

# Jean Feydy

Research fellow at Inria Paris

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Citizenship : French

Date of birth: June 4<sup>th</sup>, 1994

## Research interests

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

## Education and employment

- since 2021 **Research fellow (Chargé de Recherche), Inria Paris.**  
In the HeKA team, with a focus on public health and digital patient representations.
- 2019–2021 **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 Trounev.
- 2015–2016 **Pre-doctoral internship, École Normale Supérieure de Cachan.**  
Under the supervision of Alain Trounev.
- 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 (\* denotes co-first authorship)

- Preprints **Sinkhorn divergences for unbalanced Optimal Transport, ArXiv:1910.12958,** Thibault Séjourné, Jean Feydy, François-Xavier Vialard, Alain Trounev, Gabriel Peyré.  
**Collective proposal distributions for nonlinear MCMC samplers: mean-field theory and fast implementation, ArXiv:1909.08988,** Grégoire Clarté, Antoine Diez, Jean Feydy.
- 2022 **Physics-informed deep neural network for rigid-body protein docking, MLDD workshop (spotlight presentation) at ICLR 2022,** Freyr Sverrisson, Jean Feydy, Joshua Southern, Michael Bronstein, Bruno Correia.
- 2021 **Accurate point cloud registration with robust optimal transport, NeurIPS 2021,** Zhengyang Shen\*, Jean Feydy\*, Peirong Liu, Ariel Hernán Curiale, Ruben San José Estépar, Raúl San José Estépar, Marc Niethammer.

- Fast end-to-end learning on protein surfaces**, *CVPR 2021*, Freyr Sverrisson\*, Jean Feydy\*, Bruno Correia, Michael Bronstein.
- Kernel operations on the GPU, with autodiff, without memory overflows**, *Journal of Machine Learning Research*, Benjamin Charlier\*, Jean Feydy\*, Joan Glaunès\*, François-David Collin, Ghislain Durif.
- 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

- since 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 50k times.
- since 2018 **KeOps: kernel operations on the GPU, with autodiff, without memory overflows**, *a library that provides efficient support for semi-symbolic, "distance-like" matrices on CPUs and GPUs. Implemented in CUDA/C++ with PyTorch, NumPy, R and Matlab bindings*: [www.kernel-operations.io](http://www.kernel-operations.io), developed with Benjamin Charlier and Joan Glaunès, downloaded 190k times.

## Teaching

- since 2022 **Geometric data analysis**, *Master 2 "Mathématiques, Vision, Apprentissage"*.
- since 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*.