Eleftherios Garyfallidis, PhD

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Summary

Inventor of revolutionary medical imaging algorithms, lead engineer and founder of DIPY, author of 11 journals and 20 conferences (h-index 8, 250 citations), winner of international scientific competitions, collaborator of 100+ scientists worldwide and holder of a PhD from the University of Cambridge, UK.

Education

2008 – 2012	**PhD in Medical Imaging**	University of Cambridge	UK
2004 – 2006	**MSc in Brain & Mind Sciences**	University of Crete and FORTH	GR
1999 – 2003	**BSc in Computer Science**	Technological Institution of Athens	GR

Founder & Lead Software Engineer

2009 – Today ***Diffusion Imaging in Python*** diffusion MRI analysis software library **dipy.org**

Diffusion Imaging in Python (DIPY) is a free and open source software project for the analysis of data from diffusion magnetic resonance imaging (dMRI) experiments. dMRI is an application of MRI that can be used to measure structural connectivity of the brain's white matter. DIPY today has an international team of 30+ contributors, spanning eight different academic institutions in six countries and three continents and still growing.

Research experience

2014 – Today Postdoctoral Researcher ***"White matter bundle analytics for fundamental dMRI and applications in aging"*** University of Sherbrooke

Creating biomarkers for Alzheimer's disease using dMRI, advanced machine learning and statistical methods applied on specific bundles. Supervised by Professor Maxime Descoteaux (SCIL) and Professor Stephen Cunnane (CDRV).

2012 – 2014 Postdoctoral Researcher ***"Diffusion MRI methods for direct registration of bundles"*** University of Sherbrooke

Working on the development of new methods for registration of white matter fascicles at the Sherbrooke Connectivity Imaging Lab (SCIL) under the supervision of Professor Maxime Descoteaux.

2008 – 2012 PhD Project ***"Towards an accurate brain tractography"*** MRC – CBU, University of Cambridge

The objective of this thesis was to improve on the methods for inferring neural tracts from diffusion weighted magnetic resonance imaging (dMRI). Accordingly, I presented advancements to the reconstruction, tracking, segmentation and registration modalities of dMRI analysis. The thesis is available for download here.

2006 – 2008 Research Project ***"Direct source localization using MEG"*** DAMTP, University of Cambridge

Investigating the possibility of localizing dipoles using magnetoencephalography with a direct analytical inversion approach.

2005 – 2006 MSc 1st Project ***"Automatic shape decomposition"*** Foundation for Research and Technology Hellas

The goal of this project was to decompose complex solid shapes, e.g. binary images of human hands, into meaningful parts using machine learning and computer vision approaches.

2005 – 2006 MSc 2nd Project *"**Developing fMRI applications**"* Foundation for Research and Technology Hellas

The goal of this project was to implement standard visualization algorithms for inpsecting fMRI-based activations.

2002 – 2003 BSc Project *"**Classification of OCDs and NCs using ERPs**"* Technological Institution of Athens

The purpose of this project was to encode and classify event related potentials of EEG signals between obsessive compulsive disorder patients and normal controls. For this purpose we used neural associative memories.

