

BRUNO JEDYNAK

CURRICULUM VITAE

Department of Applied Mathematics and Statistics
and Center for Imaging Science
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Personal:

Born: November 5, 1965, Suresnes, France.
Married, father of three children born in 1990, 1997, and 2000.
Permanent resident in the USA, green card holder.

Current employment:

Associate Research Professor, Dept. of Applied Mathematics and Statistics (AMS), Johns Hopkins University (JHU)
Faculty member, Center for Imaging Science, JHU
Faculty member, Laboratoire Paul Painlevé, Université des Sciences et Technologies de Lille

Education:

- **1989 B. Sc Université Paris XI Orsay, France.**

1984-1986: Université de Paris X Nanterre, France. Diplôme d'Etudes Universitaires Générales (DEUG) Mathématiques et Applications aux Sciences Sociales (MASS)

1986-1989: Université de Paris XI Orsay, France. Licence et Maîtrise de Mathématiques Appliquées.

- **1995 Ph. D., Statistics and Stochastic Models, Université Paris XI Orsay, France.**

1989-1990 Diplôme d'études approfondies (DEA) de Statistiques et Modèles Stochastiques

1990-January 24, 1995 Thèse de doctorat de l'Université Paris-Sud en Statistiques et Modèles Stochastiques. Supervisors: Professor André Gagalowicz and Professor Donald Geman. Dissertation title: "Modèles stochastiques et méthodes déterministes pour extraire les routes des images de la Terre vues du ciel"[Stochastic Models and Deterministic Methods for Extracting Roads from Remote Sensing Images]. Laboratory: Syntim, Institut National de Recherche en Informatique et Automatique (INRIA)[National Institute for Research in Computer Science and Control], Rocquencourt, France.

Previous Employment:

- March 2005 - August 2008. Assistant Research Professor, AMS, JHU.
- September 2003 - February 2005. Visiting Professor, AMS, JHU.

- September 1997 - August 2003. Maître de conférences, USTL. [Associate Professor]
- September 1996 - June 1997. Postdoctoral Researcher, Dept. of Statistics, University of Chicago.
- February 1995- June 1996. Research scientist, INRIA, Rocquencourt.
- September 1994 - June 1996 Teaching assistant, IUT de Paris, Université Paris V.
- February 1991 - June 1992. Visiting graduate student, Dept. of Mathematics and Statistics, University of Massachusetts at Amherst.

Publications in peer-reviewed journals:

1. D. Geman and B. Jedynek, "An active testing model for tracking roads from satellite images," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 18(1), pp. 1-14, 1996.
2. D. Geman and B. Jedynek, "Model-based classification trees," *IEEE Transactions on Information Theory*, 47(3), pp. 1075-1082, 2001.
3. H. Zheng, M. Daoudi and B. Jedynek, "Blocking Adult Images Based on Statistical Skin Detection", *Electronic Letters on Computer Vision and Image Analysis*, 4(2), pp. 1-14, 2004.
4. B. Jedynek, S. Khudanpur, "Maximum Likelihood Set for Estimating a Point Mass Function", *Neural computation*, 17(7), pp. 1508-1530, July 2005.
5. B. Jedynek, H. Zheng and M. Daoudi, "Skin Detection using Pairwise Models", *Image and Vision Computing*, 23(13), pp. 1122-1130, November 2005.
6. B. Jedynek, D. Karakos "Finding a Needle in a Haystack: Conditions for Reliable Detection in the Presence of Clutter", *Statistics and Probability Letters*, 78(5), pp. 471-480, August 2007.
7. H. Huang, B. Jedynek and J. Bader, "Where have all the interactions gone ? Estimating the coverage of two-hybrid protein interaction maps", *PLoS Computational Biology*, *PLoS Comput Biol.*, 3(11), September 2007. This article was selected for Faculty of 1000 Biology.
8. N. Penumetcha, B. Jedynek, M. Hosakere, E. Ceyhan, K.N. Botteron, J.T. Ratnanather, "Segmentation of arteries in MPRAGE images of the ventral medial prefrontal cortex", *Comput Med Imaging Graph* 32(1) pp. 36-43 2008
9. H. Cho, H. Jdžnsson, K. Campbell, P. Melke, JW Williams, B. Jedynek, A.M. Stevens, A. Groisman and A. Levchenko. "Self-Organization in High-Density Bacterial Colonies: Efficient Crowd Control". *PLoS Biol* 5(11), 2007. This article was featured in ScienceDaily.
10. Joshua Vogelstein, Brendon Watson, Adam Packer, Bruno Jedynek, Rafael Yuste, and Liam Paninski, "Spike inference from calcium imaging using sequential Monte Carlo methods", *Biophysical journal*, 97(2), 2009.
11. Stephanie L. Davis, Eric L. Nuernberger, Peter Um, Camille Vidal, Bruno Jedynek, Martin G. Pomper, William R. Bishail, and Sanjay K. Jain. "Non-invasive pulmonary [18F]-2-fluoro-deoxy-D-glucose positron emission tomography correlates with bactericidal activity of tuberculosis drug treatment", *Antimicrobial Agents and Chemotherapy*, 53(11) 2009.
12. Camille Vidal, Bruno Jedynek, "Learning to Match: Deriving optimal template-Matching algorithms from Probabilist Image Models", *International Journal of Computer Vision* 88(2), 2010.

