fraction of the dataset until they are ready to publish (validation subsample)?
 - more generally, coordinate avoiding cross-analysis multiple-comparisons/over-fishing, vs too much policing?