

BIOGRAPHICAL SKETCH

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NAME: Florian Dubost

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Postdoctoral Researcher

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
Ecole Centrale Marseille, France	MS	09/2013	04/2016	Engineering
Technical University of Munich, Germany	MS	09/2014	04/2016	Medical Engineering
Erasmus University, Netherlands	PHD	04/2016	05/2020	Medical Image Analysis
Massachusetts general hospital, Harvard Medical School, US	Visiting Scientist	11/2018	03/2019	Neurology
Stanford University, US	Postdoctoral training	09/2020	present	Biomedical Data Science

A. Personal Statement

My research objectives are focused on the development of artificial intelligence technologies for neurology research. My graduate training revolved around medical engineering and offered me a multidisciplinary advanced education in computer science, physics, mathematics, biology, and chemistry. As I was progressing towards the start of my PhD, I decided to develop my expertise in machine learning—a type of artificial intelligence—and neurology, working for example on the automatic classification of fMRI signals of the auditory cortex under the supervision of Dr. Takerkart during my studies in Centrale Marseille, France. In Germany, I strengthened my expertise in machine learning in Prof. Navab's chair and developed and published an automated method for the segmentation of medical images based on Markov Chain Monte Carlo. During my PhD in the Netherlands, I focused on deep learning and neurology and developed methods for weakly supervised learning, regression neural networks, and brain lesion detection and quantification from MRI. My work on the automated quantification and detection of enlarged perivascular spaces—a type of brain lesion related to cerebral small vessel disease—was very well received and I was invited to present it at MIT, Harvard, the National University of Singapore, Boston University, and Otto von Guericke University Hospital, Germany. This work also initiated multiple ongoing international collaborations. In the meantime, I visited Prof. Rost group at Harvard to strengthen my expertise in neurology research, and developed and published deep learning registration methods for clinical brain MRI. I now just started my postdoctoral training in Prof. Daniel Rubin's group at Stanford with the additional supervision of the neurologist Prof. Lee-Messer. I am developing deep learning methods to detect and predict seizures from EEG and video recordings of epileptic patients. The project proposal focuses on the automatic prediction of seizures, which could be a game changer for people with epilepsy, but has until now only been demonstrated in very small studies. Having thousands of EEG recordings to leverage, I am confident that Prof. Rubin's group has the resources to lead this innovation. On a personal level, the proposed project will widen my neurology and AI expertise by working on epilepsy and EEG and video, which, for me, are two new data types.

1. **Dubost**, F., Adams, H., Bortsova, G., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M. 2019, '3D regression neural network for the quantification of enlarged perivascular spaces in brain MRI', *Medical Image Analysis*, 51, 89–100. (Impact factor **11.1**). 19 Citations.
2. **Dubost**, F., Yilmaz, P., Adams, H., Bortsova, G., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M. 2019, 'Enlarged perivascular spaces in brain MRI: Automated quantification in four regions', *NeuroImage*, 185, 534–544. (Impact factor **5.9**). 25 Citations.
3. **Dubost**, F., Bortsova, G., Adams, H., Ikram, A., Niessen, W. J., Vernooij, M., & De Bruijne, M. 2017, 'GP-UNet: Lesion detection from weak labels with a 3D regression network', 214–221. In *International Conference on Medical Image Computing and Computer-Assisted Intervention*. Canada. (Acceptance rate **35%**). 37 Citations.

B. Positions and Honors

Positions and Employment

2020 — Present: **Postdoctoral Scholar in Biomedical Data Science**, Department of Biomedical Data Science and Department of Radiology, *Stanford University School of Medicine*, U.S.

2020 — 2020: **Director**, *Zelus Mediacorp* - Education in Artificial Intelligence Research, Netherlands.

2016 — 2020: **Doctoral Researcher in Medical Image Analysis**, Departments of Radiology and Medical Informatics, *Erasmus University Medical Center*, Netherlands.

2018 -- 2019: **Short-Term Scholar**, J. Philip Kistler Stroke Research Center, *Massachusetts General Hospital, Harvard Medical School*, U.S. Project: Does white matter lesion burden differ in clinical versus subclinical vascular brain disease?

2014 -- 2015: **Mentee**, IT Mentoring Program, *Siemens*, Germany.

