Gabriel PEYRÉ

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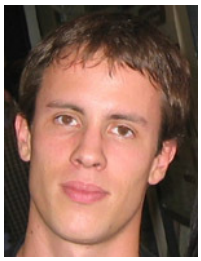
Contacts



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Vita

2014	CNRS Senior Researcher, Ceremade, Université Paris–Dauphine.
2011–2015	ERC, Project SIGMA-Vision
2009–2012	Director GDR MSPC http://www.ceremade.dauphine.fr/~peyre/mspc/
2009	Scientific leader of ANR project NatImages http://www.ceremade.dauphine.fr/~peyre/natimages/
2006	CNRS Junior Researcher, Ceremade, Université Paris–Dauphine.
2003–2005	PhD thesis under the supervision of Prof. Stéhane Mallat.
2003	Master of Sc. in Mathematics, Mathematics, Vision, Learning, With honors.
2002	Agrégation de Mathéatiques.
2001	B.Sc. of Mathematics, Université de Rennes 1, with honors.
2001	B.Sc. of Computer Science, Université de Rennes 1, with honors.
2000–2003	École Normale Supérieure de Cachan.

Reseach Interests

My research is focussed on the mathematical modeling of images and texture, with applications in image processing, numerical analysis and biological vision. Improving the state of the art in image processing requires to capture the geometry of edges and textures. The tools developed adapt the representation to the complexity of the structures of the images. This leads to faster and more efficient algorithms to solve inverse problems such as super-resolution and compressed sensing. These adaptive representations could also open the door to a better understanding of the cortical processes that are at the heart of biological vision.

Responsibilities

– Scientific leader of ERC SIGMA-Vision (2011-2015)
  http://www.ceremade.dauphine.fr/~peyre/sigma-vision/
– Scientific leader of ANR project NatImages
  http://www.ceremade.dauphine.fr/~peyre/natimages/

– Director of GDR MSPC
http://www.ceremade.dauphine.fr/~peyre/mspc/
– Associate editor, SIAM Journal on Imaging Sciences (SIIMS), Journal of Mathematical Imaging and Vision (Springer), ESAIM:Proc
– Co-editor of the special issue "Mathematical Image Analysis 2009" in Journal of Mathematical Imaging and Vision.
– PhD reporter for Yanniv Gur (Tel Aviv University, Mars 2009), Boris Mailhé (INRIA, Rennes, Dec. 2009), Jean-Marie Mirebeau (Paris 6, Dec. 2010), Bruno Galerme (ENS Cachan, Dec. 2010), Mohammad Golbabaee (EPFL, Mai 2012), Anna AJezierska (Paris Est, Mai 2013), Elif Vural (EPFL, Juin 2013), Ratiba Derfoul (Rouen, Oct. 2013), Nicolas Charon (ENS Cachan, Nov. 2013), Thomas Oberlin (Grenoble, Nov. 2013), Nadège Zarrouati-Vissière (Paris Dec. 2013), Charles Soussen (HDR, Nancy, Dec. 2013), Bernhard Schmitzer (Heidelberg, March 2014), Lyle Muller (Gif-s-Yvettes, June 2014), Cecilia Aguerrebere(Telecom-Paris, June 2014), Yann Traonmilin (Telecom-Paris, June 2014).
– Thesis committee of Xavier Delaunay (CNES, Toulouse, Nov. 2008), Pierre Maurel (ENS, Paris, Dec. 2008), Nicolas Thorstensen (ENPC, Dec. 2009), Sheraz Khan (Ecole Polytechnique, Jan. 2010), François-Xavier Dupé (ENSICaen, Jan. 2010), Arnaud Woiselle (CEA Saclay, Dec. 2010), Emilien Tlapale (INRIA Sophia, Jan. 2011), Khalid Jalalzai (École Polytechnique, Mars 2012), Raphael Prevost (Paris-Dauphine, Oct. 2013), Jean-Baptiste Fiot (Paris-Dauphine, Oct. 2013), Olivier Schwander (École Polytechnique, Nov. 2013), Carole Le Guyader (HDR, Rouen, March 2013)
– Plenary speakers at conferences SSVM'13 (Juin 2013), Orasis (Juin 2013), Curves and Surfaces (June 2014), NCMIP (June 2014), SMAI (June 2015).
– Major contributor for the third edition of "A Wavelet Tour of Signal Processing" of S. Mallat, Jan. 2009,
http://www.ceremade.dauphine.fr/~peyre/wavelet-tour/
– Author of the teaching material "A Numerical Tour of Signal Processing",
http://www.numerical-tours.com

