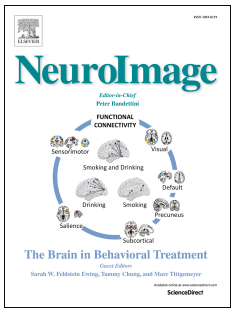
# Accepted Manuscript

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PII: S1053-8119(18)30687-6

DOI: 10.1016/j.neuroimage.2018.08.006

Reference: YNIMG 15167

To appear in: *NeuroImage*

Received Date: 18 March 2018

Revised Date: 22 June 2018

Accepted Date: 2 August 2018

Please cite this article as: Kumar, K., Toews, M., Chauvin, L., Colliot, O., Desrosiers, C., Multi-modal brain fingerprinting: A manifold approximation based framework, *NeuroImage* (2018), doi: 10.1016/j.neuroimage.2018.08.006.

# Multi-modal brain fingerprinting: a manifold approximation based framework

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**Abstract**

This work presents an efficient framework, based on manifold approximation, for generating brain fingerprints from multi-modal data. The proposed framework represents images as bags of local features which are used to build a subject proximity graph. Compact fingerprints are obtained by projecting this graph in a low-dimensional manifold using spectral embedding. Experiments using the T1/T2-weighted MRI, diffusion MRI, and resting state fMRI data of 945 Human Connectome Project subjects demonstrate the benefit of combining multiple modalities, with multi-modal fingerprints more discriminative than those generated from individual modalities. Results also highlight the link between fingerprint similarity and genetic proximity, monozygotic twins having more similar fingerprints than dizygotic or non-twin siblings. This link is also reflected in the differences of feature correspondences between twin/sibling pairs, occurring in major brain structures and across hemispheres. The robustness of the proposed framework to factors like image alignment and scan resolution, as well as the reproducibility of results on retest scans, suggest the potential of multi-modal brain fingerprinting for characterizing individuals in a large cohort analysis.

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*Preprint submitted to Elsevier*