GREGORY OPERTO, Ph. D.

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Dr. Greg Operto is a **senior data scientist** specialized in the field of neuroimaging and cohort studies. After graduating in 2005 from Polytech-Marseille both in **Biomedical Engineering** and **Digital Imaging**, he received his **PhD** in **Computer Science** from Aix-Marseille University in 2009. He then joined **NeuroSpin**, the high-field MRI center of the Commissariat à l'Energie Atomique (Atomic Energy Commission). There between 2011 and 2016, he managed the production unit in charge of **large-scale computation** of biomarkers in CATI, the French platform for **multicenter neuroimaging cohort studies**. Then he held the position of **research scientist** in the neuroimaging team of the BarcelonaBeta Brain Research Center, where he studied new **early biomarkers** of Alzheimer's disease using **advanced image processing** and **machine learning** techniques over large cohorts of presymptomatic subjects. In addition he led the development of the platform for the **management**, **processing** and **control** of large imaging datasets. In 2022 he was appointed **Head of Neuroinformatics** to address the growing infrastructural needs involved in large neuroimaging datasets. By his double experience both in **research** and **engineering**, he combines the necessary skills to tackle not only the fundamental questions related to the study of Alzheimer's disease but also the many technical challenges raised by data of ever-increasing complexity.

QUALIFICATIONS

Advanced knowledge of the Python language (software development and scientific computing)
Proficient experience with image processing and machine learning techniques in application to health and medical imaging
Neuroimaging and brain data analysis (anatomy, function, connectivity)
Design, implementation and management of multi-site dataflows (data acquisition, processing, quality control)
Supervision of students and engineers
Open source software maintainer and contributor
Extended experience in managing large databases, big data processing and analysis in research
Excellent communication skills. Fluent in 4 languages. Participations at international conferences and meetings, articles as first, last and co-author.
Mentor for the Google Summer of Code Training Program
Teaching experience (2005-2019)

PROFESSIONAL EXPERIENCE

Head of Neuroinformatics at BarcelonaBeta Brain Research Center - Pasqual Maragall Foundation (supervisor: JD. Gispert, PhD), Barcelona (2022 -)
Pursuing the development of a platform for the management, processing and control of large neuroimaging datasets “from the scanner to researchers”
Coordinating the implementation of a portfolio of data processing pipelines
Managing data integration for enhanced multimodal and statistical modeling

Research scientist at BarcelonaBeta Brain Research Center - Pasqual Maragall Foundation (supervisor: JD. Gispert, PhD), Barcelona (2016 - 2022)
Research on novel imaging markers of Alzheimer’s Disease
Leading the development of a platform for the management, processing and control of large neuroimaging datasets
Postprocessing and analysis of large multimodal datasets, large-scale production of imaging markers in the context of Alzheimer’s research
Associate Professor in Diagnostic Imaging at Pompeu Fabra University

Research Engineer / Production Manager in CATI (director: J-F. Mangin, PhD), NeuroSpin (2011-2016)
Creation of a national infrastructure for the support of cohort studies on Alzheimer's patients and related dementias.
Multi-site coordination of analyses performed on large neuroimaging datasets.
Member of the executive committee of the project.
Supervision of a software development team (3) focused on quality control.
Collaborations with national and international research projects.

Supervision of training engineers (2).

Postdoctoral Research Fellow in NeuroSpin CEA Saclay, France (2010-2011)
Working on classification and computer vision methods for the study of the cortical folding process and intersubject variability in the developing brain.
Supervision: J-F. Mangin, PhD

PhD Student - Graduate Teaching Assistant, Université Aix-Marseille (2005-2009)
Doctoral training in neuroimaging (Laboratoire des Sciences de l'Information et des Systèmes): functional magnetic resonance imaging, computer vision, machine learning, optimization, shape analysis

Training Engineer, Neurology Department 1st Medicine Faculty, Charles University, Prague, Czech Republic (2004)
Design of a video movement detection system during the acquisition of fMRI data - Application to studies in fMRI and repetitive transcranial magnetic stimulation (rTMS)

EDUCATION

Ph.D. in Computer Science - Université Aix-Marseille, 2005-2009
Thesis: Structural surface-based analysis of fMRI data
Supervision: Dr. Olivier Coulon, Ph.D - Prof. Rémy Bulot, Ph.D