2014 -- 2014: **Intern in Machine Learning Research**, Computer Science and Systems Laboratory and Institute of Neuroscience of Timone, *French National Centre for Scientific Research*, France. Project: Ensemble methods for inter-subject machine learning from fMRI data.

Other Experience and Professional Memberships

Reviewing Activities

IF indicates Impact Factor.

2016 — Present: Reviewer of Multiple Journals: *Medical Image Analysis* (IF 11.1), *IEEE Transactions on Medical Imaging* (IF 9.7), *NeuroImage* (IF 5.8), *Scientific Reports* (IF 4.5), *Frontiers in Pharmacology* (IF 4.4), *NeuroImage Clinical* (IF 4.4), *IEEE Transactions on Biomedical Engineering* (IF 4.3), *Quantitative Imaging in Medicine and Surgery* (IF 3.1), *IEEE Sensors* (IF 3.1).

2016 — Present: Reviewer for Multiple Conferences: *International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI)*, *IEEE International Symposium on Biomedical Imaging (ISBI)*, *Medical Imaging with Deep Learning (MIDL)*, *International Workshop on Machine Learning in Clinical Neuroimaging (MLCN)*.

Memberships of Scientific Societies

2018 — 2019: Member, *European Society of Radiology*.

2017 — Present: Member, *Dutch Society of Pattern Recognition and Image Processing*.

2017 — Present: Member, *Medical Image Computing and Computer Assisted Intervention Society*.

Institutional Responsibilities

2020: Co-organiser of international deep learning competition, *MICCAI challenge: Vascular Lesions Detection*, planned in 2021.

2020: Program committee member, *MICCAI conference workshop: Simulation and Synthesis in Medical Imaging, Virtual*.

2020: Program committee member, *MICCAI conference workshop: Large-scale Annotation of Biomedical data and Expert Label Synthesis, Virtual*.

2019: Program committee member, *NeurIPS conference workshop: Medical Imaging meets NeurIPS, Canada*.

2019: Program committee member, *MICCAI conference workshop: Large-scale Annotation of Biomedical data and Expert Label Synthesis, China*.

2018: Master's thesis defense committee member, *TU Delft, Netherlands*. Thesis title: *Detecting Perivascular Spaces: a Geodesic Deep Learning Approach*.

Teaching Activities

2020: Creation and dissemination of educational videos, research in artificial intelligence, Zelos Mediacorp, Netherlands.

2018 — 2020: Training of medical students, rating and annotation of brain lesions from MRI scans, Quantib BV, Netherlands, and Otto von Guericke University Hospital, Germany.

2019: Teaching Assistant, Advanced Image Processing course, Clinical Technology Master Program, TU Delft, Netherlands.

Supervision of Graduate Students

2020: 1 Graduate student, Zelos Mediacorp, Netherlands (Corentin Giroud)

2019: 3 Graduate students, collaboration between Brigham and Women Hospital, Harvard Medical School, U.S. and Erasmus University Medical Center, Netherlands. (Laetitia Bobet, Siddharth Bakshi, and Avantika Dasgupta) Project: Deep learning for Processing of Sleep Data.

2017 — 2020: 4 Master's theses, Erasmus University Medical Center, Netherlands. (Oliver Werner, Kimberlin van Wijnen (cum Laude), Florian Calvet, Arne Barkema)

2017 — 2020: 9 Graduate Students, Erasmus University Medical Center, Netherlands. (Nicolas Posocco, Robin Camarasa, Corentin Doue, Axel Roc, Antonin Renaudier, Benjamin Collery, Filipe Marques, Pauline Dame, Vera de Vos)

Volunteer Work

2016: Staff member, European Conference on Computer Vision (ECCV), Netherlands.

2015: Staff member, International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI), Germany.

2014: Healthy control subject, autism fMRI study, Institute of Neuroscience of Timone, France.

Other activities

2020 — Present: Design of the deep learning framework of Spine Virtual Laboratory of Prof. Guttman's group, Brigham and Women's Hospital, Harvard Medical School.

2017 — Present: Design and use of my own GPU-cluster for my personal use in side projects, as additional resources for my students, and for colleagues' projects.

2017 — 2020: Design of GPU-clusters for the BGR department at Erasmus University Medical Center, Netherlands.

2016 — 2019: Deep learning advice for the start-up company Quantib B.V., Netherlands.

Honors

Predoctoral Fellowships

2019: 400€, Travel grant, Trustfonds, Erasmus University Medical Center.