13. Raphael Sznitman and Bruno Jedynek, "Active Testing for Face Detection and Localization", *IEEE Pattern analysis and Machine Intelligence* 32(10), 2010.
14. Penumetcha N, Kabadi S, Jedynek B, Walcutt C, Gado MH, Wang L, Ratnanather JT, "Feasibility of Geometric-Intensity-Based Semi-Automated Delineation of the Tentorium Cerebelli from MRI Scans". *Journal of Neuroimaging*, 21(2), 2011.
15. Bruno Jedynek, Peter L. Frazier and Raphael Sznitman, "Twenty Questions with Noise: Bayes Optimal Policies for Entropy Loss", *Journal of Applied Probability*, 49(1), March 2012.
16. Mrudula Pullambhatla, Jean Tessier, Graham Beck, Bruno Jedynek, Jens U Wurthner, Martin G Pomper: [125I]FIAU imaging in a preclinical model of lung infection: quantification of bacterial load. *Am J Nucl Med Mol Imaging* 2012;2(3):260-270.
17. Bruno Jedynek, Andrew Lang, Bo Liu, Elyse Katz, Yanwei Zhang, Bradley T. Wyman, David Raunig, Pierre C. Jedynek, Brian Caffo and Jerry Prince for the Alzheimer's Disease Neuroimaging Initiative, "A Computational Neurodegenerative Disease Progression Score: Method and Results with the Alzheimer's Disease Neuroimaging Initiative Cohort", *NeuroImage* 2012 Nov 15;63(3):1478-86.
18. John A. bogovic, Bruno Jedynek, Rachel Rigg, Annie Du, Bennett A Landman, Jerry L Prince, Sarah H Ying, "Approaching Expert Results Using a Hierarchical Cerebellum Parcellation Protocol For Multiple Inexpert Human Raters", *NeuroImage*, 2013 Jan 1;64:616-29.
19. Sznitman, Raphael; Richa, Rogerio; Taylor, Russell; jedynak, bruno; Hager, Gregory D. "Unified detection and tracking of instruments during retinal microsurgery", *IEEE PAMI*, 2012 Oct 1
20. R. Sznitman, A. Lucchi, P. I. Frazier, B. Jedynek and P. Fua "An Optimal Policy for Target Localization with Application to Electron Microscopy", *International conference on Machine Learning*, 2013

Publications in proceedings and book chapters:

1. D. Geman and B. Jedynek, "Detection of roads in SPOT satellite images," *Proc. International Geoscience and Remote Sensing Symposium, IGARSS '91*, Helsinki, Finland, June 1991.
2. B. Jedynek, A. Gagalowicz and M. Haindl, "Hierarchical Highway Recognition from Satellite Images," *Proc. Scandinavian Conference on Image Analysis SCIA '93*, Tromso, Norway, May 25-28, 1993.
3. D. Geman and B. Jedynek, "Shape recognition and twenty questions," *Proc. Reconnaissance des Formes et Intelligence Artificielle, RFIA '94*, 1, pp. 21-37, 1994.
4. B. Jedynek and J.P. Rozé, "Tracking roads in SPOT images by playing twenty questions," *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, Birkhauseer (Basel) pp. 243-253, Monte-Verità, April 1995.
5. B. Jedynek and F. Fleuret, "Reconnaissance d'objets 3D à l'aide d'arbres de classification," *Proc. Image'Com 96*, pp. 25-30 Bordeaux, France, Mai 1996.
6. F. Jung, B. Jedynek and D. Geman, "Recognizing buildings in aerial images," *Automatic Extraction of Man-Made Objects from Aerial and Space Images*, II, Birkhauseer (Basel), pp. 173-182, Ascona, May 1997.
7. Y. Amit, D. Geman and B. Jedynek, "Efficient focusing and face detection," *Face Recognition: From Theory to Applications*, eds. H. Wechsler et al, NATO ASI Series F, Springer-Verlag, Berlin, pp. 157-173, 1998.