Master's degree, Digital Imaging - Université Aix-Marseille, 2004-2005
Ranked 1st of promotion

Diplôme d'Ingénieur (Biomedical Eng.), Polytech-Marseille, 2002-2005

TRAINING

Docker & Singularity for biosciences (- 6 hours) - PRBB-CRG - 2019

Neuroanatomy (- 50 hours) - Pr D. Hasboun - Université Pierre et Marie Curie, Paris - 2013-2014

Agile software development (Scrum) (- 20 hours) - Valtech - 2014

LANGUAGES

French (native), English (full professional proficiency), Spanish (full professional proficiency), Catalan (full professional proficiency), Italian (elementary proficiency),

COMPUTER TECHNOLOGIES

Extended knowledge of the Python language and scientific computing in Python - Knowledge of C/C++, Matlab, R, Java
Databases (Sqlite, Postgresql) and web (server/client, JS, HTML5)
Experienced in big data technologies (machine learning, parallel computing, scalable databases), high performance computing systems (SGE, Slurm, AWS) and containerization technologies (Docker/Singularity)
Enthusiast Git/GitHub/GitLab user (GitHub username: @xgrg)
Experienced in agile project management (Scrum) and software architecture design - Enthusiast about code quality and good practices in software development
Experienced Linux system administrator since 2004.

NEUROIMAGING SOFTWARE

Statistical Parametric Mapping (SPM), FreeSurfer, FSL, nilearn, nipype, fmriprep, mrtrix3, XNAT, BrainVisa, ANTs

OPEN SOURCE CONTRIBUTION

pyxnat, Interacting with an XNAT platform (core maintainer since 2017)
python-ggseg, Visualizing cortical ROI-based statistics
nisnap, Display segmentation results in Jupyter notebooks
snaprate, Collaborative quality control of neuroimaging data

TEACHING

Diagnostic imaging, from 2016 to 2019, Pompeu Fabra University, Barcelona

Computer Science, Algorithmics, Visualization in Scientific Computing, Geometric Modeling, Pattern Recognition, Image Analysis, from 2005 to 2009, Faculté des Sciences de Luminy, Aix-Marseille University

SUPERVISION OF STUDENTS

Mentor for the Google Summer of Code training program (2020)
Master students: Javier Pozo (Universidad Carlos III Madrid, 2020),
Guillem París (Universitat Politècnica de Catalunya, 2019)
Pauline Bezivin (Université de Rennes 1, 2012)
Samuel David (ESIEE Paris, 2014)
Co-supervised PhD candidate: Alberto Redolfi (2014)

RESEARCH INTERESTS

Aging process and imaging predictors of neurodegenerative diseases
Early macro and microstructural cerebral changes in Alzheimer's Disease
Optimization of image processing dataflows over large cohorts
Quality Control on large databases
Computational anatomy

PROFESSIONAL INTERESTS

Machine learning
Computer vision
Software development in research
Large-scale data processing infrastructures

HOBBIES

Lightweight trekking, table tennis, aikido, hacking/DIY

REFERENCES

Dr. Juan Domingo Gispert López, Ph.D (current supervisor)
Head of neuroimaging
BarcelonaBeta Brain Research Center - Pasqual Maragall Foundation
jdgispert@barcelonabeta.org

Dr. José Luis Molinuevo, M.D., Ph.D (former supervisor)
Vice President Head of Experimental Medicine
H. Lundbeck A/S
jlmolinuevo@barcelonabeta.org

Dr. Jean-François Mangin, Ph.D
Director of the CATI platform
Head of the Computer-assisted Neuroanatomy group,
NeuroSpin - Atomic Energy Commission, Saclay, France
jean-francois.mangin@cea.fr

Dr. Olivier Coulon, Ph.D. (Ph.D advisor)
Head of the MeCA group
Institut des Neurosciences de La Timone, Marseille, France
olivier.coulon@univ-amu.fr

Peer-reviewed publications :

J. Huguet, C. Falcon, D. Fusté, S. Girona, D. Vicente, J.L Molinuevo, J.D Gispert, **G. Operto**, Management and Quality Control of Large Neuroimaging Datasets: Developments From the BarcelonaBeta Brain Research Center, Frontiers in Neuroscience, 2021

