

# Jérôme Darbon

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## Research Interests

Inverse Problems; Computational Imaging; Combinatorial optimization, especially network flows; Design and low level implementation of algorithms ; Applications to document, medical, biological and radar imaging.

## Positions and Education

- Oct/09-Present** RESEARCHER IN COMPUTER SCIENCE WITH CNRS  
Appointed at CMLA, ENS Cachan, to favor interactions between computer science and mathematics.
- Jun/06-Present** POSTDOCTORAL SCHOLAR at UCLA Department of Mathematics
- Nov/05-Jul/06** RESEARCH AND TEACHING POSITION at Ecole Pour l'Informatique et les Technologies Avancées, Paris, France
- Nov/01-Oct/05** PHD IN COMPUTER SCIENCE from Ecole Nationale Supérieure des Télécommunications, Paris, France  
Graduated with high honors.
- Sep/00-Sep/01** M.SC APPLIED MATHEMATICS at Ecole Normale Supérieure de Cachan, France.  
Graduated with high honors.
- Sep/98-Jun/01** M.SC, COMPUTER SCIENCES STUDIES at Ecole Pour l'Informatique et les Techniques Avancées, Paris, France.

## Grants

- 2007-2010** CO-PRINCIPAL INVESTIGATOR: Continuum applications of discrete optimization  
Funded by US NAVY/ONR N000140710810. \$ 115,000 per year for 2007–2010. Co-PI: Stanley Osher.  
Contact: Reza Malek-Madani

## Patents

- 2008** PATENT: *A fast computational method for noise reduction in digital images and videos*  
Joint patent with UCLA and Caltech, Co-inventor Alexandre Cunha (Caltech Center for Advanced Computing Research). See publications.

## Honors

- 2009** RECIPIENT of the UCLA Chancellor's Award for Postdoctoral Research  
<http://www.gdnet.ucla.edu/deans/event/postdocshw.htm>

## Students Supervision

- Oct/2007-Present** PH.D STUDENT CO-SUPERVISION  
Subject: *Optimization with Graph-cuts*, at Ecole Nationale Supérieure des Télécommunications, Paris, co-advised with Florence Tupin. PhD student: Aymen Shabou.
- Oct/2008-Present** PH.D STUDENT CO-SUPERVISION  
Participation to the supervision of the Ph.D of Alexandre Borghi at Laboratoire de Recherche en Informatique (LRI), Université Paris-Sud. Sylvain Peyronnet is the principal and official adviser.
- Jul-Aug/2008** M.SC INTERNSHIP CO-ADVISOR  
Subject: *An efficient compressive sensing algorithm for parallel many-core architectures (e.g., Multi-cores CPU, GPU, Cell)*. Co-advised with Sylvain Peyronnet from Laboratoire de Recherche en Informatique (LRI), Université Paris-Sud. Student: Alexandre Borghi. See publications.
- 2005** INTERNSHIP CO-ADVISOR  
Subject: *Development and evaluation of a reference system for hand shape based authentication*, (7 months). Co-advised with Laurence Likforman at Ecole Nationale Supérieure des Télécommunications. Student: Geoffroy Fouquier. See publications.

## Teaching Experience

- 2005-2006** LECTURES at Ecole Pour l'Informatique et les Techniques Avancées, Paris  
60 hours (2x30h) on convex optimization for 2<sup>nd</sup> year engineering students
- 2003-2005** TEACHING ASSISTANT at Ecole Nationale Supérieure des Télécommunications, Paris  
- 45 hours (3x15h) of java for Master students,  
- 45 hours (3x15h) of C++ for 2<sup>nd</sup> year engineering and Master students  
- 30 hours (2x15h) of C under UNIX for 2<sup>nd</sup> year engineering students  
- 8 hours on Markov Random Fields
- 2002-2006** LECTURES at Ecole Pour l'Informatique et les Techniques Avancées, Paris  
60 hours (2x30h) on Image Processing and Computer Vision for 3<sup>rd</sup> year engineering students
- 2000-2005** TEACHING ASSISTANT at Lycée Condorcet, Paris  
150 hours (5x30h) on Computer Science preparation for competitive examinations to enter French Higher Engineering Schools. Basic algorithms and their implementations in CAML
- 2000-2002** LECTURES at Ecole Pour l'Informatique et les Techniques Avancées, Paris  
60 hours (2x30h) on introduction to calculus and algebra for under-graduate students
- 2001** LECTURES at Ecole Pour l'Informatique et les Techniques Avancées, Paris  
30 hours (2x15h) on introduction to signal processing for under-graduate students