8. B. Jedynak, "Une comparaison entre stratégies locales et globales pour la construction d'arbres de classification," *Proc. Société Française de Statistique, SFDS'2000*, Fes, Maroco, Mai 15-19 2000.
9. M. Obeid, B. Jedynak and M. Daoudi, "Image Indexing and Retrieval Using Intermediate Features", *Proc. of the ninth ACM (Association for Computing Machinery) International Conference on Multimedia 2001*, pp. 531-533, Ottawa, Canada, September 30 - October 5 2001.
10. B. Jedynak, H. Zheng and M. Daoudi, "Maximum Entropy Models for Skin Detection", *Proc. Third Indian Conference On Computer Vision, Graphics and Image Processing, ICVGIP 2002*, pp. 276-281, Ahmedabad, India, December 16-18 2002,
11. B. Jedynak, H. Zheng and M. Daoudi, "Statistical Models for Skin Detection", IEEE Workshop on Statistical Analysis in Computer Vision, June 22 2003.
12. H. Zheng, M. Daoudi and B. Jedynak, "From Maximum Entropy to Belief Propagation: An application to Skin Detection", *Proceedings of the British Machine Vision Conference (BMVC'04)*, September 7-9, 2004
13. B. Jedynak, C. Izard and C. Stark, "Automatic Landmarking of Magnetic Resonance brain Images", to appear in the proceedings of the SPIE International Symposium on Medical Imaging, 12-17 February 2005, San Diego, California, USA.
14. B. Jedynak, S. Khudanpur and A. Yazgan, "Estimating Probabilities from Small Samples", proceedings of the 2005 Joint Statistical Meetings (JSM), August 7-11, 2005.
15. C. Izard, B. Jedynak, "Bayesian Registration for anatomical Landmark Registration", proceedings of the IEEE symposium on Biomedical Imaging: From Nano to Macro, ISBI'06, April 6-9 2006.
16. C. Izard, B. Jedynak, C. Stark, "Spline-Based Probabilistic Model for Anatomical Landmark Detection" , proceedings of MICCAI'06, 9(Pt 1), pp: 849-56. October 1-6, 2006.
17. B. Jedynak and D. Karakos, "Unigram Language Models using Diffusion Smoothing over Graphs", in *Proceedings of the 2007 Workshop on Graph-based Methods for Natural Language Processing (TextGraphs-2)*, Rochester, NY, April 26, 2007.
18. C. Izard, B. Jedynak "Statistical Deformable Model Applied to Anatomical Landmark Detection", *Proceedings of the International Symposium on Biomedical Images, SPIE'08*, February 16-21, 2008
19. C. Vidal, J. Hewitt, S. Davis, L. Younes, S. Jain and Bruno Jedynak, "Template Registration with Missing Parts: Application to the Segmentation of Tuberculosis Infected Lungs", *Proceedings of the International Symposium on Biomedical Images, SPIE'09*, April 13-17 2009.
20. C. Vidal, D. Beggs, L. Younes, S. K. Jain and B. Jedynak, "Incorporating User Input in Template-Based Segmentation" , proceedings of ISBI'11.
21. R. Sznitman, A. Basu, R. Richa, James Handa, P. Gehlbach, B. Jedynak, R. H. Taylor, G. D. Hager, "Unified Detection and Tracking in Retinal Microsurgery", proceedings of MICCAI 2011.
22. Bruno Jedynak, Bo Liu, Andrew Lang, Yulia Gel and Jerry Prince, A Time-Change Method for Computing an Alzheimer's Disease Progression Score, proceedings of NIBAD'2012 (workshop associated with MICCAI 2012)

23. Peter Frazier, Bruno M. Jedynak and Li Chen, "Sequential Screening: A Bayesian Dynamic Programming Analysis Of Optimal Group-Splitting", proceedings of the Winter Simulation Conference 2012.

