

# Curriculum Vitae

Xavier Bresson

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## Fields of Research

- Computational science and mathematical modeling (variational models, PDEs, optimization algorithms) applied to image processing (e.g. image segmentation, image denoising, image registration), machine learning (data clustering) and medical imaging.

## Current Position

- Postdoctoral Scholar at UCLA with Tony Chan & Stanley Osher since 2006

## Education

- Ph.D. in Computer Vision, Swiss Federal Institute of Technology (EPFL), 2005, Advisor: Jean-Philippe Thiran, nominated for the best EPFL thesis
- M.Sc. in Control Theory and Signal Processing, University of Paris XI, 2000
- M.Sc. from Supelec (School of Electricity), Paris, 2000
- M.Sc. in Theoretical Physics, University of Marseille, 1998

## Achievements

- 11 published journal papers (e.g. 3 papers in international journal of computer vision, ranked 2 of 94 in section "computer science and artificial intelligence")
- 350 citations according to Google Scholar, my h-index is 10 and my g-index is 17
- 5 invited talks in international conferences and workshops (including SIAM imaging conference, international conference on free boundary problems: theory and applications, and institute for mathematics and its applications at Minneapolis)
- 1 symposium organizer at SIAM imaging conference in 2008
- Co-supervision of 4 PhD students: Ethan Brown (UCLA), Tom Goldstein (UCLA), Kangyu Ni (UCLA), Nawal Houhou (EPFL)
- Faculty mentor for the institute of pure and applied mathematics (IPAM) at UCLA in "Research in Industrial Projects for Students" (RIPS) with Arete Company, summer 2007
- Program committee of international conference on imaging theory and applications, 2009
- Consulting for private companies (e.g. Philips Medical Research in Paris)
- Lecturer at Hong Kong Baptist University, Institute for Computational Mathematics, 2008, contact: Prof. Michael Ng

## Grant

- Principal Investigator: "Convex Variational Models and Fast Algorithms for Image Processing and Machine Learning", National Science Foundation, 2010-2013, submitted

## Participation to Grants (source of my funding)

- "Mathematical Models & Computational Algorithms for Image Processing, computer Vision & Computer Graphics", National Science Foundation, NSF IIS-0914580, contact: Prof. Tony Chan, 2009-2012
- "Mathematical Framework & Models for Image Understanding", Office of Naval Research, ONR N00014-09-1-0105, Contact: Prof. Tony Chan, 2009-2012
- "Shape Prior in Variational Image Segmentation", National Swiss Fundation, contact: Prof. Jean-Philippe Thiran, 2005-2007

## References

- Prof. Tony F. Chan, Hong Kong University of Science and Technology (HKUST), and Emeritus Professor at University of California, Los Angeles (UCLA), email: tonyfchan@ust.hk
- Prof. Stanley Osher, Department of Mathematics, UCLA, email: sjo@math.ucla.edu
- Prof. Jean-Philippe Thiran, Department of Electrical Engineering, Swiss Federal Institute of Technology (EPFL), email: jp.thiran@epfl.ch
- Prof. Xuecheng Tai, Department of Mathematics, University of Bergen (Norway) & Nanyang Technological University (Singapore), email: tai@mi.uib.no
- Prof. Vicent Caselles, Department of Applied Mathematics, Pompeu Fabra University, email: vicent.caselles@upf.edu
- Prof. Luminita Vese, Department of Mathematics, UCLA, email: lvese@math.ucla.edu
- Prof. Jean-Michel Morel, Department of Mathematics, Ecole Normale Supérieure de Cachan, Paris, email: morel@cmla.ens-cachan.fr
- Prof. Michael Ng, Department of Mathematics, Hong Kong Baptist University (HKBU), email: mng@math.hkbu.edu.hk
- Prof. Nikos Paragios, Ecole Centrale de Paris, email: nikos.paragios@ecp.fr