Students

– PhD supervisor of Hugo Raguet (Oct.2010-Dec.2013, co-directeur : Y. Fregnac, UNIC), Samuel Vaiter (Oct.2011-Sept.2014), Jonathan Vacher (Oct. 2013-Oct.2016), Jingwei Yang (Oct. 2013-Oct.2016, co-directeur : J. Fadili, ENSICaen), Jonathan Vacher (Oct. 2013-Oct. 2016), Quentin Denoyelle (Oct. 2014-Oct. 2017).
– Post-Doc supervisor of Sebastien Bougleux (Jan-Sept.2008, co-directeur : Laurent Cohen), Pierre Maurel (Jan-Sept.2009, co-directeur : J.F. Aujol), Julien Rabin (Jan-Sept.2010), Miyoun Jung (Sept.2010-Aout 2011, co-directeur : Laurent Cohen), Sira Ferradans (Nov.2011-Oct. 2012), Gui-Song Xia (Jan.2012-Dec.2012), Charles Deledalle (Nov.2011-Oct.2012), Giacomo Nardi (Oct.2012-Oct.2013, co-directeur : F.X. Vialard), Mohammad Golbabaee (Dec. 2012-Nov. 2013), Vincent Duval (Dec. 2012-Nov. 2014), Bernarhd Schmitzer (Oct. 2014-Sept 2015).

Organization of Workshops and Conferences

– Co-organization (with M.L. Mazure) of Workshop SIGMA'2012, CIRM, Marseille, November, 19-23, 2012.
– Co-organization (with J. Fadili) of conference MIA'12 - Mathematics and Image Analysis, Paris, IHP, Jan. 2012.
– Co-organization (with P.L. Combettes) of conference "Semaine conjointe des GDR MOA et MSPC", La Londe les Maures, Var, 6 au 11 Juin 2011..
– Co-organization (with Y. Fregnac) of the Tauc 2010 conference "From Mathematical Image Analysis to Neurogeometry of the Brain"

http://www.ceremade.dauphine.fr/~peyre/mspc/mspc-tauc-10/

- Co-organization (with M. Elad and P. Milanfar) of the mini-symposium "Recent Advances in Sparse and Non-local Image Regularization" in SIAM Conference on Imaging Science 2010, Chicago, April 2010
  http://www.ceremade.dauphine.fr/~peyre/is10/
- Organization of the conference "Mathematics and Image Analysis 2009", Paris, Dec. 2009
  http://www.ceremade.dauphine.fr/~peyre/mia09/
- Co-organization (with P. Mamassian) of the joint GDR MSPC / Vision workshop, Paris, Nov. 2009
  http://www.ceremade.dauphine.fr/~peyre/mspc-vision-09/
- Organization of the mini-symposium "Compressed Sensing" in SMAI'09, May 2009, Nice
- Organization of the graduate course "Méthodes variationnelles et parcimonieuses en traitement du signal et des images", IHP, Paris, March 2008.
  http://www.ceremade.dauphine.fr/~peyre/cours-ihp-2008/
- Organization of the workshop "An interdisciplinary approach to Textures and Natural Images Processing", IHP, Paris, Jan. 2007.
  http://www.ceremade.dauphine.fr/~peyre/workshop-textures/
- Co-organizer of the mini-symosium "Geometry of Images and Higher Dimensional Signals" in SIAM Conference on Imaging Science 2006, Minneapolis.

Teaching

- *Sparsity and Compressed Sensing*, Master (M2), ENS Cachan, ∼27h.
- *Shape and surface processing with manifold methods* (with L. Cohen), Master (M2), ENS Cachan, ∼16h.

Publications

Articles in Journals

[1] G-S. Xia, S. Ferradans, G. Peyré, and J-F. Aujol. Synthesizing and mixing stationary gaussian texture models. *to appear in SIAM Journal on Imaging Sciences*, 2013.

[2] N. Papadakis, G. Peyré, and E. Oudet. Optimal transport with proximal splitting. *SIAM Journal on Imaging Sciences*, 7(1):212–238, 2014.

[3] P. Alquier, K. Meziani, and G. Peyré. Adaptive estimation of the density matrix in quantum homodyne tomography with noisy data. *Inverse Problems*, 29(7):075017, 2013.

[4] H. Raguet, J. Fadili, and G. Peyré. A generalized forward-backward splitting. *SIAM Journal on Imaging Sciences*, 6(3):1199–1226, 2013.

[5] J. Elder, T. Oleskiw, A. Yakubovich, and G. Peyré. On growth and formlets: Sparse multi-scale coding of planar shape. *Image and Vision Computing*, 31(1):1–13, 2013.