Papers submitted, in revision, or in progress:

1. Bahman Afsari and Bruno Jedynak, "Statistical Clustering of the Knights in Shahnameh, the Book of the Kings", in review.
2. Sancar Adali, Yichen Quin, Bruno Jedynak, Daniel Naiman and Donald Geman, "Machine Learning Techniques for Predicting Cardiac Death", work in progress.

Other publications:

1. B. Jedynak, "Stratégies visuelles et jeu des 20 questions", *CNRS-INFO*, July 2000.
2. B. Jedynak, "Chercher une aiguille dans une botte de foin", *Publication IRMA*, 56-XII, December 2001.
3. J. Vogelstein, K. Zhang, B. Jedynak and L. Paninski, "Inferring the Structure of Populations of Neurons using a Sequential Monte Carlo EM Algorithm", poster presented during the Computational and System Neuroscience Meeting (COSYNE'07), Salt Lake City, February 25-27, 2007.

Lectures:

1. Séminaire Imagerie et Mathématiques [Meeting: Image and Mathematics], Ecole Nationale Supérieure (ENS) Cachan, France, January 1994.
2. Journée Information et Traitement du Signal [Meeting: Information theory and Signal Processing], Ecole Nationale Supérieure des Télécommunications (ENST) Paris, France, November 10, 1995.
3. Réunion ORASIS, Journées Francophones des Jeunes Chercheurs en Vision par Ordinateur [Meeting: Young French Researcher in Computer Vision], Sophia-Antipolis, France, January 1995.
4. Réunion du Groupement de Recherche (GDR), Programme de Recherches Coordonnées (PRC) Communication Homme-Machine [Meeting: man-machine interaction], ENST Paris, France, July 1995.
5. Workshop on Probabilistic Algorithms and Algorithmic Probability, Utrecht, The Netherlands, May 29-30, 1996.
6. Réunion du GDR Information, Signal, Images et Vision (ISIS) Indexation Multimédia, [Meeting: Multimedia Indexing], ENST Paris, France, July 4, 1996.
7. Invited conference, Sydney International Statistical Congress, Sydney, Australia, July 8-12, 1996.
8. Weekly seminar, Statistics department, University of Chicago, Chicago, IL, February 10, 1997.
9. Weekly seminar, Statistics department, Stanford University, Stanford, CA, June 4, 1997.
10. Regular seminar, META 2,MEVAL,FRACATALES, Inria-Rocquencourt, February 5, 1998.
11. Regular seminar, GDR-ISIS Action Indexation Multimédia, ENST Paris, September 29, 1999.
12. Invited conference, 33^{èmes} Journées de Statistique [33rd Annual Statistical Meeting], SFDS, Nantes, France, May 14, 2001.

13. Center for Imaging Science Seminar Series, JHU, November 13, 2001.
14. Regular seminar, équipe Statistique et Modélisation Stochastique [Dept, Statistics and Stochastic Models], Institut d'Informatique et de Mathématiques Appliquées de Grenoble (IMAG) [Grenoble Institut of Computer Science and Applied Mathematics], Grenoble, France, February 7, 2002.
15. Center for Imaging Science Seminar Series, JHU, September 23, 2003.
16. Colloquium Series, Department of Statistics, The Florida State University, October 14, 2004.
17. Regular seminar, Department of Applied Mathematics and Statistics, JHU, February 10, 2005.
18. Invited talk. Joint Statistical Meeting. Nonparametric Approaches to Learning in Computer Vision and Image Understanding. Minneapolis, August 9, 2005
19. Statistics Colloquium. Department of Mathematics and Statistics, University of Maryland at Baltimore County, April 7, 2006
20. Center for Imaging Science Seminar Series, JHU, September 26, 2006.
21. Bio3 Seminar Series, Department of Biostatistics, Bioinformatics, and Biomathematics, Georgetown University Medical Center, October 6, 2006.
22. CLSP, JHU, regular seminar, February 13th, 2007.
23. Food and Drug Administration, Center for Drug Evaluation and Research, Visiting Professor Lecture Series, January 22, 2009.
24. Regular Seminar, Dept. of Applied Mathematics and Statistics, JHU, December 2, 2010.
25. Applied Mathematics Colloquia, Cornell University, January 28, 2011.
26. Workshop "Mathematical Optimization and Mathematical Theory of Perception", La Londe les Maures, Var, France, June 2011.
27. seminar "Mathematics and image", University of Paris Jussieu, July 2011.
28. Neuroscience 2011 Conference, Washington D.C., November 16, 2011.
29. Pfizer Inc. , Invited talk, January 2012.
30. Johnson & Johnson, Invited talk, January 2012.
31. Alzheimer's Association International Conference, accepted abstract, July 2012
32. Joint Statistical Meeting, accepted abstract and invited presentation, August 2012.
33. Colloquium du département de Mathématiques et Informatique, Université Paris Descartes, January 11, 2013.
34. Séminaire du laboratoire Psychologie de la Perception, Université Paris Descartes, January 24, 2013.
35. IPAM Summer School in Computer Vision, invited tutorial, UCLA, Los angeles, July 31, 2013.