## Event Organizations

- 2008** CO-ORGANIZER OF THE INSTITUTE FOR PURE AND APPLIED MATHEMATICS (IPAM) WORKSHOP: *Graph Cuts and Related Discrete or Continuous Optimization Problems*  
UCLA, Los Angeles, February 2008. <http://www.ipam.ucla.edu/programs/gc2008/>  
Co-organizers: Y. Boykov, D. Cremers, H. Ishikawa, V. Kolmogorov and S. Osher.
- 2006** ORGANIZER OF THE SPECIAL TRACK ON *Energy Minimization Approaches in Image Processing and Computer Vision*  
Of the International Symposium on Visual Computing, ISVC'06. Co-organizer: J. Bioucas-Dias and A. Chambolle.
- 2005** CO-ORGANIZER OF THE COMBINED DOCTORAL SYMPOSIUM AND 15TH PHDOOS WORKSHOP  
held at ECOOP'05 in Glasgow, Scotland. <http://www.ecoop.org/phdoos/ecoop2005phd/>

## Visiting Positions

- 2006 INVITED RESEARCHER at Institut de Recherche pour le Développement, Cayenne, French Guyana, France. One week. Development of algorithms for detecting changes in multispectral satellite images. Contact: Jamal Atif. This work is also done in collaboration with Gary Hewer and Arjuna Flenner from the Naval Air Warfare Center Weapons Division.
- Apr-May/2006 INVITED RESEARCHER at Electrical Engineering Dpt of Bogazici University, Istanbul, Turkey. My host was Bülent Sankur.
- May-Sep/2003 INVITED VISITOR at Electrical Engineering Dpt of Bogazici University, Istanbul, Turkey. My host was Bülent Sankur.

## Editing and Program Committees

- 2008 CO-GUEST-EDITOR of SIAM Journal on Imaging Sciences (SIIMS) Special Issue on Optimization in Imaging Science, Co-guest editors: A. Blake, E. Boros, Y. Boykov and P. Torr.  
[http://www.siam.org/journals/siims/siims\\_si.php](http://www.siam.org/journals/siims/siims_si.php)
- PROGRAM COMMITTEES
- EMMCVPR 2009, Energy Minimization Methods in Computer Vision and Pattern Recognition.
  - ICISP 2010, International Conference on Image and Signal Processing.
  - CompIMAGE'2010 Symposium - Computational Modeling of Objects Represented in Images: Fundamentals, Methods and Applications,
  - ISVC, International Symposium on Visual Computing 07,08,09,10.

## Tutorial

- 2008 INVITED SPEAKER at the Summer School on Mathematical Imaging and Digital Media, Singapore. Tutorial of 8 hours on *Graph-cuts for Image Processing*  
<http://www.ims.nus.edu.sg/Programs/imaging08/activities.htm>

## Plenary Speaker

- 2010 Workshop on Imaging Sciences and Medical Applications  
*Combinatorial and Parallel Programming point of views for Markovian Energies Optimization in Image Processing*  
<http://www.mat.uc.pt/~isma2010/>