## Academic services

- Thesis committees at EPFL: Nawal Houhou, Valerie Duay, Laura Gui
- Regular reviewer for: IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), International Journal of Computer Vision (IJCV), SIAM Journal on Imaging Sciences (SIIMS), IEEE Transactions on Image Processing (TIP), IEEE Transactions on Medical Imaging (TMI), Journal of Mathematical Imaging and Vision (JMIV), SIAM Multiscale Modeling and Simulation (MMS), SIAM Journal on Scientific Computing (SISC), Computer Vision and Image Understanding (CVIU), Journal Of Computational Physics (JCOMP), International Conference on Image Processing (ICIP), International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)

## Teaching

- Teaching Assistant at the Swiss Federal Institute of Technology (EPFL), 30 hours, Contact: Prof. Jean-Philippe Thiran (jp.thiran@epfl.ch)

## Computer Skills

- Operating systems: Windows, Unix, Linux
- Programming & Applications: Matlab, C, C++, ITK

## Most Significant Publications

- X. Bresson, S. Esedoglu, P. Vanderghenst, J.P. Thiran and S. Osher, "Fast Global Minimization of the Active Contour/Snake Model", Journal of Mathematical Imaging and Vision, 28(2), 151-167, 2007
- X. Bresson, P. Vanderghenst and J.P. Thiran, "Multiscale Active Contours", International Journal of Computer Vision, 70(3), 197-211, 2006
- E.S. Brown, T.F. Chan and X. Bresson, "Convex Formulation and Exact Global Solutions for Multi-phase Piecewise Constant Mumford-Shah Image Segmentation", Preprint, 2009
- A. Szlam and X. Bresson, "A Total Variation-based Graph Clustering Algorithm for Cheeger Ratio Cuts", Preprint, 2009

## Most Cited Publications

- X. Bresson, S. Esedoglu, P. Vanderghenst, J.P. Thiran and S. Osher, "Fast Global Minimization of the Active Contour/Snake Model", *Journal of Mathematical Imaging and Vision*, 28(2), 151-167, 2007, *65 citations*
- L. Jonasson, X. Bresson, P. Haggmann, O. Cuisenaire, R. Meuli and J.P. Thiran, "White Matter Fiber Tract Segmentation in DT-MRI Using Geometric Flows", *Medical Image Analysis*, 9(3), 223-236, 2005, *45 citations*
- X. Bresson, P. Vanderghenst and J.P. Thiran, "A Variational Model for Object Segmentation Using Boundary Information and Statistical Shape Prior Driven by the Mumford-Shah Functional", *International Journal of Computer Vision*, 68(2), 145-162, 2006, *29 citations*

## Selected Talks (among more than 40)

- Special Workshop on Research in Imaging Sciences, Institute for Mathematics and its Applications University of Minnesota, Oct. 2009
- Ecole Telecom ParisTech, Image Processing Seminar, Paris, Prof. Isabelle Bloch, Sept. 2009
- University of Bonn, Germany, Computer Science Department, Prof. Daniel Cremers, Sept. 2009
- Ecole Centrale de Paris, Computer Vision Seminar, Paris, Prof. Nikos Paragios, Sept. 2009
- Hong Kong Baptist University, International Conference on Scientific Computing and Partial Differential Equations, Dec. 2008
- Hong Kong University of Science and Technology, Seminar on Applied Mathematics, Prof. Xiao-Ping Wang, Dec. 2008
- SIAM Conference on Imaging Science, San Diego, USA, Minisymposium on Variational and PDE-based Image Inpainting, July 2008
- Workshop Trends in Applied Harmonic Analysis, Banff International Research Station, Canada, Sept. 2007
- International Conference on Image Processing, San Antonio, USA, Sept. 2007
- UCLA, Applied Math Colloquium, Prof. Luminita Vese, May 2007
- UCLA, Level Set Collective Seminar, Prof. Stan Osher, Nov. 2006
- UCLA, Imagers Seminar, Prof. Tony Chan, Dec. 2006
- Computer Science Department, Technion, Israel, The Pixel Club, Prof. Ron Kimmel, June 2006
- French National Institute for Research in Computer Science and Control (INRIA), Nice, France, Prof. Rachid Deriche, March 2006
- International Conference on Scale Space and PDE methods in Computer Vision, Hofgeismar, Germany, April 2005