[6] S. Vaiter, G. Peyré, C. Dossal, and J. Fadili. Robust sparse analysis regularization. *IEEE Transactions on Information Theory*, 59(4):2001–2016, 2013.

[7] S. Vaiter, C. Deledalle, G. Peyré, J. Fadili, and C. Dossal. Local behavior of sparse analysis regularization: Applications to risk estimation. *Applied and Computational Harmonic Analysis*, 35(3):433–451, 2013.

[8] C. Dossal, M. Kachour, J. Fadili, G. Peyré, and C. Chesneau. The degrees of freedom of penalized l1 minimization. *Statistica Sinica*, 23(2):809–828, 2013.

[9] M. Jung, G. Peyré, and L. D. Cohen. Nonlocal active contours. *SIAM Journal on Imaging Sciences*, 5(3):1022–1054, 2012.

[10] C. Dossal, M.L. Chabanol, G. Peyré, and J. Fadili. Sharp support recovery from noisy random measurements by l1 minimization. *Applied and Computational Harmonic Analysis*, 33(1):24–43, 2012.

[11] G. Peyré. The numerical tours of signal processing - advanced computational signal and image processing. *IEEE Computing in Science and Engineering*, 13(4):94–97, 2011.

[12] L. Jacques, L. Duval, C. Chaux, and G. Peyré. A panorama on multiscale geometric representations, intertwining spatial, directional and frequency selectivity. *Signal Processing*, 91(12):2699–273, 2011.

[13] G. Peyré, S. Bougleux, and L. D. Cohen. Non-local regularization of inverse problems. *Inverse Problems and Imaging*, 5(2):511–530, 2011.

[14] G. Peyré. A review of adaptive image representations. *IEEE Journal of Selected Topics in Signal Processing*, 5(5):896–911, 2011.

[15] A. Ion, N. M. Artner, G. Peyré, W. G. Kropatsch, and L. D. Cohen. Matching 2d and 3d articulated shapes using the eccentricity transform. *Computer Vision and Image Understanding*, 115(6):817–834, 2011.

[16] P. Maurel, J-F. Aujol, and G. Peyré. Locally parallel texture modeling. *SIAM Journal on Imaging Sciences*, 4(1):413–447, 2011.

[17] G. Carlier, M. Comte, I. Ionescu, and G. Peyré. A projection approach to the numerical analysis of limit load problems. *Mathematical Models and Methods in Applied Sciences*, 21(6):1291–1316, 2011.

[18] L. Demanet and G. Peyré. Compressive wave computation. *Fundation of Computational Mathematics*, 11(3):257–303, 2011.

[19] G. Peyré, M. Pechaud, R. Keriven, and L.D. Cohen. Geodesic methods in computer vision and graphics. *Foundations and Trends in Computer Graphics and Vision*, 5(3-4):197–397, 2010.

[20] J. Fadili and G. Peyré. Total variation projection with first order schemes. *IEEE Transactions on Image Processing*, 20(3):657–669, 2011.

[21] G. Peyré, J. Fadili, and J-L. Starck. Learning the morphological diversity. *SIAM Journal on Imaging Sciences*, 3(3):646–669, 2010.

[22] F. Benmansour, G. Carlier, G. Peyré, and F. Santambrogio. Derivatives with respect to metrics and applications: Subgradient marching algorithm. *Numerische Mathematik*, 116(3):357–381, 2010.

[23] G. Peyré. Best basis compressed sensing. *IEEE Transaction on Signal Processing*, 58(5):2613–2622, 2010.

[24] C. Dossal, G. Peyré, and J. Fadili. A numerical exploration of compressed sampling recovery. *Linear Algebra and Applications*, 432(7):1663–1679, 2010.

[25] F. Benmansour, G. Carlier, G. Peyré, and F. Santambrogio. Numerical approximation of continuous traffic congestion equilibria. *Networks and Eterogeneous Media*, 3(4):605–623, 2009.

[26] G. Peyré. Texture synthesis with grouplets. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 4(32):733–746, 2010.

[27] G. Peyré. Manifold models for signals and images. *Computer Vision and Image Understanding*, 113(2):249–260, February 2009.

[28] G. Peyré. Sparse modeling of textures. *Journal of Mathematical Imaging and Vision*, 34(1):17–31, 2009.

[29] G. Carlier, M. Comte, and G. Peyré. Approximation of maximal cheeger sets by projection. *ESAIM: Mathematical Modelling and Numerical Analysis*, 43(1):131–150, 2009.