N. Vilor-Tejedor, T.E Evans, H.H. Adams, J.M. González-de-Echávarri, J.L. Molinuevo, R. Guigo, J.D. Gispert, **G. Operto**, Genetic Influences on Hippocampal Subfields: An Emerging Area of Neuroscience Research, Neurology Genetics, 2021

I. Ciampa, **G. Operto**, C. Falcon, C. Minguillon, M. Castro de Moura, D. Piñeyro, M. Esteller, J.L. Molinuevo, R. Guigó, A. Navarro, J.D. Gispert, N. Vilor-Tejedor, Genetic Predisposition to Alzheimer's Disease Is Associated with Enlargement of Perivascular Spaces in Centrum Semiovale Region, Genes, 2021

G. Salvadó, D. Ferreira, **G. Operto**, I. Cumplido-Mayoral, E.M Arenaza-Urquijo, R. Cacciaglia, C. Falcon, N. Vilor-Tejedor, C. Minguillon, C. Groot, W. M van der Flier, F. Barkhof, P. Scheltens, R. Ossenkoppele, S. Kern, A. Zettergren, I. Skoog, J. Hort, E. Stomrud, D. van Westen, O. Hansson, J.L Molinuevo, L-O Wahlund, E. Westman, J.D Gispert, ALFA study, BioFINDER, ADNI, The protective gene dose effect of the APOE ε2 allele on gray matter volume in cognitively unimpaired individuals, Alzheimer's & Dementia, 2021

N. Vilor-Tejedor, **G. Operto**, T.E. Evans, C. Falcon, M. Crous-Bou, C. Minguillón, R. Cacciaglia, M. Milà-Alomà, O. Grau-Rivera, M. Suárez-Calvet, D. Garrido-Martín, S. Morán, M. Esteller, H.H. Adams, J.L. Molinuevo, R. Guigó, J.D. Gispert for the ALFA Study, Effect of BDNF Val66Met on hippocampal subfields volumes and compensatory interaction with APOE-ε4 in middle-age cognitively unimpaired individuals from the ALFA study, Brain Struct Funct, 2020

E. M. Arenaza-Urquijo, G. Salvadó, **G. Operto**, C. Minguillón, G. Sánchez-Benavides, M. Crous-Bou, O. Grau-Rivera, A. Sala-Vila, C. Falcón, M. Suárez-Calvet, H. Zetterberg, K. Blennow, J.D. Gispert, J.L. Molinuevo for the ALFA study, Association of years to parent's sporadic onset and risk factors with neural integrity and Alzheimer's biomarkers, Neurology, 2020

S. Ingala, L. Mazzai, C. H. Sudre, G. Salvadó, A. Brugulat-Serrat, V. Wottschel, C. Falcon, **G. Operto**, B. Tijms, J.D. Gispert, J.L. Molinuevo, F. Barkhof, The relation between APOE genotype and cerebral microbleeds in cognitively unimpaired middle- and old-aged individuals, Neurobiology of Aging, 2020

O. Grau-Rivera, **G. Operto**, C. Falcón, G. Sánchez-Benavides, R. Cacciaglia, A. Brugulat-Serrat, N. Gramunt, G. Salvadó, M. Suárez-Calvet, C. Minguillon, Á. Iranzo, J.D. Gispert, J.L. Molinuevo for the ALFA Study, Association between insomnia and cognitive performance, gray matter volume, and white matter microstructure in cognitively unimpaired adults, Alzheimer's Research and Therapy, 2020

G. Operto, J.L. Molinuevo, R. Cacciaglia, C. Falcón, A. Brugulat-Serrat, M. Suárez-Calvet, O. Grau-Rivera, N. Bargalló, S. Morán, M. Esteller, J.D. Gispert for the ALFA Study, Interactive effect of age and APOE-ε4 allele load on white matter myelin content in cognitively normal middle-aged subjects, Neuroimage: Clinical, 2019

