Sebastian Urchs

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CONTACT

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EDUCATION

McGill University, Montreal, Canada   2013–2020

Ph.D., Integrated Program in Neuroscience, Mar 2020

Subtypes of Functional Connectivity in Autism
Advisors: Dr. Alan Evans (McGill), Dr. Pierre Bellec (Université de Montréal)

Ludwig Maximilians Universität, Munich, Germany   2006–2013

M.Sc., Neurocogntive Psychology, Mar 2013

Network Level Interactions of Functional Connectivity Maturation
Advisors: Dr. Beate Sodian (Munich), Dr. Michael Milham (New York City)

Dipl. Psychology (German M.Sc. equivalent), Jun 2012

B.Sc., Neurocognitive Psychology, Aug 2010

PROFESSIONAL
EXPERIENCE

Software Developer, Laboratory for Brain Simulation and Exploration   Jan 20–
Université de Montréal, Montreal, Canada

Core developer of dashQC, a dashboard for visual quality control and annotation of human neuroimaging data. dashQC is actively used to process imaging datasets at high density (Courtois Neuromod Project > 300 min of data per individual) and large scale (UK Biobank > 40.000 individuals).

- Implemented extension for BIDS compliant imaging data.
- Parallelized workflow and containerized for efficient deployment on HPC.
- Wrote taskflows and collected user feedback to improve user interface.
- Developed roadmap to re-implement dashQC in the plotly dash framework.
- Documented and supported dashQC for growing user base.

PhD Student, McGill Centre for Integrative Neuroscience   Sep 13–Mar 20
McGill University, Montreal, Canada, and
Laboratory for Brain Simulation and Exploration,
Université de Montréal, Montreal, Canada

Contributed to development of open source neuroimaging pipelines Neuroimaging Analysis Kit (Matlab) and fmriprep (python). I deployed these pipelines on distributed high performance clusters (HPC) to process and analyze the large scale (> 1000 individuals) imaging datasets used in my research.

- Implemented and documented pipeline to identify stable brain connections.
- Containerized analysis software for deployment on HPC (Docker, Singularity)
- Benchmarked fMRI data processing pipeline on HPC.
- Mentored undergraduate project students in the use of neuroimaging tools.
- Created and printed modular 3D brain models for teaching purposes.

Predoctoral fellow, Neuroanatomy & Connectivity Lab   Apr 13–Aug 13
Max-Planck Institute for Human Cognitive and Brain Science, Leipzig, Germany

Processed and corrected cortical surface reconstruction data for a large (120 individuals) dataset. This work led to a collaboration on two research projects and resulted in two co-authored publications.

- Corrected image segementation of human cortical surface data (freesurfer).
- Implemented python tools for computations on 3D mesh data.
- Mentored undergraduate students in the use of python for neuroimaging.

Predoctoral fellow, Center for the Developing Brain   Dec 11–Mar 13
Child Mind Institute, New York City, United States

Contributed to development of the open source Configurable Pipeline for the Analysis of Connectomes (python). Conducted the research for my graduate theses.

- Curated and processed large imaging dataset on distributed compute cluster.
- Applied support vector regression model (scikit-learn) to predict developmental trajectory of brain networks.

Research Assistant, Multisensory Integration Lab   Jun 08–Oct 11
Ludwig Maximilians Universität, Munich, Germany

- Implemented visual stimuli with millisecond precision (Psychtoolbox, Matlab)
- Set up and conducted EEG recordings (Brainproducts ActiCap).
- Analyzed EEG data (Brainvision Analyzer, eegLab).
- Conducted behavioural experiments on the Ternus illusion.

Research Assistant, Eye Tracking Lab   Jun 07–Jun 08
Ludwig Maximilians Universität, Munich, Germany

- Conducted eye tracking experiments (SR Research, Eyelink II) on scene perception, grasping and visual attention.
- Set up and maintained a participant recruitment tool for use in the department.

PREPRINTS
UNDER REVIEW   Reproducible functional connectivity endophenotype confers high risk of ASD diagnosis in a subset of individuals
S. G. W. Urchs, H. D. Nguyen, C. Moreau, C. Dansereau, A. Tam, A. C. Evans, P. Bellec.
Preprint under review at eLife

Subtypes of functional connectivity associate robustly with ASD diagnosis

<u>S. G. W. Urchs</u>, A. Tam, P. Orban, C. Moreau, Y. Benhajali, H. D. Nguyen, A. C. Evans, P. Bellec.