JOURNAL PUBLICATIONS (11) MIN I.F. 2 - MAX I.F. 14

1. **Garyfallidis, E**., O. Ocegueda, D. Wassermann, M. Descoteaux. *"Robust and efficient linear registration of fascicles in the space of streamlines"*, Neuroimage, 117:124-140, 2015.
2. Ocegueda, O., **E. Garyfallidis**, M. Descoteuax, M. Rivera. *"Symmetric Diffeomorphic Registration with Expected Cross-Correlation for Multi-Modal MRI"*, Medical Image Analysis (submitted), 2015.
3. Renaud, E. M. Descoteaux, M. Bernier, **E. Garyfallidis**, K. Whittingstall, *"Morphology of thalamus, LGN and optic radiation do not influence EEG alpha waves"*, Brain function and structure (submitted), 2015.
4. Porro, D., E. Olivetti, B. Thien, **E. Garyfallidis**, P. Avesani, *"Visual Data Mining Tool for Brain Connectivity Analysis"*, Data Mining and Knowledge Discovery (accepted), 2015.
5. Newcombe, V., M. Correia, C. Ledig, G. Giulia, J. Outtrim, D. Chatfield, T. Geeraerts, A. Manktelow, **E. Garyfallidis**, J. Pickard, B. Sahakian, P. Hutchinson, D. Rueckert, J. Coles, G. Williams, D. Menon, *"Dynamic changes in white matter abnormalities correlates with late improvement and deterioration following TBI: A diffusion tensor imaging study"*, Neurorehabilitation & Neural Repair (accepted), 2015.
6. **Garyfallidis, E.**, M. Brett, B. Amirbekian, A. Rokem, S. Van Der Walt, M. Descoteaux, and I. Nimmo-Smith. *"Dipy, a library for the analysis of diffusion MRI data"*. Frontiers in Neuroinformatics, 1-18, 2014.
7. Daducci, A., E. Canales-Rodriguez, M. Descoteaux, **E. Garyfallidis**, Y. Gur, Y-C. Lin, M. Mani, S. Merlet, M. Paquette, A. Ramirez-Manzanares, M. Reisert, P. Rodrigues, F. Sepehrband, E. Caruyer, J. Choupan, R. Deriche, M. Jacob, G. Menegaz, V. Prckovska, M. Rivera, Y. Wiaux, and J-P. Thiran. *"Quantitative comparison of reconstruction methods for intra-voxel fiber recovery from diffusion MRI."* Transactions in Medical Imaging, 33 (2): 384-399, 2014.
8. Côté, M-A., G. Girard, A. Boré, **E. Garyfallidis**, J-C. Houde, and M. Descoteaux. *"Tractometer: Towards Validation of Tractography Pipelines."* Medical Image Analysis, 17 (7): 844-857, 2013.
9. **Garyfallidis, E.**, M. Brett, M. M. Correia , G.B. Williams, I. Nimmo-Smith. *"QuickBundles, a method for tractography simplification."* Frontiers in Neuroscience, 6-175, 2012.
10. Tsiaras, V., P.G. Simos, R. Rezaie, B.R. Sheth, **E. Garyfallidis**, E.M. Castillo, A.C. Papanicolaou, *"Extracting biomarkers of autism from MEG resting-state functional connectivity networks."*, Computers in biology and medicine 41(12): 1166-77, 2011.
11. Chamberlain S.R., A. Hampshire, L.A. Menzies, **E. Garyfallidis**, J.E. Grant, B.L. Odlaug, K. Craig, N. Fineberg, B.J. Sahakian, *"Reduced brain white matter integrity in trichotillomania: a diffusion tensor imaging study."*, Archives of General Psychiatry 67(9): 965-71, 2010.

Conference Publications (20)

1. **Garyfallidis, E.** M-A Côté, J. Hau, G. Perchey, L. Petit, S. C. Cunnanne, M. Descoteaux. *"Recognition of bundles in healthy and severely diseased brains"*. Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM), Toronto, Canada, 2015.

2. Côté, M-A., **E. Garyfallidis**, H. Larochelle, and M. Descoteaux. *"Cleaning up the mess: tractography outlier removal using hierarchical QuickBundles clustering"*. Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM), Toronto, Canada, 2015.

3. Ocegueda O., **E. Garyfallidis**, M. Descoteaux, and M. Rivera. *"An algorithm and quantitative evaluation framework for registration of multi-modal brain MRI"*, Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM), Toronto, Canada, 2015.

4. Tax C.M.W., D.S. Novikov, **E. Garyfallidis**, M.A. Viergever, M. Descoteaux and A. Leemans, *"Localizing and characterizing single fiber populations throughout the brain"*, Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM), Toronto, Canada, 2015.