P. M. Petrone, A. Casamitjana, C. Falcon, M. Artigues, **G. Operto**, R. Cacciaglia, J.L. Molinuevo, V. Vilaplana, J.D. Gispert & for the Alzheimer's Disease Neuroimaging Initiative, Prediction of amyloid pathology in cognitively unimpaired individuals using voxel-wise analysis of longitudinal structural brain MRI, Alzheimer's Research and Therapy, 2019

A. Brugulat-Serrat, G. Salvadó, **G. Operto**, R. Cacciaglia, C. Sudre, O. Grau-Rivera, M. Suárez-Calvet, C. Falcon, G. Sánchez-Benavides, N. Gramunt, C. Minguillon, K. Fauria, F. Barkhof, J.L. Molinuevo, J.D. Gispert for the ALFA Study, White matter hyperintensities mediate gray matter volume and executive function relationship, Human Brain Mapping, 2019

G. Operto, R. Cacciaglia, O. Grau-Rivera, C. Falcon, A. Brugulat-Serrat, P. Ródenas, R. Ramos, S. Morán, M. Esteller, N. Bargalló, J.L. Molinuevo, J.D. Gispert for the ALFA Study, White matter microstructure is altered in cognitively normal middle-aged APOE-ε4 homozygotes, Alzheimer's Research & Therapy, 2018

C. Falcon, A. Tucholka, G. Monté-Rubio, R. Cacciaglia, **G. Operto**, L. Rami, J.D. Gispert, J.L Molinuevo for the Alzheimer's Disease Neuroimaging Initiative, Longitudinal structural cerebral changes related to core CSF biomarkers in preclinical Alzheimer's disease: A study of two independent datasets, NeuroImage: Clinical, 2018

C. Dufouil, B. Dubois, B. Vellas, F. Pasquier, F. Blanc, J. Hugon, O. Hanon, J-F Dartigues, S. Harston, A. Gabelle, M. Ceccaldi, O. Beauchet, P. Krolak-Salmon, R. David, O. Rouaud, O. Godefroy, C. Belin, I. Rouch, N. Auguste, D. Hannequin, A. Benetos, J. Pariente, M. Paccalin, O. Moreaud, C. Hommet, F. Sellal, M. Vercelletto, I. Jalenques, A. Gentric, P. Vandel, H. Savarieau, **G. Operto**, H. Bertin, M. Chupin, V. Bouteloup, M-O Habert, J-F Mangin, G. Chêne on behalf of the Memento cohort Study Group, Cognitive and imaging markers in non-demented subjects attending a memory clinic: study design and baseline findings of the MEMENTO cohort, Alzheimer's Research & Therapy, 2017

G. Operto, M. Chupin, B. Batrancourt, M.O Habert, O. Colliot, H. Benali, C. Poupon, C. Champseix, C. Delmaire, S. Marie, D. Rivière, M. Pélégrini-Issac, V. Perlbarg, R. Trebossen, M. Bottlaender, V. Frouin, A. Grigis, D. Papadopoulos Orfanos, H. Dary, L. Fillon, C. Azouani, A. Bouyahia, C. Fischer, L. Edward, M. Bouin, U. Thoprakarn, J. Li, L. Makkaoui, S. Poret, C.

Dufouil, V. Bouteloup, G. Chételat, B. Dubois, S. Lehéricy, J.F. Mangin, Y. Cointepas and the CATI Consortium, CATI: A Large Distributed Infrastructure for the Neuroimaging of Cohorts, Neuroinformatics, 2016

D. Germanaud, J. Lefèvre, C. Fischer, M. Bintner, A. Curie, V. des Portes, S. Eliez, M. Elmaleh-Bergès, D. Lamblin, S. Passemard, **G. Operto**, M. Schaer, A. Verloes, R. Toro, J.F. Mangin, L. Hertz-Pannier, Simplified gyral pattern in severe developmental microcephalies? New insights from allometric modeling for spatial and spectral analysis of gyrification, Neuroimage, 2014

G. Operto, D. Rivière, B. Fertil, R. Bulot, J-F. Mangin, O. Coulon, Structural Analysis of fMRI Data : A Surface-Based Framework for fMRI Multi-Subject Studies, Medical Image Analysis, 2012

P. Havránková, N.D. Walker, **G. Operto**, T. Sieger, J. Vymazal, R. Jech, Cortical pattern of complex but not simple movements is affected in writer's cramp: a parametric event-related fMRI study, Clinical Neurophysiology, 2011

