

# Alexandre ABRAHAM

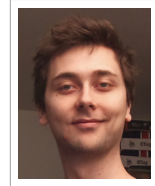
PhD in Machine Learning

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## Thesis

Title	<b>Learning functional brain atlases modeling inter-subject variability</b>
Supervisors	Dimitris SAMARAS (Stony Brook University – Centrale Paris) Gael VAROQUAUX (Inria) Bertrand THIRION (Inria)
Research Interests	Recent studies have shown that resting-state spontaneous brain activity unveils intrinsic cerebral functioning and complete information brought by prototype task study. From these signals, we set up a functional atlas of the brain, along with an across-subject variability model. The novelty of our approach lies in the integration of neuroscientific priors and inter-individual variability in a probabilistic description of the rest activity. This variability, ignored until now, may lead to learning of fuzzy atlases, thus limited in term of resolution. These models have been applied to ABIDE, a very large autism spectrum disorders dataset, on which we outperformed state of the art for diagnosis. This program yielded both numerical and algorithmic challenges because of the data volume but also because of the complexity of modelisation. <ul style="list-style-type: none"><li>• Resting State Functional Magnetic Resonance Imaging</li><li>• Sparse dictionary learning (with TV+L1 regularization)</li><li>• Stochastic Methods</li><li>• Clustering</li></ul>

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## Publications (First author)

T-MI (in progress)	<b>Total-Variation Regularized Multi-subject Dictionary Learning</b> – Alexandre ABRAHAM, Dimitris SAMARAS, Bertrand THIRION and Gaël VAROQUAUX – Transactions on Medical Imaging - IEEE
NeuroImage (submitted)	<b>Toward Robust Functional-Connectivity Biomarkers of Autism</b> – Alexandre ABRAHAM, Michael MILHAM, Adriana DI MARTINO, Cameron CRADDOCK, Dimitris SAMARAS, Bertrand THIRION and Gaël VAROQUAUX – NeuroImage
MICCAI 2013	<b>Extracting brain regions from rest fMRI with total-variation constrained dictionary learning</b> – Alexandre ABRAHAM, Elvis DOHMATOB, Bertrand THIRION, Dimitris SAMARAS and Gaël VAROQUAUX – MICCAI - 16th International Conference on Medical Image Computing and Computer Assisted Intervention
STMI 2014	<b>Region segmentation for sparse decompositions: better brain parcellations from rest fMRI</b> – Alexandre ABRAHAM, Elvis DOHMATOB, Bertrand THIRION, Dimitris SAMARAS, Gaël VAROQUAUX – Sparsity Techniques in Medical Imaging
Frontiers 2013	<b>Machine Learning for Neuroimaging with Scikit-Learn</b> – Alexandre ABRAHAM, Fabian PEDREGOSA, Michael EICKENBERG, Philippe GERVAIS, Andreas MULLER, Jean KOSSAIFI, Alexandre GRAMFORT, Bertrand THIRION, Gaël VAROQUAUX – <i>Frontiers in Neuroscience</i>

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## Internships

- March – June 2014 **Study of the EMBARC dataset** Stony Brook University  
New York, USA *Computer Vision laboratory*  
In collaboration with Stony Brook Hospital's psychiatrists, I studied the EMBARC dataset, an fMRI study on depression disorders. I have performed the preprocessing of the data and applied my analysis pipeline on them.
- September – November 2014 **Study of the ABIDE dataset** New York  
New York, USA *Child Mind Institute*  
In collaboration with Michael Milham and Cameron Craddock, I worked on the analysis of the ABIDE dataset. The CMI performed the preprocessing of these data. I used them and studied the impact of the preprocessing pipelines on the prediction. Early results were presented at Brainhack and have been submitted to *Biological Psychiatry* in collaboration with Adriana Di Martino from NYU Langone Medical Center.

