

# Jean Feydy

*PostDoc at Imperial College London*

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🇫🇷 Citizenship : French  
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## Research interests

My main focus is geometric data analysis, with applications to medical imaging. I have developed fast numerical schemes for kernel methods, optimal transport theory and computational anatomy.

## Education and employment

- 2019–2022 **Post-Doctoral research**, *Imperial College London*.  
In the department of computing, under the supervision of Michael Bronstein.
- 2016–2019 **PhD in applied mathematics**, *École Normale Supérieure de Cachan*.  
“Geometric data analysis, beyond convolutions”, under the supervision of Alain Trouvé.
- 2015–2016 **Pre-doctoral internship**, *École Normale Supérieure de Cachan*.  
Under the supervision of Alain Trouvé.
- Ap.-Sep. 2015 **MVA internship**, *Siemens Healthcare, Princeton, NJ*, design of a real-time denoising pipeline using structure tensors and steerable wavelets.
- 2014–2015 **Student at the M2 MVA, "Mathematics, Vision, Learning"**, *École Normale Supérieure de Cachan*, graduated with highest honours.
- 2012–2016 **Student at the École Normale Supérieure (Paris)**, *Major in Mathematics*.
- 2010–2012 **2-year intensive program preparing for the national competitive exam for entry to engineering schools**, *Lycée Marcelin Berthelot, Saint-Maur-des-Fossés*.

## Publications

- Preprints **Fast end-to-end learning on protein surfaces**, Freyr Sverrisson\*, Jean Feydy\*, Bruno Correia, Michael Bronstein.  
**Sinkhorn divergences for unbalanced Optimal Transport**, *ArXiv:1910.12958*, Thibault Séjourné, Jean Feydy, François-Xavier Vialard, Alain Trouvé, Gabriel Peyré.  
**Kernel operations on the GPU, with autodiff, without memory overflows**, *ArXiv:2004.11127*, Benjamin Charlier\*, Jean Feydy\*, Joan Glaunès\*, François-David Collin, Ghislain Durif.  
**Collective proposal distributions for nonlinear MCMC samplers: mean-field theory and fast implementation**, *ArXiv:1909.08988*, Grégoire Clarté, Antoine Diez, Jean Feydy.
- 2020 **Fast geometric learning with symbolic matrices**, *NeurIPS 2020 (spotlight presentation)*, Jean Feydy\*, Joan Glaunès\*, Benjamin Charlier\*, Michael Bronstein.  
**Geometric data analysis, beyond convolutions**, *PhD thesis in applied mathematics*, defended on July 2, 2020.

- 2019 **Fast and Scalable Optimal Transport for Brain Tractograms**, *MICCAI 2019*, Jean Feydy\*, Pierre Roussillon\*, Alain Trouvé, Pietro Gori.  
**Interpolating between Optimal Transport and MMD using Sinkhorn divergences**, *AiStats 2019*, Jean Feydy, Thibault Séjourné, François-Xavier Vialard, Shun-ichi Amari, Alain Trouvé, Gabriel Peyré.
- 2018 **Global divergences between measures: from Hausdorff distance to Optimal Transport**, *ShapeMI workshop (oral presentation) at MICCAI 2018*, Jean Feydy, Alain Trouvé.
- 2017 **Optimal Transport for Diffeomorphic Registration**, *MICCAI 2017 (oral presentation)*, Jean Feydy, Benjamin Charlier, F.-X. Vialard, Gabriel Peyré.  
**Distortion minimizing geodesic subspaces in shape spaces and computational anatomy**, *Viplmage 2017*, Benjamin Charlier, Jean Feydy, David W. Jacobs and Alain Trouvé.

## Software

- 2019 **GeomLoss: geometric loss functions for shape processing and data analysis**, *PyTorch package for the computation of kernel norms, chamfer distances and Optimal Transport costs that scales up to millions of samples in seconds: [www.kernel-operations.io/geomloss](http://www.kernel-operations.io/geomloss)*, downloaded 20k times.
- 2018 **KeOps: kernel operations on the GPU, with autodiff, without memory overflows**, *CUDA/C++ library with PyTorch, NumPy, R and Matlab bindings: [www.kernel-operations.io](http://www.kernel-operations.io)*, with Benjamin Charlier and Joan Glaunès, downloaded 30k times.
- 2017 **Shapes toolbox**, *efficient PyTorch implementation of diffeomorphic registration algorithms on meshes: [plmlab.math.cnrs.fr/jeanfeydy/shapes\\_toolbox](http://plmlab.math.cnrs.fr/jeanfeydy/shapes_toolbox)*.

## Teaching

- 2020 **AI session**, *DIU brain aging in neuroradiology for French radiologists*.
- since 2019 **Workshop session on image processing and computational anatomy**, *AI-Radiology Masterclass for radiology interns of the Paris region*.
- 2018 **Workshop session on computational anatomy**, *GeomData summer school*, Fréjus.
- 2016–2019 **Tutor and teaching assistant (“Caïman”)**, *École Normale Supérieure (Paris)*.
  - Introduction to Riemannian geometry through the study of shapes spaces – lectures and monitoring of a reading group.
  - Mathematical Foundations of Data Sciences (wavelets, sparsity, CNNs and optimal transport) – workshop sessions, with lectures by Gabriel Peyré.
  - Mathematical Culture: a journey from highschool to research, with applications – lectures targeted at computer scientists, physicists, philosophers, etc. from the ENS.
Redaction of three ~150 pages long manuals – one for each class.
- 2012–2016 **Teaching assistant (mathematics) in preparatory classes, MPSI and MP\***, *Lycée Marcelin Berthelot, Saint-Maur-des-Fossés and Lycée Louis-le-Grand, Paris*.