2018: 5.8k€, Personal grant, De Drie Lichten association, Netherlands. Project: Does white matter lesion burden differ in clinical versus subclinical vascular brain disease?

2018: ≈6k€, Research grant with Prof. MD. M. Vernooij (GPU Quadro P6000), NVIDIA, U.S.

2018: ≈3.7k€, Pilot grant for 450,000 Billing Units, SURFsara, Dutch National Computing Facilities, Netherlands.

2017: ≈3.7k€, Pilot grant for 450,000 Billing Units, SURFsara, Dutch National Computing Facilities, Netherlands.

2015: 2.7k€, Scholarship, Franco-German University, Germany.

2014: 2.7k€, Scholarship, Franco-German University, Germany.

Invited Lectures

2019: Massachusetts Institute of Technology (MIT), Computer Science and Artificial Intelligence Laboratory, U.S. Invited by Prof. Golland.

2019: Harvard Medical School, Massachusetts General Hospital, U.S. Invited by Prof. Rost.

2019: Harvard Medical School, Athinoula A. Martinos Center, U.S. Invited by Prof. Fischl.

2019: Boston University, U.S. Invited by Prof. Seshadri.

2019: Otto von Guericke University Hospital, Department of Neurology, Germany. Invited by Prof. Schreiber and Dr. Oeltze-Jafra.

2018: Netherlands Organisation for Applied Scientific Research (TNO), The Netherlands. Invited by Dr. Van Opbroek.

Awards

2019: 3rd Place, International Deep Learning Competition, Accurate Automated Spinal Curvature Estimation, MICCAI 2019 challenge, China.

2019: 3rd Place, as of 09/03/2018, International Deep Learning Competition, White Matter Hyperintensity Segmentation Challenge, Netherlands.

2017: 3rd Prize Poster Award, ICT.OPEN, a Dutch IT research conference, Netherlands.

2017: 2nd Prize Poster Award, NFBIA summer school, a Dutch summer school on medical image analysis, Netherlands.

C. Contributions to Science - a star (*) indicates equal contribution

1. Regression of Image-level Labels using Neural Networks. During my PhD, I developed methods to optimize regression neural networks with image-level labels such as the number or volume of a (diseased) brain tissue, or brain age. I empirically showed that, with these techniques, networks can reach a performance similar to the inter-rater agreement using very small training datasets: 25 images, with a single label per image.

- **Dubost, F., Adams, H., Bortsova, G., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M.** 2019, '3D regression neural network for the quantification of enlarged perivascular spaces in brain MRI', *Medical Image Analysis*, 51, 89--100. (Impact factor **11.1**).
- **Dubost, F., Bortsova, G., Adams, H., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M.** 2019, 'Hydranet: data augmentation for regression neural networks', 438-446, In *International Conference on Medical Image Computing and Computer-Assisted Intervention*. China. (Acceptance rate **35%**).
- Wang, J., Knol, M. J., Tiulpin, A., **Dubost, F.**, de Bruijne, M., Vernooij, M. W., Adams, H. H., Ikram, M. A., Niessen, W. J., & Roshchupkin, G. V. 2019, 'Gray matter age prediction as a biomarker for risk of dementia', *Proceedings of the National Academy of Sciences*, 116, 42, 21213--21218. (Impact factor **9.6**).

2. Brain Lesion Detection. I extended my research to not only quantify but also locate brain lesions, hence extracting additional imaging information for subsequent medical research. To leverage all labelling resources, I developed two methods: one that used only image-level labels such as object count and was based on weakly supervised learning and network interpretability, and another method that used image annotations and was based on regressing distance maps. These methods had a performance that was similar to intra-rater agreement.

- **Dubost, F., Adams, H., Yilmaz, P., Bortsova, G., van Tulder, G., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M.** 2020, 'Weakly Supervised Object Detection with 2D and 3D Regression Neural Networks', *Medical Image Analysis*, 101767. (Impact factor **11.1**).
- van Wijnen, K. M.*, **Dubost, F.***, Yilmaz, P., Ikram, M. A., Niessen, W. J., Adams, H., Vernooij, M. W., & de Bruijne, M. 2019, 'Automated lesion detection by regressing intensity-based distance with a neural network', 234-242. In *International Conference on Medical Image Computing and Computer-Assisted Intervention*. China. (Acceptance rate **35%**).