Professional societies:

Société Française de Statistique (SFDS) [French Statistical Society].

Société des Mathématiques Appliquées et Industrielles (SMAI) [French Applied and Industrial Mathematics Society].

IEEE Computer Society.

American Statistical Association

Recent and current participation in Grants as PI, coPI or senior personnel:

(PI: B. Jedynek) 2008-2009

1. Potts Memorial Foundation

Quantitative Imaging Methods for the Discovery of Surrogate Markers of M. tuberculosis Infection

(PI: B. Jedynek) 2008-2010

2. Allocation Grant from Bill and Melinda Gates Foundation Grant

Quantitative Imaging Methods for Tuberculosis

(PI: B. Jedynek) 2010-2012

3. Allocation Grant from NIH Grant PI: Sanjay Jain

Quantitative Imaging Methods for Tuberculosis

(PI: B. Jedynek) 2012-2015

4. Allocation Grant from NIH Grant PI: Sanjay Jain

Molecular Imaging for Macrophage-Associated Pulmonary Diseases

(PI: B. Jedynek) 2010-2011

5. Research grant from Pfizer Inc.

Modeling of Alzheimer's disease Neuro-imaging Initiative Study

(PI: B. Jedynek) 2011-2012

6. Ossoff scholar award

Developing the Alzheimer's Disease Progression Scale (ADPS) and further characterizing the course of AD

(PD: R. Winslow) 2007-2010

7. NIH 1R24 HL08534301A1

CardioVascular Research Grid (CVRG)

(PI: J.L. Prince) 2006 - 2016

8. NIH/NINDS 1 R01 NS056307

Automatic Cerebellar MRI Labeling in Health and Disease

(PI:J. DiRuggiero) 2009-2011

9. NSF Award 0842636

Community structure, genomic heterogeneity and metabolic diversity of the microbiome of the oldest and driest desert on Earth, the Atacama Desert in Northern Chile

10. (PI:D. Geman) 2010-2014

Active Scene Interpretation by Entropy Pursuit

(PI:J. Flombaum) 2013-2015

11. Science of Learning Institute, Johns Hopkins University

Spatial Localization through Learning: An Information Theoretic Approach

Postdoc Advising and Co-advising:

Camille Vidal, September 2008-September 2009.

PhD. Advising and Co-advising:

1. Huicheng Zheng, "Maximum entropy modeling for skin detection: With an application to Internet filtering", December 2001- November 8, 2004, Computer Science, USTL, France.
2. Camille Izard, "Automatic Landmarking of Magnetic Resonance brain Images", September 2004 - June 2007, Mathematics, USTL, France.
3. Joshua Vogelstein, "Uncovering Neuromechanisms of the Dorsal Cochlear Nucleus", Neurosciences, JHU, September 2006-December 2009.
4. Raphael Sznitman, September 2008 - September 2011, Computer Science, JHU.
5. Andrew Lang, January 2011 - present, Electrical and Computer Engineering, JHU.
6. Bo Liu, January 2011 - January 2013, Applied Mathematics and Statistics, JHU.
7. Lee Chen, October 2011 - June 2013, Applied Mathematics and Statistics, JHU.
8. Runze Tang, September 2013 - present, Applied Mathematics and Statistics, JHU.

