

Maxime Chamberland

POST-DOCTORAL RESEARCH FELLOW · NEUROIMAGING

Nijmegen, The Netherlands

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Experience does for the soul what educational does for the mind

Education

PhD. in Radiation Sciences & Biomedical Imaging

UNIVERSITY OF SHERBROOKE - FACULTY OF MEDICINE AND HEALTH SCIENCES

- Diffusion and functional MRI visualisation for neurosurgical planning

Canada

2013-2017

MSc. in Computer Science & Medical Imaging

UNIVERSITY OF SHERBROOKE - COMPUTER SCIENCE FACULTY

- Real-time fibre tractography using diffusion MRI

Canada

2011-2013

BSc. in Digital Imaging Science

UNIVERSITY OF SHERBROOKE - COMPUTER SCIENCE FACULTY

- Cooperative program including 3 internships at the Canadian Space Agency (Junior R&D developer)

Canada

2007-2010

Experience

Radboud Excellence Initiative Fellowship

DONDERS INSTITUTE FOR BRAIN, COGNITION AND BEHAVIOUR

- Computational Neuroimaging & Clinical Applications

Nijmegen, The Netherlands

2021-PRESENT

Post-Doctoral Research Fellow

CARDIFF UNIVERSITY BRAIN RESEARCH IMAGING CENTRE

- Computational Neuroimaging [Medical Imaging methods development]

Cardiff, United Kingdom

2017-PRESENT

Sessional Lecturer

UNIVERSITY OF SHERBROOKE

- Visual and Digital Interactions (IMN638) [Real-time rendering, GPU programming]

Sherbrooke, Canada

Fall 2013

Teaching Fellow

UNIVERSITY OF SHERBROOKE

- Digital Medias Acquisition (IMN117) [Image analysis]

Sherbrooke, Canada

2011-2013

Research Funding

Radboud University

RADBOUD EXCELLENCE INITIATIVE FELLOWSHIP

The Netherlands

2 years

2021-2023

Postdoctoral Fellowship (\$90,000)

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC)

- Ranked 1st across the Biomedical category.

2 years

2017-2019

Alexander-Graham-Bell Post-graduate Scholarship (\$105,000)

NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL OF CANADA (NSERC)

- High-caliber biomedical PhD fellowship.

3 years

2014-2017

Doctoral Fellowship (\$40,000)

FONDS DE RECHERCHE DU QUÉBEC - NATURE AND TECHNOLOGY (FRQNT)

- Awarded but gratefully declined in favor of the above grant.

2 years

2014-2016

Post-graduate scholarship (\$19,000)

FACULTY OF MEDICINE AND HEALTH SCIENCES, UNIVERSITY OF SHERBROOKE (CANADA)

1 year

2013

Honors & Awards

TRAINING ABROAD GRANTS

2016	\$4000 , Quebec Bio-Imaging Network Research Travel Grant [Cardiff University]	Cardiff, UK
2015	\$6000 , Michael Smith Foreign Study Supplement (NSERC) [Harvard Medical School]	Boston, USA

TRAVEL STIPENDS

2020	£165 , Guarantors of Brain Conference Travel Grant	United Kingdom
2018	£600 , Guarantors of Brain Conference Travel Grant	United Kingdom
2018	\$500 , ISMRM Conference Educational Stipend	Paris
2016	\$500 , ISMRM Conference Educational Stipend	Singapore
2016	\$500 , Sherbrooke Neuroscience Center Travel Award	Singapore
2015	\$500 , ISMRM Conference Educational Stipend	Toronto
2015	\$500 , Sherbrooke Neuroscience Center Travel Award	Honolulu
2015	\$500 , Québec BioImaging Network Travel Award	Honolulu
2014	\$500 , Québec BioImaging Network Travel Award	Hamburg
2012	\$500 , Sherbrooke Neuroscience Center Travel Award	Beijing
2012	\$750 , University of Sherbrooke – Student Recognition Travel Award	Beijing

PUBLICATIONS AWARDS

2017	\$500 , Sherbrooke Neuroscience Center Publication Award (also awarded in 2015)	Canada
2016	\$1000 , FRQNT Chercheurs Étoiles - Best Paper (Nature & Technology)	Canada
2014	N/A , Neurotechnix – Best Student Paper Award	Rome

