Jean-David Benamou

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Born June 6th 1964.

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France.

Professional Experience

1993–today	**INRIA "Directeur de Recherche"** (Paris, Fr.). INRIA is a public research institute in computer science and applied maths. Junior researcher until 2000, Senior since. *On leave 2006–2009, see below:*
2006–2008	Rice University visiting Professor (Houston, USA). Computational and Applied Mathematics Dpt.
2008–2009	TOTAL SA Research Engineer (Pau, Fr.). Seismic inversion Dpt.
1992–1993	Post-Doc at CAM, UCLA (Los Angeles, USA).

Expertise

Optimal Transportation.

Linear Wave Propagation / High Frequency models / Geometric Optics.

Calculus of Variation.

Non-Smooth Optimization.

Numerical Analysis and computer implementation of Numerical Methods.

Education

1989–1992	**PhD in Applied Mathematics, Université Paris Dauphine**. "Measure preserving mappings, incompressible fluid mechanics and semi-geostrophic model in meteorology", Advisor Y. Brenier.
1987–1989	MSc in Applied Mathematics, Université Paris Dauphine, France.

Languages

French	Mother tongue.
English	**Fluent**.
Russian	Notions.

Supervision

PhD	I. Solliec (2003), K. Guittet (2003), L. Nenna (2016), Miao Yu (ongoing), Lucas Martinet (ongoing).
Post-Docs	T. Katsaounis (1999), P. Hoch (2002), S. Hagdahl (2005), X. Dupuis (2013-2014), R. Andreev (2015-2016), S. Di Marino (2017) J.B. Courbot (ongoing), A. Natale (ongoing).
Master thesis	A dozen.
Engineer	S. Legrand (2015-2016).
Others	Songting Luo (PhD 2009, UC Irvine, Adv. H.K. Zhao), B. Froese (PhD 2012, Simon Fraser U., Adv. A. Oberman), R. Hachi (PhD 2015, U. Paris Dauphine, Adv. G. Carlier), M. Laborde (PhD 2016, U. Paris Dauphine, Adv. G. Carlier).

Teaching

Post Grad.	I taught a course on "Numerical Geometric Optics" at several institutions (U. Paris Dauphine, Ecole Polytechnique, ENS Lyon, Rice U.).
	"Numerical Optimal Transportation" at a RICAM School (2014).
	"Numerical Methods For Partial Differential Equations" at Rice U. (2006-2008).
Under Grad.	"Analysis I " at Rice U. (2006-2008).
	"Analysis" at Pôle U. Léonard de Vinci (2000-2002).

Scientific Management

2013–	**Mokaplan team leader.** Mokaplan is a joint INRIA/U. Paris Dauphine team (currently 8 permanent researchers).
2015-2016	Mokabajour coordinator. Mokabajour was a software development project (1 engineer + researchers from Mokaplan and U. Grenoble).
2012–2107	Isotace ANR consortium coordinator. Isotace was a public funded consortium gathering 4 academic partners (INRIA/U. Paris Sud/Ecole Poytechnique/U. Paris 7) and the company Zeliade SA.
2000–2005	Otto team leader. Otto was a smaller INRIA research group (only me and students).
2000–2003	GO++ coordinator. GO++ was a public funded software development project (1 post-doc).

Funding

2015–2021	Mokaplan team INRIA support.
2018-2021	Romsoc H2020 ITN grant.
2017-2018	IRIS "Paris Sciences Lettres" University grant.
2017-2020	MAGA and MFG "Agence Nationale de la Recherche" grants.
2017	CNES study.
2012–2017	Isotace "Agence Nationale de la Recherche" grant.
2014–2016	Mokalien INRIA associated team abroad (with U. McGill).
2014–2016	Mokabajour INRIA "Action de Développement Technnologique" Grant .
2002-2004	" Action Concertée Incitative" GO++ public grant.

Professional Services

2015–	Member of the Academic council of PSL (Paris-Sciences-Lettres) University.
2016–	Member of the local INRIA "restauration" comittee.
2013–2017	I co-organized 5 workshops on Optimal Transportation 2 at BIRS (2013, 2015), 1 at MFO (2017), 1 at U.McGill (2014) and 1 at U. Paris Dauphine (2015).
2017	I co-organized a " Calculus of Variation and Optimal Transportation" International Conference at IHP, Paris.
Other	Juries, referees ...

Technology Transfer

2018 –	Use of Optimal Transport modeling in Freeform optics. This is a collaboration with *Philips Lighting* (Eindhoven), a PhD will start in 2018.
2018–	We are working on a 3D cluster parallel implementation of Optimal Transportation Solvers. This is a collaboration with the *Observatoire de Paris* with applications to the " Early Universe mass reconstruction problem".
2017–	Optimal Transport distances as misfit cost function in Geophysical inverse problems. This is a collaboration with the *Institut de Physique du Globe de Paris* and the PhD subject of Miao Yu .
2017	A study on the use of Optimal Transportation as a distance and interpolation tool for satellite (Cryosat and SWOT) marine data. This is a collaboration with *CNES and MERCATOR-Ocean* companies.
2008–2009	At *TOTAL* : Implementation of numerical methods for paraxial wave propagation in transverse anisotropic media.