5. Chekir, A., M. Descoteaux, **E. Garyfallidis**, M-A. Cote , F. Oulebsir-Boumghar, *"A Hybrid Approach for Optimal Automatic Segmentation of White Matter Tracts in HARDI"*, IEEE Conference on Biomedical Engineering and Sciences, Sarawak, Malaysia, 2014.

6. **Garyfallidis, E.**, D. Wassermann and M. Descoteaux. *"Direct native-space fiber bundle alignment for group comparisons"*. Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM). Milan, Italy, 2014.

7. **Garyfallidis, E.**, M. Zuchelli, J-C. Houde, and M. Descoteaux. *"How to perform best ODF reconstruction from the Human Connectome Project sampling scheme?"* Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM). Milan, Italy. 6838, 2014.

8. **Garyfallidis, E.**, A. Rokem, B. Amirbekian, S. van der Walt, M. Zucchelli, J-O. Ocegueda-Gonzalez, S. St-Jean, G. Girard, M. Paquette, I. Nimmo-Smith, M. Brett, and M. Descoteaux. *"The new methods available in Dipy 0.7.0+ that you should know about."* Proceedings of: Organization of Human Brain Mapping (OHBM). Hamburg, Germany, 2014.

9. Zuchelli, M., **E. Garyfallidis**, M. Paquette, S. Merlet, G. Menegaz, and M. Descoteaux. *"Comparison between discrete and continuous propagator indices from Cartesian q-space DSI sampling."* Proceedings of: International Society of Magnetic Resonance in Medicine (ISMRM). 6762, 2014.

10. **Garyfallidis E.**, S. St-Jean, M. Paquette, P. Coupé, and M. Descoteaux. *"Constrained spherical deconvolution on signal and ODF values."* Proceedings of: ISBI HARDI Reconstruction Challenge. 16, 2013.

11. **Garyfallidis E.**, S. St-Jean, M. Paquette, P. Coupé, and M. Descoteaux. *"Deconvolution enhanced Generalized Q-Sampling 2 and DSI deconvolution."* Proceedings of: ISBI HARDI Reconstruction Challenge. 17, 2013.

12. Paquette, M., **E. Garyfallidis**, S. St-Jean, P. Coupé, and M. Descoteaux. *"Particle Swarm Optimization in Multi-Tensor Imaging"*. Proceedings of: ISBI HARDI Reconstruction Challenge. 15, 2013.

13. **Garyfallidis E**., Gerhard S., Avesani P., Nguyen T., Tsiaras V., Nimmo-Smith I., Olivetti E., "*A software application for real-time, clustering-based exploration of tractographies*", 18th Annual Meeting of the Organization for Human Brain Mapping, 2012.

14. Olivetti E., Nguyen TB., **Garyfallidis E**., "*The Approximation of the Dissimilarity Projection*", 2nd IEEE International Workshop on Pattern Recognition in NeuroImaging, 2012.

15. **Garyfallidis E**., Nimmo-Smith I., "*Cartesian grid q-space reconstruction*", HARDI Reconstruction Workshop of the 9th IEEE International Symposium on Biomedical Imaging, 2012.

16. Correia M.M., Williams G.B., Yeh F-C, Nimmo-Smith I., **Garyfallidis E**., "*Robustness of diffusion scalar metrics when estimated with Generalized Q-Sampling Imaging acquisition schemes*", 19th Proceedings of the International Society of Magnetic Resonance in Medicine, 2011.