OTHERS

2020	\$200 , ISMRM Pediatric Study Group - Oral presentation	Virtual
2014	\$500 , Sherbrooke Neuroscience Center Scientific Day - Best Oral Presentation	Canada
2013	\$300 , Molecular Imaging Center of Sherbrooke – Best Student Poster	Canada
2013	\$1500 , ACFAS – Best Scientific Picture (Jury's and people's choice)	Canada
2012	N/A , National Science Foundation – Scientific Visualization Challenge (People's choice)	USA
2012	N/A , NeuroBureau – Best Educational Brain Art Illustration	-

Skills

Computer Science	Medical Image Analysis, Machine Learning, Data visualisation
Programming	C/C++, Python, OpenGL, GLSL, R, Matlab, Bash, Git, LaTeX
Softwares	FiberNavigator, MRtrix, Dipy, FSL, ExploreDTI, AFNI, TensorFlow, Keras, SKlearn

Reviewing	Nature Communications, NeurolImage, Neuromage Clinical, Human Brain Mapping, Medical Image Analysis, Brain Structure and Function, Frontiers, PLOS One, PLOS Computational Biology, MICCAI, cdMRI
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Committee member	Natural Sciences and Engineering Research Council of Canada (2021-2023) Biomedical Scholarships and Fellowships Selection Committee
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Languages	French, English
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Oral Presentations

OHBM 2021

EDUCATION COURSE: TRACTOMETRY: PEERING INTO THE WHITE MATTER.

- Single-subject analysis via high-dimensional analysis

Virtual
Summer 2021

Jena University Hospital seminar series- Germany

INVITED BY DR. DANIEL GULLMAR

- Tract-specific MRI measures explain learning and recall differences in multiple sclerosis.

Virtual
May 2021

MICCAI 2020

ORAL PRESENTATION: COMPUTATIONAL DIFFUSION MRI

- Beyond lesion-load: Tractometry-based metrics for characterizing white matter lesions within fibre pathways

Virtual

Fall 2020

ISMRM 28th Annual Meeting

ORAL PRESENTATION: PEDIATRIC HIGH-END

- Highlighting tract-specific microstructural abnormalities in single subjects using autoencoders

Virtual

Fall 2020

ISMRM 27th Annual Meeting

ORAL PRESENTATION: FIBER ORIENTATIONS & TRACTOGRAPHY SESSION

- Improved statistical power to detect differences in tissue microstructure through dimensionality reduction

Montreal, Canada

Spring 2019

Computational Brain Connectivity Mapping Winter School Workshop

INVITED BY PROF. RACHID DERICHE

- Interactive & Advanced Tractography Visualization

Juans-Les-Pins, France

Fall 2017

ISMRM Workshop on Breaking the Barriers of Diffusion MRI

POWER-PITCH: TRACTOGRAPHY SESSION

- Exploring Geometrical Sheet-Like Structures in Real-Time

Lisbon, Portugal

Fall 2016

Center for Brain Imaging, NYU

INVITED BY PROF. FERNANDO BOADA

- Invited talk on Tractography and Neurosurgical planning

New York, USA

Fall 2015

Department of Mathematics and Computer Science, TU/e

INVITED BY PROF. LUC FLORACK

- Invited FiberNavigator demonstration

Eindhoven, The Netherlands

Spring 2015

Image Sciences Institute, PROVIDIlab, UMC

INVITED BY PROF. ALEXANDER LEEMANS

- Invited talk on Exploring brain connectivity in real-time

Utrecht, The Netherlands

Spring 2015

INRIA Research Institute

INVITED BY PROF. RACHID DERICHE

- Invited talk on Diffusion & Functional MRI visualization

Sophia-Antipolis, France

Fall 2014

Laboratory of Mathematics in Imaging, Harvard Medical School

INVITED BY PROF. CARL-FREDRIK WESTIN

- Invited talk on Real-time Fiber Tractography

Boston, USA

Spring 2013

Computational Radiology Laboratory, Harvard Medical School

INVITED BY PROF. SIMON K. WARFIELD

- Invited talk on Real-time Fiber Tractography

Boston, USA

Spring 2013

Projects

Lesionometry

[HTTPS://GITHUB.COM/CHAMBERM/LESIONOMETRY](https://github.com/CHAMBERM/LESIONOMETRY)

- Tractometry-based metrics for characterizing white matter lesions within fibre pathways.

Python

2020-2021

Detect

[HTTPS://GITHUB.COM/CHAMBERM/DETECT](https://github.com/CHAMBERM/DETECT)

- A browser-based anomaly detection framework for diffusion MRI using Tractometry.

Python

2020-2021

FiberNavigator

[HTTPS://GITHUB.COM/CHAMBERM/FIBERNAVIGATOR](https://github.com/CHAMBERM/FIBERNAVIGATOR)

- Open-source neuroimaging visualization tool for diffusion MRI data.