## Invited Colloquia and Seminars

- 17) *Combinatorial and parallel programming point of views for Markovian Energies Minimization in Image Processing*  
Mathematical Methods for Imaging Seminar, Institut Henri Poincaré Paris, December 2009.
- 16) *Dynamic Network Flows and Non-linear Discrete Total Variation Evolutions.*  
Institut Camille Jordan Seminar, Université, Lyon October 2009.
- 15) *Combinatorial and parallel programming point of views for Markovian Energies Minimization.*  
CMLA's seminar, Ecole Normale Supérieure de Cachan, April 2009.
- 14) *Combinatorial and parallel programming point of views for Markovian Energies Minimization.*  
ARIANA team seminar, INRIA Sophia-Antipolis, April 2009.
- 13) *Markovian Energies Minimization via Maximum Flow.*  
Applied & Computational Mathematics Colloquium of California Institute of Technology, Pasadena, November 2008.
- 12) *Markovian Energies Minimization Via Maximum Flow.*  
Seminar of Jacques-Louis Lions Laboratory, University of Paris 6, May 2008, Paris, May 2008.
- 11) *Total Variation Minimization and maximum-flows.*  
Seminar at University des Antilles-Guyanne, Cayenne, French Guyana, May 2008.
- 10) *Total Variation Optimization and "Graph-cut".*  
Mathematics department Colloquium of Rochester Institute of Technology, Rochester, April 2008.
- 9) *Discrete and Continuous Parametric Max-Flows, Graph-Cuts and TV Optimization.*  
Colloquium of the department of computational and applied mathematics of RICE University, Houston, Oct. 2007.

- 8) *Global Optimization of Markovian Energies with Pairwise Interactions via Maximum-Flow*. Applied Mathematics Colloquium of UCLA, April 2007.
- 7) *Fast and Exact Optimization of the discrete Total Variation*. Seminar of SIEMENS Corp., Princeton, March 2007.
- 6) *Exact Optimization for Discrete image processing Energies with pairwise submodular and supermodular priors*. Seminar of INRIA Sophia-Antipolis, Nice, France, January 2007.
- 5) *Exact Optimization for Discrete image processing Energies with pairwise submodular and supermodular priors*. Image Processing seminar of Ecole Nationale Supérieure des Télécommunications, Paris, January 2007.
- 4) *Exact Discrete Total Variation Minimization*. Laboratoire A2SI, Ecole des Sciences et Technologies de l'information et de la communication, Paris, February 2006.
- 3) *Image Restoration with Markov Random Fields: Total Variation, Levelable and Convex Energies*. Mathematical Seminar of Instituto Superior Técnico (IST), Lisboa, Portugal, January 2006.
- 2) *Image restoration with Global Markov Random Fields Optimization*. Seminar on Discrete Optimization, Graph-Cuts and Image Analysis at Ecole Normale Supérieure, Paris, Jan. 2005.
- 1) *Image restoration based on total variation minimization: Exact sampling and exact optimization*. Seminar of Jacques-Louis Lions Laboratory, University of Paris 6, May 2008, Paris, January 2005.

## Invited Conference Talks

- 12) *Dynamic Network Flows and Nonlinear Discrete Total Variation Evolutions*. SIAM Conference on Imaging Sciences, Chicago, IL, April 2010.
- 11) *Combinatorial and parallel programming point of views for Markovian Energies Minimization*. SIAM Conference on Analysis of Partial Differential Equations, Miami, FL, December 2009.
- 10) *Toward real/interactive time for  $\ell_1$  related problems*. Institute for MAThematics and its Applications (IMA), Special Workshop: Research in Imaging Sciences. Minneapolis, MN, October, 2009
- 9) *Simple Compressive Sensing Algorithms for Parallel Many-core Architectures*. 20th International Symposium on Mathematical Programming, Chicago, IL. August 2009.
- 8) *Simple Compressive Sensing Algorithms for Parallel Many-core Architectures*. ONR Workshop on Compressive Sensing, United States Naval Academy, Annapolis, February 2009.
- 7) *TV Optimization and "Graph-Cuts"*. IPAM workshop on Graph cuts and related Discrete or Continuous Optimization Problems. February 2008.
- 6) *Maximum-flows/Minimum-cuts Algorithms for Energy Minimization*. IPAM Workshop Cyber-Enabled Discovery and Innovation: Knowledge Extraction, IPAM CDI, UCLA, Los Angeles, October 2007.
- 5) *Global and Approximate Optimization of Markov Random Fields*. Minisymposium on *Practical Minimization Methods for Nonconvex Energies*, SIAM Conference on Imaging Science, San Diego, July 2008.
- 4) *Algorithms for Sparse Reconstruction*. Minisymposium on *Fast Discrete Optimizations for Sparse Approximations*, SIAM Conference on Imaging Science, San Diego, July 2008.
- 3) *TV Optimization and Graph-cuts*. Banff International Research Station–Trends in Applied Harmonic Analysis, September 2007, Banff, Canada.
- 2) *Total Variation Optimization and "Graph-cut"*. Mini-symposium on *Image processing based on partial differential equations* International Congress on Industrial and Applied Mathematics, ICIAM 07, Zurich, Switzerland, July 2007
- 1) *Fast and Exact Discrete Image Restoration Based on Total Variation and on Its Extensions to Levelable Potentials*. Minisymposium on *Recent Developments in Total Variation Based Models*, SIAM Conference on Imaging Science, Minneapolis, May 2006.