Softwares

2017	MaLbr: a Monge-Ampère based Optimal Transportation solver.
	Mokasat: 2D Wasserstein interpolation prototype based on the Multi-Marginal Sinkhorn/Entropic approach to Optimal Transportation.
2016	Mokabajour: A collection of Optimal Transportation Numerical method implementations for the reflector Freeforming problem.
	MathMarx: a Semi-Discrete Optimal Transport solver applied to the Principal Agent Problem (password: mokaplan).
2015	ALG2: a FreeFem++ implementation of the classic non-smooth proximal splitting method to solve the "Benamou-Brenier" Optimal Transportation Formulation.
2002	GO++ : a C++ library for the Lagragian/Eulerian solution of Hamiltonian System/Hamilton Jacobi equations, was used at CEA, not maintained anymore.
1996	Multivalued Travel Times computation Benchmark based on the IFP Marmousi model (following a 1996 workshop).

Invited Talks and Seminar

2017	Séminaire Parisien d'Optimisation (IHP,Paris).
	Waves diffracted by Patrick Joly Conf. (Gif sur Yvette).
	Minisymposium on FreeForm Optics, ENUMATH (Voss).
	Cemracs Workshop on Mean Field Games (CIRM, Marseille).
	FOCM plenary speaker (Barcelona)
2016	Croupe de Travail Calva (Paris).
	Optimal Transportation and Application (Pisa).
2015	Wave Conf. in Honor of W. W. Symes (Michigan State U.)
	ICMS Gradient Flow Workshop (Edinburgh).
	Gradient Flow in Paris Workshop (Paris).
2014	RICAM School on Optimal Transport (Linz).
	Optimal Transport Workshop (Toulouse).
2013	SIAM PDE plenary speaker (Orlando).
	Seminaire du Collège de France (Paris).

Recent Publications

Please see my Google Scholar profile for the full list.

[1] Jean-David Benamou and Vincent Duval. **Minimal convex extensions and finite difference discretization of the quadratic Monge-Kantorovich problem**. Submitted , 2017. URL https://hal.inria.fr/hal-01616842.

[2] Jean-David Benamou, Guillaume Carlier, and Luca Nenna. **Generalized incompressible flows, multi-marginal transport and Sinkhorn algorithm**. submitted, 2017. URL https://hal.archives-ouvertes.fr/hal-01621311.

[3] Jean-David Benamou, Guillaume Carlier, and Luca Nenna. **A Numerical Method to solve Optimal Transport Problems with Coulomb Cost**. Chapter in "Splitting Methods in Communication and Imaging, Science and Engineering", Editors R. Glowinski, S. Osher, and W. Yin., Springer. 2017. URL https://hal.inria.fr/hal-01148954.

[4] Jean-David Benamou and Brittany D. Froese. **A viscosity framework for computing Pogorelov solutions of the Monge-Ampere equation**. In Radon Series on Computational and Applied Mathematicsol Vol 17: Topological Optimization and Optimal Transport. 2017. URL https://hal.inria.fr/hal-01053454.

[5] Jean-David Benamou, Guillaume Carlier, and Roméo Hatchi. **A numerical solution to Monge's problem with a Finsler distance as cost**. submitted , 2016. URL https://hal.archives-ouvertes.fr/hal-01261094.

[6] Jean-David Benamou, Guillaume Carlier, and Filippo Santambrogio. **Variational Mean Field Games**. Active Particles, Volume 1 Pages 141-171 Publisher Springer International Publishing , 2016. URL https://hal.archives-ouvertes.fr/hal-01295299.

[7] Guillaume Carlier, Quentin Mérigot, Edouard Oudet, and Jean-David Benamou. **Discretization of functionals involving the Monge-Ampère operator**. *Numerische Mathematik*, 134(3):611–636, 2016. doi: 10.1007/s00211-015-0781-y. URL https://hal.inria.fr/hal-01112210.

[8] Jean-David Benamou, Francis Collino, and Jean-Marie Mirebeau. **Monotone and Consistent discretization of the Monge-Ampere operator**. *Mathematics of computation* Volume 85 Issue 302 Pages 2743-2775, 2016. URL https://hal.archives-ouvertes.fr/hal-01067540.

[9] Jean-David Benamou, Guillaume Carlier, Marco Cuturi, Luca Nenna, and Gabriel Peyré. **Iterative Bregman Projections for Regularized Transportation Problems**. *SIAM Journal on Scientific Computing*, 2(37):A1111–A1138, 2015. doi: 10.1137/141000439. URL https://hal.archives-ouvertes.fr/hal-01096124.

[10] Jean-David Benamou, Guillaume Carlier, and Maxime Laborde. **An augmented Lagrangian approach to Wasserstein gradient flows and applications**. *ESAIM: Proceedings and Surveys* Volume 54 Pages 1-17 , December 2015. URL https://hal.archives-ouvertes.fr/hal-01245184.

[11] Jean-David Benamou and Guillaume Carlier. **Augmented Lagrangian methods for transport optimization, Mean-Field Games and degenerate PDEs**. *Journal of Optimization Theory and Applications* Volume 167 Issue 1 Pages 1-26, 2015. URL https://hal.inria.fr/hal-01073143.

[12] Jean-David Benamou, Brittany D. Froese, and Adam M. Oberman. **Numerical solution of the Optimal Transportation problem using the Monge–Ampère equation**. *Journal of Computational Physics*, 260(1):107–126, 2014. doi: 10.1016/j.jcp.2013.12.015. URL https://hal.inria.fr/hal-01115626.

[13] Jean-David Benamou, Francis Collino, and Simon Marmorat. **Numerical Microlocal analysis of 2-D noisy harmonic plane and circular waves**. *Asymptotic Analysis*, 83(1-2):157–187, 2013. doi: 10.3233/ASY-121157. URL https://hal.inria.fr/hal-00937691.