P. Havrankova, R. Jech, N.D. Walker, **G. Operto**, J. Tauchmanova, J. Vymazal, P. Dušek, M. Hromčík, E. Růžička, Repetitive TMS of the somatosensory cortex improves writer's cramp and enhances cortical activity, Neuroendocrinology Letters, 2010

C. Clouchoux, D. Rivière, J-F. Mangin, **G. Operto**, J. Régis, O. Coulon, Model-driven parameterization of the cortical surface for localization and inter-subject matching, Neuroimage, 2010

G. Operto, R. Bulot, J-L. Anton, O. Coulon, Projection of fMRI data onto the cortical surface using anatomically-informed convolution kernels, Neuroimage, 2008

Chapters in book :

C. Falcon, **G. Operto**, J.L. Molinuevo, J.D. Gispert. (2018) Neuroimaging Methods for MRI Analysis in CSF Biomarkers Studies. In: Perneczky R. (eds) Biomarkers for Alzheimer's Disease Drug Development. Methods in Molecular Biology, vol 1750. Humana Press, New York, NY

J-F. Mangin, M. Perrot, **G. Operto**, C. Fischer, J. Lefèvre, D. Rivière, (2015) Sulcus Identification and Labeling, In Brain Mapping, edited by Arthur W. Toga, Academic Press, Waltham, Pages 365-371, ISBN 9780123973160, http://dx.doi.org/10.1016/B978-0-12-397025-1.00307-9.

Invited oral presentations :

Getting a @Handle on Big Neuroimaging Datasets - Building Your Pre-Processing Script & Quality Control, Joint Annual Meeting ISMRM-ESMRMB & ISMRT, London, May 2022

Management and Quality Control of Large Neuroimaging Datasets: Developments From the BarcelonaBeta Brain Research Center, BrainHack Global, Marseille, December 2021

La Neuroimagerie pour comprendre et prévenir la Maladie d'Alzheimer, Ville de Menton, May 2019

Towards a future without Alzheimer - BarcelonaBeta Brain Research Center, Project MNC3 kickoff day, Nice, March 2017

Structural Group Analysis of Cortical Curvature and Depth Patterns in the Developing Brain, International symposium on biomedical imaging - ISBI, Barcelona, May 2012

Peer-reviewed conferences :

S. Puch, A. Aduriz, A. Casamitjana, V. Vilaplana, P. Petrone, **G. Operto**, R. Cacciaglia, S. Skouras, C. Falcon, J.L. Molinuevo, J.D. Gispert, Voxelwise nonlinear regression toolbox for neuroimage analysis: Application to aging and neurodegenerative disease modeling, Neural Information Processing Systems, Workshop on Machine Learning for Health, 2016

G. Operto, G. Auzias, A. Le Troter, M. Perrot, D. Rivière, J. Dubois, P. Hüppi, O. Coulon, J-F. Mangin, Structural Group Analysis of Cortical Curvature and Depth Patterns in the Developing Brain (accepted for oral presentation), international symposium on biomedical imaging - ISBI, Barcelona, 2012

O. Coulon, F. Pizzagalli, **G. Operto**, G. Auzias, C. Delon-Martin, M. Dojat, Two new stable anatomical landmarks on the central sulcus: definition, automatic detection, and their relationship with primary motor functions of the hand, International Conference of the IEEE Engineering in Medicine and Biology Society - EMBC, 2011

G. Operto, B. Fertil, R. Bulot, O. Coulon, Structural group analysis of brain functional data : assessing results significance, Medical Image Computing and Computer-Assisted Intervention – MICCAI - fMRI workshop, London, 2009

G. Operto, C. Clouchoux, R. Bulot, J.-L. Anton, O. Coulon, Surface-based structural group analysis of fMRI data, Medical Image Computing and Computer-Assisted Intervention – MICCAI, New York City, 2008

G. Operto, R. Bulot, J-L. Anton, O. Coulon, Anatomically informed convolution kernels for the projection of fmri data on the cortical surface , Medical Image Computing and Computer-Assisted Intervention – MICCAI, Copenhagen, 2006