C++, OpenGL, GLSL

Main active developer

Peer-reviewed Publications

JOURNAL PAPERS

1. Tax, CMW., Kleban, E., **Chamberland**, M., Baraković, M., Rudrapatna, U., and Derek K. Jones. "Measuring compartmental T2-orientational dependence in human brain white matter using a tiltable RF coil and diffusion-T2 correlation MRI." *NeuroImage* 236 (2021): 117967.

2. Winter, M., Tallantyre, C E., Brice, AW T., Robertson, P N., Jones, K D., **Chamberland, M.**, Tract-specific MRI measures explain learning and recall differences in multiple sclerosis, *Brain Communications*, 2021;, fcab065.
3. Koller, K., Rudrapatna, U., **Chamberland, M.**, Raven, E. P., Parker, G. D., Tax, C. M., ... and Jones, D. K. (2020). MICRA: Microstructural image compilation with repeated acquisitions. *NeuroImage*, 225, 117406.
4. Barakovic, M., Tax, C.M., Rudrapatna, U.S., **Chamberland, M.**, Rafael-Patino, J., Granziera, C., Thiran, J.P., Daducci, A., Canales-Rodríguez, E.J. and Jones, D.K., 2020. Resolving bundle-specific intra-axonal T2 values within a voxel using diffusion-relaxation tract-based estimation. *NeuroImage*, p.117617.
5. de Almeida Martins, J.P., Tax, C. M. W., Reymbaut, A., Szczepankiewicz, F., **Chamberland, M.**, Jones, D. K., Topgaard, D., 2020. *Computing and visualising intra-voxel orientation-specific relaxation-diffusion features in the human brain*: Human Brain Mapping.
6. Geeraert, B., **Chamberland, M.**, Lebel, M., Lebel, C., 2020. *Multimodal principal component analysis to identify major features of white matter structure and links to reading*. *PloS one* (in press).
7. Genc, S., Tax, C. M., Raven, E. P., **Chamberland, M.**, Parker, G. D., Jones, D. K., 2020. *Impact of b-value on estimates of apparent fibre density*. Human Brain Mapping.
8. Rheault, F., De Benedictis, A., Daducci, A., Maffei, C., Tax, C.M.W. et al., 2020. *Tractostorm: The what, why, and how of tractography dissection reproducibility*. Human Brain Mapping
9. St-Jean, S., **Chamberland, M.**, Viergever, M.A. and Leemans, A., 2019. *Reducing variability in along-tract analysis with diffusion profile realignment*. *NeuroImage*, 199, 663-679.
10. **Chamberland, M.**, Raven, E.P., Genc, S., Duffy, K., Descoteaux, M., Parker, G.D., Tax, C.M. and Jones, D.K., 2019. *Dimensionality reduction of diffusion MRI measures for improved tractometry of the human brain*. *NeuroImage*, 200, 89-100.
11. Schilling, K.G., Nath, V., Hansen, C., Parvathaneni, P., Blaber, J., Gao, Y., Neher, P., et al., 2019. *Limits to anatomical accuracy of diffusion tractography using modern approaches*. *NeuroImage*, 185, pp.1-11.
12. Zhang, Z., Descoteaux, M., Zhang, J., Girard, G., **Chamberland, M.**, Dunson, D., Srivastava, A. and Zhu, H., 2018. *Mapping population-based structural connectomes*. *NeuroImage*, 172, pp.130-145.
13. **Chamberland, M.**, Tax, C.M. and Jones, D.K., 2018. *Meyer's loop tractography for image-guided surgery depends on imaging protocol and hardware*. *NeuroImage: Clinical*, 20, pp.458-465.
14. Maier-Hein, K.H., Neher, P.F., Houde, J.C., Côté, M.A., Garyfallidis, E., Zhong, J., **Chamberland, M.** et al., 2017. *The challenge of mapping the human connectome based on diffusion tractography*. *Nature communications*, 8(1), p.1349.
15. **Chamberland, M.**, Girard, G., Bernier, M., Fortin, D., Descoteaux, M. and Whittingstall, K., 2017. *On the origin of individual functional connectivity variability: the role of white matter architecture*. *Brain connectivity*, 7(8), pp.491-503.
16. **Chamberland, M.**, Scherrer, B., Prabhu, S.P., Madsen, J., Fortin, D., Whittingstall, K., Descoteaux, M. and Warfield, S.K., 2017. *Active delineation of Meyer's loop using oriented priors through MAGNETic tractography (MAGNET)*. *Human brain mapping*, 38(1), pp.509-527.
17. Kaye, H.L., Peters, J.M., Gersner, R., **Chamberland, M.**, Sansevere, A. and Rotenberg, A., 2017. *Neurophysiological evidence of preserved connectivity in tuber tissue*. *Epilepsy & behavior case reports*, 7, pp.64-68.
18. Tax, C.M., **Chamberland, M.**, van Stralen, M., Viergever, M.A., Whittingstall, K., Fortin, D., Descoteaux, M. and Leemans, A., 2015. *Seeing more by showing less: orientation-dependent transparency rendering for fiber tractography visualization*. *PloS one*, 10(10), p.e0139434.
19. **Chamberland, M.**, Bernier, M., Fortin, D., Whittingstall, K. and Descoteaux, M., 2015. *3D interactive tractography-informed resting-state fMRI connectivity*. *Frontiers in neuroscience*, 9, p.275.
20. **Chamberland, M.**, Bernier, M., Houde, J.C., Descoteaux, M. and Whittingstall, K., 2014. *Using fMRI non-local means denoising to uncover activation in sub-cortical structures at 1.5 T for guided HARDI tractography*. *Frontiers in human neuroscience*, 8, p.715.