## Other Presentations

- 18) *Global Optimization for First Order Markov Random Fields with Submodular Priors.*  
International Workshop on Combinatorial Image Analysis, Buffalo, NY, USA, 2008
- 17) *Total Variation Optimization and Graph-cut.*  
Seminar at Ecole Nationale Supérieure des Télécommunications, medical imaging group, August 2007.
- 16) *Minimum-cuts in Network and its application to optimization.*  
Seminar at Center for Computational Biology, UCLA, May 2007.
- 15)  *$L^1$ -norm and morphological filters*  
Image Processing Seminar of UCLA, April 2007.
- 14) *A Note on the Binary Mumford-Shah Model*  
Computer Vision/Computer Graphics Collaboration Techniques and Applications conference, Paris, March 2007.
- 13) *Fast and accurate feature detection and triangulation using total variation filtering of biological images*  
Medical imaging seminar of Ecole Nationale Supérieure des Télécommunications, March 2007.
- 12) *An Efficient Algorithm for Connected Attribute Thinnings and Thickenings.*  
International Symposium on Visual Computing, Lake Tahoe, USA, November 2006.
- 11) *Minimum cuts in networks and its application to exact optimization of non-convex energies.*  
Level-sets collective seminar at UCLA mathematics department, August 2006.
- 10) *Minimum cuts in networks and its application to exact optimization of TV-based model.*  
Level-sets collective seminar at UCLA mathematics department, August 2006.
- 9) *Minimum cuts in networks and its application to exact optimization of TV-based model.*  
"Imagers" collective seminar at UCLA mathematics department, June 2006.
- 8) *Fast and Exact  $L^1 + TV$  Minimization and some links with Mathematical Morphology.*  
Medical Imaging Seminar of Ecole Nationale Supérieure des Télécommunications, June 2006.
- 7) *Image restoration with discrete Level Sets and Markovian energies: exact optimization.*  
Seminar at Ecole Nationale Supérieure des Télécommunications, Recognition methods for speech, writing and gesture group, March 2006.
- 6) *Total Variation Minimization with  $L^1$  Data Fidelity as a Contrast Invariant Filter.*  
International Symposium on Image and Signal Processing and Analysis, Zagreb, Croatia, September 2005.
- 5) *An efficient Algorithm for Attribute Openings and Closings.*  
European Signal Processing Conference, Antalya, Turkey, September 2005.
- 4) *Exact Optimization of Discrete Constrained Total Variation Minimization Problems (Poster)*  
International Workshop on Combinatorial Image Analysis, Auckland, New-Zealand, December 2004.
- 3) *Generic Algorithmic Blocks dedicated to Image Processing.*  
Workshop for PhD Students in Object-Oriented Systems and Doctoral Symposium. Oslo, Norway, June 2004.
- 2) *Generic Implementation of Morphological Image Operators (Poster)*  
International Symposium on Mathematical Morphology, Sydney, Australia, April 2002.
- 1) *Error Correcting Code Performance for Watermark Protection.*  
Symposium SPIE on Electronic Imaging 2001 (EI'2001) – Security and Watermarking of Multimedia Contents III (EI27), San Jose, USA, January 2001.

## Other Skills

PROFICIENT in C and C++

Including low level optimization, vectorization, parallel programming, generic and generative programming and software engineering.

SPORTS

Track and Fields, national level in triple jump: 1995 and 1996,  
Soccer, national level at A.J Auxerre in 1994 and 1995.