Master's Advising:

1. Ivan Keller, "Recherche d'un meilleur modèle a priori pour une méthode d'extraction des routes dans une image satellite" [A better prior model for extracting roads from remote sensing images], Statistics, Paris XI, Spring 1994.
2. Mohamed Obeid, "Indexation d'images par le contenu" [Content Based Image Indexing], Computer Science, USTL, Spring 2001.
3. Didier Barret, "Détection de la peau dans des images en couleurs" [Skin Detection From Color Images], Computer Science, USTL, Spring 2002.
4. Rhanem Jbilat, "Images naturelles et images de synthèse" [Natural Images vs Synthetic Images], Applied Mathematics, USTL, Spring 2003.
5. Camille Izard, "Automatic Landmarking of Magnetic Resonance brain Images" Mathematics, USTL, Spring 2004.
6. Neeraja Penumetcha, "Applications of semi-automated methods for cortical analysis", Biomedical Engineering, JHU, 2005-2006.
7. Raphael Sznitman, "Sequential Mutual Information Maximization for Face Detection", Computer Sciences, JHU, 2008.
8. Saumya Gurbani, September 2012 - July 2013, Biomedical Engineering, JHU.
9. Han Weidong, January 2013 - present, Applied Mathematics and Statistics, JHU.
10. Zhou Ye, January 2013 - present, Applied Mathematics and Statistics, JHU.
- 11.

Thesis advising committees

1. Hailiang Huang, BME, JHU, 2006-January 2012.
2. Joshua Vogelstein, "Uncovering Neuromechanisms of the Dorsal Cochlear Nucleus", Neurosciences, JHU, September 2006-December 2009.

Graduate students oral exams, 2010 and 2011

1. Yichen Qin, Candidacy Exam (4/12/2011)
2. Ming Sun, GBO (3/28/2011)
3. Eric Harley, GBO (3/9/2011)
4. Graham Beck, Candidacy Exam (12/10/2010)
5. Kailash Patil, GBO (10/21/2010)
6. Anoop Deoras, GBO (3/1/2010)
7. Snehashis Roy, GBO (3/30/2010)

Reviewing journal papers:

Annales des Telecommunications.
Ecological Modelling.
IEEE transactions on Pattern Analysis and Machine Intelligence.
IEEE Transactions on Image Processing.
Journal of Machine Learning Research.
Journal of the Royal Statistical Society.
Neural Computation.
Pattern Recognition.
Statistics and Probability Letters.

Member of the Program Committee:

CVPR 2008
ICCV 2009
Workshop: "Information Theory in Computer Vision and Pattern Recognition" ICCV2011
Chairman for Session 753 "Data analysis and Statistics IV", Neuroscience 2011

Reviewing grant proposal:

NSF Computer Vision panel
Swiss National Science Foundation
Fonds de la Recherche Scientifique (Belgium)

Teaching:

1. Calculus I, UMASS at Amherst, Spring 1992.
2. Calculus I, Graphs, Linear algebra, Probabilities, Statistics and Logic, Université Paris V, Fall 1995 and Spring 1996.
3. Calculus I-II, Graph theory, Linear algebra, Probabilities, Statistics, Logic, IUT A, USTL, September 1997 to June 2003.

4. Information Theory for Image Processing and Computer Vision, Dept. of Mathematics, USTL, Spring 2002 and 2003.
5. Probabilities and Statistics, (550.310 and 550.311), AMS, JHU. Spring and Summer 2005 and 2006, Fall 2007, 2008, 2009 and 2010.
6. Statistical Methods in Imaging, (580.466 and 550.431), Dept. of Biomedical Engineering and AMS, JHU, Spring 2006, 2007, 2010,2011, and 2012.
7. Data Mining (550.461) AMS, JHU, Fall 2007, 2008, 2009, 2010, 2011, 2012 and 2013.
8. Introduction to Statistics (550.430), AMS, JHU, Spring 2007, 2008 and 2009.
9. 550.211 Statistics for the Life Sciences, Spring 2011,2012 and 2013.

Skills:

- Languages: French (native), fluent English, some Spanish.
- Computers skills: C,C++,Unix,L^AT_EX, Mupad, Mathematica, Matlab, R.
- Musical skills: active practice of jembe, congas and drums.