21. **Chamberland, M.**, Whittingstall, K., Fortin, D., Mathieu, D. and Descoteaux, M., 2014. *Real-time multi-peak tractography for instantaneous connectivity display*. Frontiers in neuroinformatics, 8, p.59.
22. Coupé, P., Manjón, J.V., **Chamberland, M.**, Descoteaux, M. and Hiba, B., 2013. *Collaborative patch-based super-resolution for diffusion-weighted images*. NeuroImage, 83, pp.245-261.

SHORT PAPERS

1. **Chamberland, M.**, Genc, S., Raven, E., Parker, G., Tax, C.M.W., Cunningham, A., Doherty, J., van den Bree, M., Jones, DK., 2020. *Tractometry-based Anomaly Detection for Single-subject White Matter Analysis*. Proceedings of The 3rd International Conference on Medical Imaging with Deep Learning (MIDL), Montreal, 2020.
2. Girard, G., **Chamberland, M.**, Houde, J.C., Fortin, D. and Descoteaux, M., 2012. *Neurosurgical tracking at the sherbrooke connectivity imaging lab (SCIL)*. In International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI'12)-DTI Challenge Workshop (pp. 55-73).

BOOK CHAPTERS

1. **Chamberland, M.**, Winter, M., Brice, T., Jones, D.K., Tallantyre, E., 2020, September. *Beyond lesion-load: Tractometry-based metrics for characterizing white matter lesions within fibre pathways*. MICCAI 2020 - International Workshop on Computational Diffusion MRI
2. **Chamberland, M.**, St-Jean, S., Tax, C.M. and Jones, D.K., 2018, September. *Obtaining representative core streamlines for white matter tractometry of the human brain*. In International Conference on Medical Image Computing and Computer-Assisted Intervention (pp. 359-366). Springer, Cham.
3. **Chamberland, M.**, Gray, W., Descoteaux, M. and Jones, D.K., 2017, September. *Interactive Computation and Visualization of Structural Connectomes in Real-Time*. In International Workshop on Connectomics in Neuroimaging (pp. 35-41). Springer, Cham.
4. Vaillancourt, O., **Chamberland, M.**, Houde, J.C. and Descoteaux, M., 2015. *Visualization of diffusion propagator and multiple parameter diffusion signal*. In Visualization and Processing of Higher Order Descriptors for Multi-Valued Data (pp. 191-212). Springer, Cham.