[30] G. Peyré. Image processing with non-local spectral bases. *SIAM Multiscale Modeling and Simulation*, 7(2):703–730, 2008.

[31] G. Peyré and L. D. Cohen. Heuristically driven front propagation for fast geodesic extraction. *International Journal for Computational Vision and Biomechanics*, 1(1):55–67, 2008.

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[33] S. Mallat and G. Peyré. A review of bandlet methods for geometrical image representation. *Numerical Algorithms*, 44(3):205–234, 2007.

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[35] G. Peyré and S. Mallat. Surface compression with geometric bandelets. *ACM Transactions on Graphics*, 24(3):601–608, July 2005.

Preprints

[36] G. Nardi, G. Peyré, and F-X. Vialard. A second-order total variation metric on the space of immersed curves. Technical report, Preprint hal-00952672, 2014.

[37] G. Tartavel, Y. Gousseau, and G. Peyré. Variational texture synthesis with sparsity and spectrum constraints. Technical report, Preprint Hal-00881847, 2013.

[38] N. Bonneel, J. Rabin, G. Peyré, and H. Pfister. Sliced and radon wasserstein barycenters of measures. Technical report, Preprint Hal-00881872, 2013.

[39] J. Liang, J. Fadili, and G. Peyré. Iteration-complexity of a generalized forward backward splitting algorithm. Technical report, Preprint arXiv:1310.6636, 2013.

[40] G. Charpiat, G. Nardi, G. Peyré, and F-X. Vialard. Finsler steepest descent with applications to piecewise-regular curve evolution. Technical report, Preprint hal-00849885, 2013.

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[43] V. Duval and G. Peyré. Exact support recovery for sparse spikes deconvolution. Technical report, Preprint hal-00839635, 2013.

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Books

[45] G. Peyré. *L'algebre discrete de la transformee de Fourier*. editions Ellipses Marketing, 2004.

[46] V. Beck, J. Malick, and G. Peyré. *Objectif Agregation, 2nd edition*. editions H et K,, 2004.

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[48] J. Fadili, G. Peyré, S. Vaiter, C. Deledalle, and J. Salmon. Stable recovery with analysis decomposable priors. In *Proc. Sampta'13*, pages 113–116, 2013.

[49] S. Vaiter, G. Peyré, and J. Fadili. Robust polyhedral regularization. In *Proc. Sampta'13*, pages 156–159, 2013.

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[52] S. Ferradans, N. Papadakis, G. Peyré, and J-F. Aujol. Regularized discrete optimal transport. In Arjan Kuijper, Kristian Bredies, Thomas Pock, and Horst Bischof, editors, *Proc. SSVM'13*, volume 7893 of *Lecture Notes in Computer Science*, pages 428–439. Springer Berlin Heidelberg, 2013.

[53] C. Deledalle, S. Vaiter, G. Peyré, J. Fadili, and C. Dossal. Risk estimation for matrix recovery with spectral regularization. In *Proc. ICML'12 Workshops*, 2012.

[54] S. Vaiter, C. Deledalle, G. Peyré, J. Fadili, and C. Dossal. Degrees of freedom of the group lasso. In *Proc. ICML'12 Workshops*, 2012.

[55] C. Deledalle, S. Vaiter, G. Peyré, J. Fadili, and C. Dossal. Proximal splitting derivatives for risk estimation. In *Proc. NCMIP'12*, 2012.

[56] G. Peyré, J. Fadili, and J. Rabin. Wasserstein active contours. In *Proc. ICIP'12*, 2012.

[57] C. Deledalle, S. Vaiter, G. Peyré, J. Fadili, and C. Dossal. Unbiased risk estimation for sparse analysis regularization. In *Proc. ICIP'12*, 2012.

[58] G-S. Xia, S. Ferradans, G. Peyré, and J-F. Aujol. Compact representations of stationary dynamic textures. In *Proc. ICIP'12*, 2012.

[59] M. Kachour, C. Dossal, J. Fadili, G. Peyré, and C. Chesneau. The degrees of freedom of the lasso in underdetermined linear regression models. In *Proc. SPARS 2011*, 2011.

[60] G. Peyré, J. Fadili, and C. Chesneau. Adaptive structured block sparsity via dyadic partitioning. In *Proc. EUSIPCO 2011*, pages 1455–1459, 2011.

[61] G. Peyré and J. Fadili. Group sparsity with overlapping partition functions. In *Proc. EUSIPCO 2011*, pages 303–307, 2011.

[62] M. Jung, G. Peyré, and L. D. Cohen. Texture segmentation via non-local non-parametric active contours. In *Proc. EMMCVPR 2011*, volume 6819/2011, pages 74–88, 2011.

