Maxime **Chamberland**

Post-Doctoral Research Fellow · NeuroImaging

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Keywords: Medical Image Analysis, Diffusion MRI, Data Visualisation, Machine Learning, Anomaly Detection

Education

PhD. in Radiation Sciences & Biomedical Imaging — *Sherbrooke, Canada*
University of Sherbrooke - Faculty of Medicine and Health Sciences — *2013-2017*
- Diffusion and functional MRI visualisation for neurosurgical planning

MSc. in Computer Science & Medical Imaging — *Sherbrooke, Canada*
University of Sherbrooke - Computer Science Faculty — *2011-2013*
- Real-time fibre tractography using diffusion MRI

BSc. in Digital Imaging Science — *Sherbrooke, Canada*
University of Sherbrooke - Computer Science Faculty — *2007-2010*
- Cooperative program including 3 internships at the Canadian Space Agency (Junior R&D developer)

Experience

Radboud Excellence Initiative Fellowship — *Nijmegen, The Netherlands*
Donders Institute for Brain, Cognition and Behaviour — *2021-PRESENT*
- Computational Neuroimaging & Clinical Applications

Post-Doctoral Research Fellow — *Cardiff, United Kingdom*
Cardiff University Brain Research Imaging Centre — *2017-2021*
- Computational Diffusion MRI & Medical Image Analysis

Sessional Lecturer — *Sherbrooke, Canada*
University of Sherbrooke — *Fall 2013*
- Visual and Digital Interactions (IMN638) [Real-time rendering, GPU programming]

Teaching Fellow — *Sherbrooke, Canada*
University of Sherbrooke — *2011-2013*
- Digital Medias Acquisition (IMN117) [Image analysis]

Research Funding

Radboud University — *2 years*
Radboud Excellence Initiative Fellowship — *2021-2023*
The Netherlands

Postdoctoral Fellowship ($90,000) — *2 years*
Natural Sciences and Engineering Research Council of Canada (NSERC) — *2017-2019*
- Ranked 1st across the Biomedical category.

Alexander-Graham-Bell Post-graduate Scholarship ($105,000) — *3 years*
Natural Sciences and Engineering Research Council of Canada (NSERC) — *2014-2017*
- High-caliber biomedical PhD fellowship.

Doctoral Fellowship ($40,000) — *2 years*
Fonds de recherche du Québec - Nature and Technology (FRQNT) — *2014-2016*
- Awarded but gratefully declined in favor of the above grant.

Post-graduate scholarship ($19,000) — *1 year*
Faculty of Medicine and Health Sciences, University of Sherbrooke (Canada) — *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, France*
2016	**$500**, ISMRM Conference Educational Stipend	*Singapore*
2016	**$500**, Sherbrooke Neuroscience Center Travel Award	*Singapore*
2015	**$500**, ISMRM Conference Educational Stipend	*Toronto, Canada*
2015	**$500**, Sherbrooke Neuroscience Center Travel Award	*Honolulu, Hawaii*
2015	**$500**, Québec BioImaging Network Travel Award	*Honolulu, Hawaii*
2014	**$500**, Québec BioImaging Network Travel Award	*Hamburg, Germany*
2012	**$500**, Sherbrooke Neuroscience Center Travel Award	*Beijing, China*
2012	**$750**, University of Sherbrooke – Student Recognition Travel Award	*Beijing, China*

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

Oral Presentations

OHBM 2021 *Virtual*

Educational Course: Tractometry: Peering into the White Matter *Summer 2021*

- Single-subject analysis via high-dimensional analysis

Donders Toolkit 2021 *Virtual*

Educational Course: Basics of Diffusion MRI *Summer 2021*

- Basics of Diffusion Imaging and Structural Connectivity

Jena University Hospital seminar series- Germany *Virtual*

Invited by Dr. Daniel Gullmar *May 2021*

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

MICCAI 2020 *Virtual*

Oral presentation: Computational diffusion MRI *Fall 2020*

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

ISMRM 28th Annual Meeting *Virtual*

Oral presentation: Pediatric High-End *Fall 2020*

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

ISMRM 27th Annual Meeting *Montreal, Canada*

Oral presentation: Fiber Orientations & Tractography session *Spring 2019*

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

Computational Brain Connectivity Mapping Winter School Workshop *Juans-Les-Pins, France*

Invited by Prof. Rachid Deriche *Fall 2017*

- Interactive & Advanced Tractography Visualization

ISMRM Workshop on Breaking the Barriers of Diffusion MRI *Lisbon, Portugal*

Power-pitch: Tractography session *Fall 2016*

- Exploring Geometrical Sheet-Like Structures in Real-Time

Center for Brain Imaging, NYU *New York, USA*

Invited by Prof. Fernando Boada *Fall 2015*

- Invited talk on Tractography and Neurosurgical planning

Department of Mathematics and Computer Science, TU/e *Eindhoven, The Netherlands*

Invited by Prof. Luc Florack *Spring 2015*

- Invited FiberNavigator demonstration

Image Sciences Institute, PROVIDIlab, UMC *Utrecht, The Netherlands*

Invited by Prof. Alexander Leemans *Spring 2015*

- Invited talk on Exploring brain connectivity in real-time

INRIA Research Institute *Sophia-Antipolis, France*

Invited by Prof. Rachid Deriche *Fall 2014*

- Invited talk on Diffusion & Functional MRI visualization

Laboratory of Mathematics in Imaging, Harvard Medical School *Boston, USA*

Invited by Prof. Carl-Fredrik Westin *Spring 2013*

- Invited talk on Real-time Fiber Tractography

Computational Radiology Laboratory, Harvard Medical School *Boston, USA*

Invited by Prof. Simon K. Warfield *Spring 2013*

- Invited talk on Real-time Fiber Tractography

Projects

Lesionometry *Python*

https://github.com/chamberm/Lesionometry *2020-2021*

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

Detect *Python*

https://github.com/chamberm/detect *2020-2021*

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

FiberNavigator *C++, OpenGL, GLSL*

HTTPS://GITHUB.COM/CHAMBERM/FIBERNAVIGATOR *Main active developer*

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

Publications

Journal Papers

1. **Chamberland, M.**, Genc, S., Tax, C.M.W., Shastin, D., Koller, K., Raven, E., Cunningham, A., Doherty, J., van den Bree, M., Parker, G., Hamandi, K., Gray, WP., Jones, DK., 2020. *Detecting microstructural deviations in individuals with deep diffusion MRI tractometry*. MedRxiv preprint (2021).
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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*).
8. 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.
9. 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
10. 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.
11. **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.
12. 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.
13. 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.
14. **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.
15. 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.
16. **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.
17. **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.

18. 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.
19. 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.
20. **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.
21. **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.
22. **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.
23. 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 con-*

strained 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).