## Hobbies

- Traveling (three months backpacking in Asia), cooking, sports (semi-marathon), cinema

## List of publications

### Refereed Journal Papers (11 papers)

- T. Goldstein, X. Bresson, and S. Osher, "Geometric Applications of the Split Bregman Method: Segmentation and Surface Reconstruction", *Journal of Scientific Computing*, Accepted, 2009
- K. Ni, X. Bresson, T. Chan and S. Esedoglu, "Local Histogram Based Segmentation Using the Wasserstein Distance", 84(1), 97-111, *International Journal of Computer Vision*, 2009
- N. Houhou, J.-P. Thiran and X. Bresson, "Fast Texture Segmentation based on Semi-Local Region Descriptor and Active Contour", *Numerical Mathematics: Theory, Methods and Applications*, 2(4), 445-468, 2009
- X. Bresson and T. Chan, "Fast Minimization of the Vectorial Total Variation Norm and Applications to Color Image Processing", *Inverse Problems and Imaging*, 2(4), 455-484, 2008
- X. Bresson, S. Esedoglu, P. Vanderghenst, J.P. Thiran and S. Osher, "Fast Global Minimization of the Active Contour/Snake Model", *Journal of Mathematical Imaging and Vision*, 28(2), 151-167, 2007
- I. Bogdanova, X. Bresson, J.P. Thiran and P. Vanderghenst, "Scale Space Analysis and Active Contour on Omnidirectional Images", *IEEE Transactions on Image Processing*, 16(7), 1888-1901, 2007
- L. Jonasson, X. Bresson, P. Haggmann, J.P. Thiran and V. Wedeen, "Representing Diffusion MRI in 5D Simplifies Regularization and Segmentation of White Matter Tracts", *IEEE Transactions on Medical Imaging*, 26(11), 1547-1554, 2007
- L. Jonasson, P. Haggmann, C. Pollo, X. Bresson, C. Richero Wilson, R. Meuli and J.P. Thiran, "A Level Set Method For Segmentation of The Thalamus And Its Nuclei in DT-MRI", *Signal Processing*, 87(2), 309-321, 2007
- X. Bresson, P. Vanderghenst and J.P. Thiran, "Multiscale Active Contours", *International Journal of Computer Vision*, 70(3), 197-211, 2006

- X. Bresson, P. Vanderghelynst and J.P. Thiran, "A Variational Model for Object Segmentation Using Boundary Information and Statistical Shape Prior Driven by the Mumford-Shah Functional", *International Journal of Computer Vision*, 68(2), 145-162, 2006
- L. Jonasson, X. Bresson, P. Hagmann, O. Cuisenaire, R. Meuli and J.P. Thiran, "White Matter Fiber Tract Segmentation in DT-MRI Using Geometric Flows", *Medical Image Analysis*, 9(3), 223-236, 2005

#### Journal papers in preparation or submitted (7)

- A. Szlam and X. Bresson, "A Total Variation-based Graph Clustering Algorithm for Cheeger Ratio Cuts"
- T. Goldstein, X. Bresson, and S. Osher, "Global Minimization of Markov Random Fields with Applications to Optical Flow"
- E.S. Brown, T.F. Chan and X. Bresson, "Convex Formulation and Exact Global Solutions for Multi-phase Piecewise Constant Mumford-Shah Image Segmentation"
- M. Jung and X. Bresson and T.F. Chan and L.A. Vese, "Nonlocal Mumford-Shah Regularizers for Color Image Restoration"
- D. Zosso, X. Bresson, and J.P. Thiran, "Geodesic Active Fields for Image Registration"
- X. Zhang, M. Burger, X. Bresson, and S. Osher, "Bregmanized Nonlocal Regularization for Deconvolution and Sparse Reconstruction"
- X. Bresson and T. Chan, "Non-local Unsupervised Variational Image Segmentation Models"