CONFERENCE ABSTRACTS

1. **Chamberland, M.**, Shastin, D., Genc, S., Hamandi, K., Gray, WP., Tax, C.M.W. Jones, DK., 2021. *An n=1 approach to white matter anomaly detection in epilepsy*. International Society for Magnetic Resonance in Medicine (ISMRM), Vancouver, Canada.
2. **Chamberland, M.**, Genc, S., Raven, E., Parker, G., Tax, C.M.W., Cunningham, A., Doherty, J., van den Bree, M., Jones, DK., 2020. *Highlighting tract-specific microstructural abnormalities in single subjects using autoencoders*. International Society for Magnetic Resonance in Medicine (ISMRM), Paris, France.
3. **Chamberland, M.**, Genc, S., Raven, E., Parker, G., Tax, C.M.W., Cunningham, A., Doherty, J., van den Bree, M., Jones, DK., 2020. *Tract-specific microstructural anomaly detection using autoencoders for single subject analysis*. Organization for Human Brain Mapping (OHBM), Montreal, Canada.
4. **Chamberland, M.**, Iqbal, NS., Rudrapatna, SU., Parker, G., Tax, C.M.W., Staffurth, J., Powell, J., Wise, RG., Jones, D.K., 2019. *Characterising tissue heterogeneity in cerebral metastases using multi-shell multi-tissue constrained spherical deconvolution*. International Society for Magnetic Resonance in Medicine (ISMRM), Montreal, Canada.
5. **Chamberland, M.**, Raven, E., Genc, S., Duffy, K., Parker, G., Tax, C.M.W., Descoteaux, M., Jones, DK., 2019. *Metrics that Matter: Improved statistical power to detect differences in tissue microstructure through dimensionality reduction*. International Society for Magnetic Resonance in Medicine (ISMRM), Montreal, Canada.
6. **Chamberland, M.**, and Jones, DK., 2018. *Enhancing bundle topology for tractography visualization using silhouette rendering*. International Society for Magnetic Resonance in Medicine (ISMRM), Paris, France.
7. **Chamberland, M.**, Descoteaux, D., Jones DK., 2018. *Advances in structural and functional connectivity visualization using the FiberNavigator*. International Society for Magnetic Resonance in Medicine (ISMRM), Paris, France.

8. **Chamberland, M.**, Tax, CMW., Gray, W., Jones, DK., 2018. *The neurosurgical implication of scanner, gradient performance and acquisition protocol on Meyer's loop reconstruction*. International Society for Magnetic Resonance in Medicine (ISMRM), Paris, France.
9. **Chamberland, M.**, Tax, C.M.W., Fortin, D., Whittingstall, K., Descoteaux, M., 2016. *Exploring geometrical sheet-like structures in real time*. International Society for Magnetic Resonance in Medicine (ISMRM) – Breaking the barriers of diffusion MRI Workshop, Lisbon, Portugal.
10. **Chamberland, M.**, Scherrer, B., Prabhu, S., Fortin, D., Whittingstall, K., Descoteaux, D. and Warfield, S.K., 2016. *Magnetic ROIs enable improved tractography accuracy through oriented prior*. International Society for Magnetic Resonance in Medicine (ISMRM), Singapore.
11. **Chamberland, M.**, Girard, G., Bernier, M., Fortin, D., Descoteaux, M., and Whittingstall, K., 2016. *Association between structural and functional inter-subject variability of the motor and visual networks*. International Society for Magnetic Resonance in Medicine (ISMRM), Singapore.
12. **Chamberland, M.**, Bernier, M., Fortin, D., Descoteaux, M., and Whittingstall, K., 2015. *Tractography-driven resting-state fMRI for investigating inter-subject variability*. Organization for Human Brain Mapping (OHBM), Honolulu, Hawaii.
13. **Chamberland, M.**, Bernier, M., Fortin, D., Whittingstall, K., and Descoteaux, M., 2015. *Interactively computing and visualizing functional and structural brain connectivity in real time*. International Society for Magnetic Resonance in Medicine (ISMRM), Toronto, Canada.
14. **Chamberland, M.**, Descoteaux, M., Whittingstall, K., and Fortin, D., 2014. *Simultaneously probing functional and structural brain connectivity in real time: Fibernavigator: An interactive tool for brain visualization*. Neurotechnix, Rome, Italy.
15. **Chamberland, M.**, Bernier, M., Fortin, D., Descoteaux, M., and Whittingstall, K., 2014. *Uncovering a visuospatial network at rest*. Organization for Human Brain Mapping (OHBM), Hamburg, Germany.
16. **Chamberland, M.** and Descoteaux, M., 2013. *Explore the brain white matter networks in real-time: multi-sticks fiber tracking*. International Society for Magnetic Resonance in Medicine (ISMRM), Salt-Lake City, USA.
17. **Chamberland, M.**, Fortin, D. and Descoteaux, M., 2012. *Real-time fiber tractography: interactive parameter tuning for neurosurgical interventions*. Organization for Human brain mapping (OHBM), Beijing, China.

THESES

1. **Chamberland, M.**, 2017. Développement d'outils neuroinformatiques spécialisés pour améliorer l'analyse individuelle en médecine personnalisée" (Ph.D thesis, Université de Sherbrooke).
2. **Chamberland, M.**, 2013. Visualisation en imagerie par résonance magnétique de diffusion: tractographie en temps réel des fibres de la matière blanche du cerveau (M.Sc thesis, Université de Sherbrooke).