Preprint under review at eLife

Neuropsychiatric mutations delineate functional brain connectivity dimensions contributing to autism and schizophrenia

C. Moreau[‡], <u>S. G. W. Urchs</u>[‡], P. Orban, C. Schramm, G. Dumas, A. Labbe, G. Huguet, E. Douard, P.-O. Quirion, A. Lin, L. Kushan, S. Grot, D. Luck, A. Mendrek, S. Potvin, E. Stip, T. Bourgeron, A. C. Evans, C. E. Bearden, P. Bellec, S. Jacquemont, Simons Variation in Individuals Project Consortium.

Preprint under review at Nature Communications

PUBLICATIONS

A standardized protocol for efficient and reliable quality control of brain registration in functional MRI studies

Y. Benhajali, A. Badhwar, H. Spiers, <u>S. G. W. Urchs</u>, J. Armoza, T. Ong, D. Pérusse, P. Bellec.

Front. Neuroinform. *14 (2020) p. 7.*

Analysis of task-based functional MRI data preprocessed with fMRIPrep

O. Esteban, R. Ciric, K. Finc, R. W. Blair, C. J. Markiewicz, C. A. Moodie, J. D. Kent, M. Goncalves, E. DuPre, D. E. P. Gomez, Z. Ye, T. Salo, R. Valabregue, I. K. Amlien, F. Liem, N. Jacoby, H. Stojić, M. Cieslak, <u>S. G. W. Urchs</u>, Y. O. Halchenko, S. S. Ghosh, A. De La Vega, T. Yarkoni, J. Wright, W. H. Thompson, R. A. Poldrack, K. J. Gorgolewski.

Nat. Protoc. *15.7 (July 2020) pp. 2186–2202.*

Multivariate consistency of resting-state fMRI connectivity maps acquired on a single individual over 2.5 years, 13 sites and 3 vendors

A. Badhwar, Y. Collin-Verreault, P. Orban, <u>S. G. W. Urchs</u>, I. Chouinard, J. Vogel, O. Potvin, S. Duchesne, P. Bellec.

Neuroimage *205 (Oct. 2019) p. 116210.*

A highly predictive signature of cognition and brain atrophy for progression to Alzheimer's dementia

A. Tam, C. Dansereau, Y. Iturria-Medina, <u>S. G. W. Urchs</u>, P. Orban, H. Sharmarke, J. Breitner, P. Bellec, Alzheimer's Disease Neuroimaging Initiative.

Gigascience *8.5 (May 2019).*

MIST: A multi-resolution parcellation of functional brain networks

<u>S. G. W. Urchs</u>, J. Armoza, Y. Benhajali, J. St-Aubin, P. Orban, P. Bellec.

MNI Open Res *1 (Dec. 2017) p. 3.*

MULTIMODAL IDENTIFICATION OF A BRAIN BIOTYPE HIGHLY PREDICTIVE OF FUTURE PROGRESSION TO ALZHEIMER'S DEMENTIA

C. Dansereau, A. Tam, A. Badhwar, <u>S. G. W. Urchs</u>, P. Orban, P. Rosa-Neto, P. Bellec.

Alzheimers. Dement. *13.7, Supplement (July 2017) P1360–P1361.*

Sex beyond the genitalia: The human brain mosaic

D. Joel, Z. Berman, I. Tavor, N. Wexler, O. Gaber, Y. Stein, N. Shefi, J. Pool, <u>S. G. W. Urchs</u>, D. S. Margulies, F. Liem, J. Hänggi, L. Jäncke, Y. Assaf.

Proc. Natl. Acad. Sci. U. S. A. *112.50 (Dec. 2015) pp. 15468–15473.*

A correspondence between individual differences in the brain's intrinsic functional architecture and the content and form of self-generated thoughts
K. J. Gorgolewski, D. Lurie, S. G. W. Urchs, J. A. Kipping, R. C. Craddock, M. P. Milham, D. S. Margulies, J. Smallwood.
PLoS One *9.5 (May 2014) e97176.*

CONFERENCE PRESENTATIONS

Mirror Effects of 4 Neurodevelopmental CNVs on Functional Connectivity and Implication for Idiopathic Autism
C. Moreau[‡], S. G. W. Urchs[‡], C. Schramm, A. Lin, L. Kushan, A. C. Evans, J. D. Lewis, Consortium, Simons VIP, C. Bearden, P. Bellec, S. Jacquemont.
Annual Meeting of the Society of Biological Psychiatry (May 2019).

Altered brain connectivity in patients with 16P11.2
C. Moreau[‡], S. G. W. Urchs[‡], Simons Variation in Individuals Project Consortium, A. Evans, J. D. Lewis, P. Bellec, S. Jacquemont.
XXVth World Congress of Psychiatric Genetics (Jan. 2019).

dashqc-fmri - an interactive web dashboard for manual quality control
S. G. W. Urchs, J. Armoza, Y. Benhajali, P. Bellec.
Sixth Biennial Conference on Resting State and Brain Connectivity (Sept. 2018).