17. **Garyfallidis E.**, Brett M., Amirbekian B., Nguyen C., Yeh F-C., Olivetti E., Halchenko Y., Nimmo-Smith I., "*Dipy - a novel software library for diffusion MR and tractography*", 17th Annual Meeting of the Organization for Human Brain Mapping, 2011.
18. Tsiaras V., Simos P.G., Rezaie R., Sheth B.R., **Garyfallidis E.**, Castillo E.M., Papanicolaou A.C., "*Extracting biomarkers of autism from MEG resting-state functional connectivity networks.*", Computers in biology and medicine 41(12):1166-77, 2011.
19. **Garyfallidis E.**, Brett M., Nimmo-Smith I, "*Fast Dimensionality Reduction for Brain Tractography Clustering*", 16th Annual Meeting of the Organization for Human Brain Mapping, 2010.
20. **Garyfallidis E.**, Brett M., Tsiaras V., Vogiatzis G., Nimmo-Smith I., "*Identification of corresponding tracks in diffusion MRI tractographies*", 18th Proceedings of the International Society of Magnetic Resonance in Medicine, 2010.

Oral Conference Presentations

1. Garyfallidis, E., D. Wassermann, and M. Descoteaux, "Direct native-space fiber bundle alignment for group comparisons", International Society of Magnetic Resonance in Medicine (ISMRM). Milan, Italy. 7796, 2014.
2. Speaker at the OHBM Educational course MR Diffusion Imaging: Getting Your Measures Right, "Diffusion tractography", Hamburg, June 2014.
3. Speaker at the OHBM Educational course MR Diffusion Imaging: Getting Your Measures Right, "Connectivity and tract-analysis", Honolulu, June 2015.

Invited Talks

1. Garyfallidis E. (Oct. 2014), "Hack the white matter with Dipy", Ignite speaker in Brainhack EDT (brainhack.org), University of Montreal, Canada. Invited by Prof. Pierre Bellec and Prof. Julien Cohen-Adad.
2. Garyfalldis E. (May 2014), "Diffusion MRI workshop", University of Verona, Italy. Invited by Prof. Gloria Menegaz.
3. Garyfallidis E. (Mar. 2013), "Quickbundles-based Segmentation", Harvard University, USA. Invited by Prof. Simon Warfield and Prof. Carl Fredrik Westin.
4. Garyfallidis E. (May 2013), "Diffusion imaging course with DIPY", University of California at Berkeley, USA. Invited by Prof. Mark D'Esposito, MD and Dr. Matthew Brett, MD.
5. Garyfallidis E. (May 2013), "Beyond DIPY 0.7", Stanford University, USA. Invited by Prof. Bob Dougherti and Dr. Ariel Rokem.
6. Garyfallidis E. (June 2013), "Python in Neuroimaging and DIPY course", EPFL, Switzerland. Invited by Prof. Jean-Philippe Thiran and Dr. Alessandro Dadducci.
7. Garyfallidis E. (Sep. 2012), "DIPY 0.6 on the edge of diffusion MR analysis", CIMEK, FBK, Trento, Italy. Invited by Prof. Paolo Avesani and Dr. Emanuelle Olivetti.
8. Garyfallidis E. (Jul. 2012), "Accuracy in voxel reconstruction using dMRI", Stanford University, USA. Invited by Prof. Bob Dougherti and Dr. Ariel Rokem.

Outreach

1. Presented at the 350th celebration of the Royal Society, London, UK. In the presence of Her Majesty Queen Elizabeth II and His Royal Highness the Duke of Edinburgh. Video available here. The title of the presentation was "*Surfing your Brain Super-Highways*".
2. Interviewed by The Scientist Magazine . The article was available on 1st Nov. 2014. Link available here.

