

# Accepted Manuscript

Multi-modal brain fingerprinting: A manifold approximation based framework

Kuldeep Kumar, Matthew Toews, Laurent Chauvin, Olivier Colliot, Christian Desrosiers



PII: S1053-8119(18)30687-6

DOI: [10.1016/j.neuroimage.2018.08.006](https://doi.org/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.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

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

Kuldeep Kumar<sup>a,c,\*1</sup>, Matthew Toews<sup>a</sup>, Laurent Chauvin<sup>a</sup>,  
Olivier Colliot<sup>b,c,d</sup>, Christian Desrosiers<sup>a</sup>

<sup>a</sup>Laboratory for Imagery, Vision and Artificial Intelligence, École de technologie supérieure,  
1100 Notre-Dame W., Montreal, QC, Canada, H3C1K3

<sup>b</sup>Sorbonne Universités, UPMC Univ Paris 06, Inserm, CNRS, Institut du cerveau et la  
moelle (ICM) - Hôpital Pitié-Salpêtrière, Boulevard de l'hôpital, F-75013, Paris, France

<sup>c</sup>Inria Paris, Aramis project-team, 75013, Paris, France

<sup>d</sup>AP-HP, Departments of Neurology and Neuroradiology, Hôpital Pitié-Salpêtrière, 75013,  
Paris, France

---

## 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.

---

<sup>1</sup>kkumar@livia.etsmtl.ca

Download English Version:

<https://daneshyari.com/en/article/8686590>

Download Persian Version:

<https://daneshyari.com/article/8686590>

[Daneshyari.com](https://daneshyari.com)