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## Conferences attended

- July 2-4, 2012 Pattern Recognition in Neuroimaging, London, United Kingdom
- Aug. 23-27, 2012 Euroscipy, Brussels, Belgium
- May 14-15, 2013 Big data, theoretical and practical challenges, Paris, France
- Sept. 22-16, 2013 Medical Imaging Computing and Computer Assisted Intervention (MICCAI), Nagoya, Japan – *Poster, Student travel award*
- Oct. 23-24, 2013 Brainhack, Sèvres, France
- June 8-12 2014 Organization for Human Brain Mapping (OHBM) – *Oral session*
- Sept. 14-18, 2014 Medical Imaging Computing and Computer Assisted Intervention (MICCAI), Boston, USA – *Poster at STMI workshop*
- April 3, 2015 Pydata, Paris, France
- July 6-11, 2015 International Conference on Machine Learning (ICML), Lille, France – *Poster at MLOSS workshop*

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## Summer schools

- July 9-13, 2012 Biomedical Image Analysis Summer School: Modalities, Methodologies & Clinical Research, Paris, France
- July 8-12, 2013 Summer school on Graphical models for the characterisation of information flow in complex networks: Application in neuroimaging, Grenoble, France
- July, 22-26, 2013 Visual recognition and machine learning summer school, Paris, France

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## Education

- December 2012 – November 2015 **PhD student in machine learning** Inria – Parietal team  
Inria – CEA – Paris Sud University *Neurospin Saclay*  
In the Parietal Team directed by Bertrand THIRION.
- April – September 2010 **Master's Degree final internship** Thales  
Thales Air Systems – Artificial Intelligence Laboratory *Élancourt*  
Adding goals to the multi-agent framework used to planify mission of autonomous drones.
- 2009 – 2010 **Master's degree in Computer science** UPMC  
Artificial Intelligence and Decision *Paris*  
Machine Learning, Decision, Intelligent Agents.

2007 – 2009 **Researcher Student** LRDE  
 EPITA Research and Development Laboratory *Kremlin-Bicêtre*  
 Olena Project – generic and efficient programming in C++ applied to image processing. Research activities, software engineering, ConceptC++ study, implementation of a watershed algorithm.

March 2009 – August 2009 **Research engineer internship** LIP6 – EDF R&D  
 SMACH Project *Paris*  
 Refactoring of a human behavior simulation software. Addition of a Q-Learning algorithm to learn and simulate a typical family behavior from given rules and constraints to estimate energy consumption.

2004 – 2009 **Computer Science Engineering School** EPITA  
 EPITA – 2:1 engineer degree *Kremlin-Bicêtre*  
 Multi Agent System Simulation Platform: ant colony. Specialization in research and artificial intelligence. Development of basic projects using neural networks, genetic algorithms, text mining, metaheuristic.

2003 **Baccalauréat Scientifique** Lycée Notre-Dame  
 Baccalauréat with honours *Sannois*

## Professional Experiences

December 2015 – Today **Research and Development engineer** Inria – Parietal team  
 Development and maintenance of nilearn, a Python package for machine learning in neurimaging using scikit-learn. *Neurospin Saclay*

April 2012 – November 2012 **Research and Development engineer** INSERM  
 Inserm – CEA *Neurospin Saclay*  
 Design and development of the API *Neuro-Imaging for Scikit Learn*.

January 2011 – March 2012 **IT consultant** Harmonie Technologie  
 Crédit Agricole Technologies *Paris*  
 Java expert – Development of the mobile application server.

September 2007 – February 2008 **C++ programming internship** Aldebaran Robotics  
 Maintenance and development of an embedded platform. *Paris*

## Skills

Programming	Python, C/C++, Java, Ocaml	Scripting	Shell, Python
Scientific	Scilab, Matlab	Typography	L <sup>A</sup> T <sub>E</sub> X
Web design	XHTML, CSS, Javascript	Database	MySQL, PostGRESQL

## Languages

French **Mother tongue**  
 English **Fluent, TOEIC 985**

## Teaching

2009 – 2010 **High School teacher** OIIO Formation  
 Teaching mathematics, basic computer science and algorithms to prepare students for computer science baccalaureate. *Paris*

2006 – 2010 **Occasional preparatory class teacher** EPITA  
 Teaching mathematics and practical work in computer science, mathematics and algorithms. *Kremlin-Bicêtre*