Awards/Honors

1. Winner of the international scientific competition IEEE ISBI HARDI Challenge, San Francisco, USA, 2013.
2. Official OHBM exhibitor for DIPY, Honolulu, Hawaii, 2015.
3. Mentor and speaker at OHBM Hackathon 2015 together with Dr. Ariel Rokem.
4. Consultant for R01 of P.I. Prof. Cameron Craddock from the Child Mind Institute, New York, 2015.
5. Consultant for R01 of P.I. Arno Klein from the University of Columbia, 2012.
6. Mentor in Google Summer of Code and the Python Software Foundation, 2015.
7. Consultant in Startup Event, Microsoft Athens, 2012.
8. Topic Editor in Frontiers in Human Neuroscience, 2014.
9. RBIQ Travelling Award for attending ISMRM 2014.
10. Distinction Award for the MSc – Grade 8.65/10.
11. Distinction Award for the BSc Thesis – Grade 10/10.
12. Scholarship from the Board of Graduate Studies, University of Cambridge (2009 – 2010).
13. EPSRC funding for College and Tuition Fees for the 4 years of the PhD course.
14. Sponsorship from the Vergottis Foundation for the living expenses for the PhD course.
15. Scholarship (Jul. 2004 – Jun. 2005) awarded after competitive examination at the MSc course.
16. Scholarship (Mar. 2006 – Jul. 2006) from the Computational Vision and Robotics Laboratory, FORTH, GR.
17. Life member of Wolfson College, Cambridge, UK.
18. Member of Quebec Neuroimaging Network, CA.

Past Employment

2004 – 2006 **Freelance Developer** Applications for Booking Air-tickets, Athens, GR.
2002 – 2003 **Security Analyst (White Hat)** National Center for Scientific Research, Athens, GR.
2000 – 2001 **UI Developer** AlphaCyber Group, Stock Market Analysis, Athens, GR.
1997 – 2000 **Sales/Promotion** Golden Jewelery Shop, family business, Athens, GR.

Programming

I am a professional software engineer. I have programmed in more than 20 different languages. I am a professional Python developer and experienced in C/C++ and Cython. Apart from developing and leading the development of DIPY I have also worked extensively in scientific visualization. Here is a project that I started developing in 2010 using Python and OpenGL.

2010 – 2012 **Free on Shades** medical imaging and network visualization library **fos.me**

A 3D visualization software library using OpenGL and the Python programming language for extremely efficient and interactive experience of tractographies from neuroanatomists.

Teaching

I have teached advanced courses in Machine Learning (Medical Research Council), Python Development for Medical Imaging (University of Sherbrooke) and taught in summer schools for DIPY (CREATE/NSERC/QBIN).

PhD Courses

Machine Learning, Statistical Pattern Processing, Signal Detection and Estimation, High Performance Computing, Statistical, Methods, and Complex Optimization.

MSc Courses

Medical Imaging, Neurobiology, Neurophysiology, Introduction to Robotics, Developmental Psychology, Biomedial Technology, Robotic Action, Biomimetic Robotics, Philosophy of the Mind, and Machine Vision.

Activities & Sports

Swimming, Martial Arts, Freeletics, Cryptocurrencies (bitcoins).

Personal Characteristics

Team player, Passionate, Friendly, Hard Working, Determined, Inventive.

References

Prof. Maxime Descoteaux	Position:	Chair of Neuroinformatics	Telephone:	+1 819 580 1456
		University of Sherbrooke	E-mail:	maxime.descoteaux@gmail.com
		Sherbrooke, CA	Relationship:	Postdoc supervisor
Dr. Ian Nimmo-Smith	Position:	Former Head of Methods Group	Telephone:	+44 7966 699 097
		MRC – CBU	E-mail:	iannimmosmith@gmail.com
		Cambridge, UK	Relationship:	PhD 1st advisor
Dr. Matthew Brett, MD	Position:	Lead Engineer at NIPY	Telephone:	+1 5106 434 053
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		Berkeley, US	Relationship:	Collaborator
Prof. Daniel Alexander	Position:	Professor of Imaging Science	Telephone:	UCL + ext. 32419
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Prof. Paolo Avesani	Position:	Head of Neuroinformatics	Telephone:	+39 046 131 4336
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		Trento, IT	Relationship:	Collaborator
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		Trento, IT	Relationship:	Collaborator
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Prof. Nikolaos Vassilas	Position:	Head of Informatics	Telephone:	+30 6977 840 215
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		Athens, GR	Relationship:	BSc supervisor