A brain signature with high positive predictive power of ASD diagnosis
S. G. W. Urchs, C. Dansereau, A. Tam, G. Bezgin, J. Lewis, A. Evans, P. Bellec.
24th Annual Meeting of the Organization for Human Brain Mapping (June 2018).

Multimodal identification of a brain biotype highly predictive of future progression to Alzheimer's Dementia
C. Dansereau, A. Tam, A. Badhwar, S. G. W. Urchs, P. Orban, P. Rosa-Neto, P. Bellec.
Alzheimer's Association International Conference (July 2017).

Subtypes of Functional Connectivity in Autism
S. G. W. Urchs, Y. Benhajali, P. Kostopoulos, P. Orban, J. Lewis, A. Evans, P. Bellec.
22nd Annual Meeting of the Organization for Human Brain Mapping (June 2016).

Functional brain network subtypes are associated with Alzheimer's disease biomarkers in an aging, high-risk, cognitively normal cohort: The prevent-alzheimer's disease study
P. Orban, S. G. W. Urchs, M. Savard, C. Madjar, A. Tam, L. Theroux, A. C. Evans, P. Rosa-Neto, D. L. Collins, J. Poirier, J. C. S. Breitner, P. Bellec.
Alzheimer's Association International Conference vol. 11 (July 2015).

HONORS & AWARDS	Canadian Open Neuroscience Platform Student Scholarship	$25,000 (CAD)	July 2019
	Organization for Human Brain Mapping Hackathon Travel Award	$500 (USD)	June 2016
	Neuro Cognitive Psychology Program Travel Award	$500 (USD)	July 2012
	German Academic Exchange Service PROMOS grant for International Studies	€4,000 (EUR)	December 2011

WORKSHOPS & TEACHING

Instructor, NIAK Workshop   **Sep 2015**

Introduction to processing of neuroimaging data

- Gave theoretical introduction on principles of neuroimaging data processing
- Created applied example problems for participants to work through
- Introduced bootstrap analysis for stability estimation of brain connectivity and demonstrated brain visualization techniques

Workshop Presenter, MICCAI Tutorial: Advances in fMRI   **Oct 2016**

Subtypes Of Functional Brain Organization Are Associated With Autism Symptoms

- Demonstrated unsupervised clustering on heterogeneous clinical imaging data.
- Discussed limitations of group analyses for psychiatric biomarker research.

Instructor and Teaching assistant, Brainhack School   **Jun 2019**

Open Datasets (instructor), and *Containers for Scientific Software* (teaching assistant)

- Presented open neuroimaging data sources, demonstrated command line access to AWS S3
- Assisted participants with installing Docker, troubleshooting compatibility (WSL), gaining access to Compute Canada resources

Teaching Assistant, nilearn workshop   **Oct 2016**

How to incorporate machine and deep learning in your data analysis

- Assisted participants with technical setup and access to compute cluster
- Helped participants during the course to debug code and overcome compatibility issues

CONTRIBUTION TO SCIENTIFIC SOFTWARE

dashQC   **2018–**
Developer, Maintainer

fMRIPrep   **2019**
Benchmark and documentation

Neuroimaging Analysis Kit NIAK   **2013–2018**
Development and Teaching

Configurable Analysis Pipeline CPAC   2012
Development

SERVICE   **President**, Student Union   **2009–2010**
                           Ludwig Maximilians Universität, Munich, Germany

                           As one of four elected presidents, I managed and represented the student union
                           of 45.000 students. In this role, I co-founded and led a platform for the, ultimately
                           successful, abolition of undergraduate tuition fees in the state of Bavaria. During
                           my tenure, I also oversaw the renovation of the offices of the student union.
                           - Negotiated with president of university, Bavarian minister of education, and
                             Bavarian prime minister.
                           - Represented position of student union in print and television interviews.
                           - Coordinated with my counterparts at universities in Germany and Austria.
                           - Trained and supervised staff secretary of student union.
                           - Supervised renovation of offices and setup of new IT infrastructure.

                           Student committee member, Strategy commission   **2009–2010**
                           Ludwig Maximilians Universität, Munich, Germany

                           As one of 15 members of the university strategy commission, I reviewed and ad-
                           vised on the successful application for the second (2012) round of the federal
                           Excellence Initiative with a total volume of 2.7 billion Euro. Our application was
                           one of 11 funded applications.
                           - Reviewed and reported on four departmental funding proposals
                           - Evaluated and voted on viability of internal proposals
                           - Drafting of recommendations for the executive committee of the university

TECHNICAL   **General**: AWS, Docker, Singularity, Slurm, git & github, Unix, WSL
SKILLS   **Programming**: Python, Bash, zsh, R, Matlab
                    Languages: English (fluent), French (advanced), German (native)