#### Refereed Conference Papers (8 oral & 8 poster)

- M. Jung, X. Bresson, T.F. Chan, L.A. Vese, "Color Image Restoration Using Nonlocal Mumford-Shah Regularizers", *Energy Minimization Methods in Computer Vision and Pattern Recognition*, 2009
- N. Houhou, X. Bresson, A. Szlam, T.F. Chan and J.-P. Thiran, "Semi-Supervised Segmentation based on Non-local Continuous Min-Cut", *International Conference on Scale Space and Variational Methods in Computer Vision*, 2009
- V. Duay, X. Bresson, F. J. Sanchez Castro, C. Pollo, M. Bach Cuadra and J.-P. Thiran, "An Active Contour-based Atlas Registration Model applied to Automatic Subthalamic Nucleus Targeting on MRI: Method and Validation", *Medical Image Computing and Computer Assisted Interventions*, 2008
- V. Duay, X. Bresson, F. J. Sanchez Castro, C. Pollo, M. Bach Cuadra and J.-P. Thiran, "An Active Contour-based Atlas Registration Model applied to Automatic Subthalamic Nucleus Targeting on MRI: Method and Validation", *Medical Image Computing and Computer Assisted Interventions*, 2008
- N. Houhou, J.-P. Thiran and X. Bresson, "Fast Texture Segmentation Model based on the Shape Operator and Active Contour", *Computer Vision and Pattern Recognition*, 1-8, 2008
- X. Bresson and T. Chan, "Active Contours Based on Chambolle's Mean Curvature Motion", *International Conference on Image Processing*, 33-36, 2007
- V. Duay, X. Bresson, N. Houhou, M. Bach and J.P. Thiran, "Registration of Multiple Regions Derived from the Optical Flow Model and the Active Contour Framework", *European Signal Processing Conference*, 282-286, 2007
- X. Bresson and J.P. Thiran, "Image Segmentation Model Using Active Contour and Image Decomposition", *International Conference on Image Processing*, 1657-1660, 2006
- V. Duay, M. Bach, X. Bresson and J.P. Thiran, "Dense Deformation Field Estimation for Atlas Registration Using the Active Contour Framework", *European Signal Processing Conference*, 2006
- X. Bresson, P. Vanderghelynst and J.P. Thiran, "Multiscale Active Contours", *5th International Conference on Scale Space and PDE methods in Computer Vision*, LNCS 3459, 167-178, 2005
- L. Jonasson, P. Hagmann, C. Richero Wilson, X. Bresson, C. Pollo, R. Meuli and J.P. Thiran, "Coupled Region Based Level Sets for Segmentation of the Thalamus and its Subnuclei in DT-MRI", *International Society for Magnetic Resonance in Medicine*, 2005
- L. Jonasson, P. Hagmann, X. Bresson, J.P. Thiran and V. Wedeen, "Representing Diffusion MRI in 5D for Segmentation of White Matter Tracts with a Level Set Method", *Information Processing in Medical Imaging*, 311-320, 2005
- S. Roy, J. Broquet, X. Bresson and J.P. Thiran, "Semi-Automatic contour Analysis of the Optic Nerve Head", *International Meeting of International Neuro-Ophthalmology Society*, 2004
- X. Bresson, P. Vanderghelynst and J.P. Thiran, "A Priori Information in Image Segmentation: Energy Functional based on Shape Statistical Model and Image Information", *International Conference on Image Processing*, 428-428, 2003
- L. Jonasson, P. Hagmann, X. Bresson, R. Meuli, O. Cuisenaire and J.P. Thiran, "White Matter Mapping in DT-MRI Using Geometric Flows", *Computer Aided Systems Theory*, 2809, 585-596, 2003
- X. Bresson, P. Vanderghelynst and J.P. Thiran, "Geometric Moments in Scale-Spaces", *16th International Conference on Pattern Recognition*, 4, 418-421, 2002

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