[63] N. Schmidt, G. Peyré, and Y. Fregnac. Dissipative wave model fitting using localized sources. In *Proc. Waves 2011*, pages 473–476, 2011.

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[65] J. Rabin and G. Peyré. Wasserstein regularization of imaging problem. In *Proc. ICIP'11*, pages 1541–1544, 2011.

[66] M. Jung, G. Peyré, and L. D. Cohen. Non-local active contours. In *LNCS, Proc. SSVM'11*, volume 6667, pages 255–266. Springer, 2011.

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[68] G. Peyré and J. Fadili. Learning analysis sparsity priors. In *Proc. of Sampta'11*, 2011.

[69] J. Rabin, G. Peyré, and L. D. Cohen. Geodesic shapes and surfaces retrieval via optimal mass transport. In *Proc. of ECCV'10*, pages 771–784. Springer-Verlag, 2010.

[70] T. Oleskiw, G. Peyré, and J. Elder. On growth and formlets: Sparse multi-scale coding of planar shape. In *Proc. of CVPR'10*, pages 459–466. IEEE, June 2010.

[71] N. Schmidt, G. Peyré, Y. Fregnac, and P. E. Roland. Separation of traveling waves in cortical networks using optical imaging. In *Proc. of ISBI'10*, pages 868–871. IEEE Press, April 2010.

[72] N. Ouarti and G. Peyré. Best basis denoising with non-stationary wavelet packets. In *Proc. of ICIP'09*, pages 3825–3828, November 2009.

[73] J. Fadili and G. Peyré. Total variation projection with first order schemes. In *Proc. of ICIP'09*, pages 1325–1328, November 2009.

[74] C. Dossal, G. Peyré, and J. Fadili. Challenging restricted isometry constants with greedy pursuit. In *Proc. of ITW'09*, pages 475–479, October 2009.

[75] S. Bougleux, G. Peyré, and L. D. Cohen. Image compression with anisotropic geodesic triangulations. In *Proc. of ICCV'09*, pages 2343–2348, October 2009.

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[77] M. Pechaud, G. Peyré, and R. Keriven. Extraction of tubular structures over an orientation domain. In *Proc. of CVPR'09*, pages 336–342. IEEE, 2009.

[78] C. Dossal, G. Peyré, and J. Fadili. A numerical exploration of compressed sampling recovery. In *Proc. of SPARS'09*, 2009.

[79] S. Bougleux, G. Peyré, and L. D. Cohen. Anisotropic geodesics for perceptual grouping and domain meshing. In D. A. Forsyth, P. H. S. Torr, and A. Zisserman, editors, *Proc. of ECCV'08*, volume 5303 of *Lecture Notes in Computer Science*, pages 129–142. Springer, 2008.

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[81] A. Ion, N. M. Artner, G. Peyré, S. B. L. Marmol, W. G. Kropatsch, and L. D. Cohen. 3d shape matching by geodesic eccentricity. In *Proc. Computer Vision and Pattern Recognition Workshops*, pages 1–8, 2008.

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[84] G. Peyré, E. LePennec, C. Dossal, and S. Mallat. Geometric estimation with orthogonal bandlet bases. In *Proc. of SPIE Wavelet XII*, pages 67010M.1–67010M.10, 2007.

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[95] G. Peyré and L. D. Cohen. Geodesic re-meshing and parameterization using front propagation. In *Proc. of VLSM'03*, pages 33–40, 2003.

Book Chapters

[96] G. Peyré. *Le traitement numérique des images*, chapter Images des mathématiques. CNRS, 2011.

[97] G. Peyré. *Un exploration numerique du traitement des signaux, des images et des surfaces*, volume 94, chapter MATAPLI, pages 41–64. SMAI, 2011.

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[99] G. Peyré and L. D. Cohen. *Progress in Nonlinear Differential Equations and Their Applications*, volume 63, chapter Geodesic Computations for Fast and Accurate Surface Remeshing and Parameterization, pages 157–171. Springer, 2005.

[100] S. Mallat and G. Peyré. *Journee annuelle de la SMF*, chapter Traitement geometrique des images par bandelettes. SMF, june 2006.

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[101] G. Peyré and J. Fadili. Apprentissage d'a priori analyse. In *Gretsi'11*, 2011.

[102] G. Peyré, J. Fadili, and C. Chesneau. Parcimonie adaptative structuree par blocs dyadiques. In *Gretsi'11*, 2011.

[103] J. Rabin and G. Peyré. Regularisation de wasserstein et application au transfert de couleur. In *Gretsi'11*, 2011.

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