3. Application of AI in Neurology Research. I proposed new methods to quantify enlarged perivascular spaces, a brain lesion related to cerebral small vessel disease and known to be difficult to quantify. These methods have now been implemented in multiple sites internationally. I also proposed a method to measure the spatial progression of dementia, and another method to register clinical brain MRI for Stroke research.

- **Dubost, F., Yilmaz, P., Adams, H., Bortsova, G., Ikram, M. A., Niessen, W., Vernooij, M., & de Bruijne, M.** 2019, 'Enlarged perivascular spaces in brain MRI: Automated quantification in four regions', *NeuroImage*, 185, 534--544. (Impact factor **5.9**).
- **Dubost, F.***, Dünwald, M.*, Huff, D., Scheumann, V., Schreiber, F., Vernooij, M., Niessen, W., Skalej, M., Schreiber, S., Oeltze-Jafra, S. & de Bruijne, M. 2019, 'Automated Quantification of Enlarged Perivascular Spaces in Clinical Brain MRI across Sites', 103-111. In *OR 2.0 Context-Aware Operating Theaters and Machine Learning in Clinical Neuroimaging*. (Oral). China. (Acceptance rate not reported).
- Venkatraghavan, V.*, **Dubost, F.***, Bron, E. E., Niessen, W. J., de Bruijne, M., Klein, S., Initiative, A. D. N. 2019, 'Event-Based Modeling with High-Dimensional Imaging Biomarkers for Estimating Spatial Progression of Dementia', 169-180. In *International Conference on Information Processing in Medical Imaging*. China. (Acceptance rate **30%**).
- **Dubost, F.**, de Bruijne, M., Nardin, M., Dalca, A. V., Donahue, K. L., Giese, A.-K., Etherton, M. R., Wu, O., de Groot, M., Niessen, W., & others 2020, 'Multi-atlas image registration of clinical data with automated quality assessment using ventricle segmentation', *Medical Image Analysis*, 101698. (Impact factor **11.1**).

Complete List of Published Work: https://scholar.google.fr/citations?hl=en&user=_yNBmx8AAAAJ

D. Additional Information: Research Support and/or Scholastic Performance

YEAR	COURSE TITLE	GRADE
ERASMUS UNIVERSITY		
2019	Logframe for Grant Writing	P
2019	Grant writing for Dutch Charities	P
2019	Scientific Integrity	P
2018	Scientific Visualization with Blender	P
2017	Computer Vision by Learning	P
2017	Advance Pattern Recognition	P
2017	Biomedical English Writing and Communication	P
TECHNICAL UNIVERSITY MUNICH		
2016	Growth and Remodeling in Biological Tissue	1.3
2016	Image Understanding I: Machine Vision Algorithms	1.3
2016	Kinematic Design of Linkages using Matlab and Catia	1.0
2016	Physiology	1.4
2016	Biomechanics - Fundamentals and Modeling	1.7
2016	Analysis of Three-Dimensional Shapes	1.0
2016	Advanced Practical Course Machine Learning In Medical Imaging	1.3
2016	Heat and Mass Transfer	1.7
2016	Non-linear Continuum Mechanics	1.7
2016	Neuroprosthetics	2.0
2015	Kinematics	2.7
2015	Fiber Composites	2.7
2015	Automation in Medicine	3.0
2015	Lecture Series in Bionics / Biomimetics	3.0
2015	Advanced Topics of Software Engineering	3.3
2015	Computer-based Product Development - CAD	3.0
2015	Quality Management	3.3
2015	Polymers and Polymertechnology	4.0
2015	Design of Composite Structures with CATIA V5	3.3
ECOLE CENTRALE MARSEILLE		
2014	Bioengineering	4.0
2014	Imaging and Radiation Therapy	4.0
2014	Chemical Therapy, Biotechnology, Biomimetism	4.0
2014	Mathematics III	4.0
2014	Data Processing	4.0
2013	Automation of Linear Systems	4.0
2013	Robotics	4.0
2013	Advanced Image and Signal Processing	4.0
2013	Biology	4.0
2013	Optics in Biological Tissues	4.0
2013	Material Science	4.0

Erasmus University graduate courses are graded P (pass) or F (fail). The courses of the Technical University of Munich (TUM) are graded as 1.0 (best), 4.0 (average, pass), 5.0 (fail). The courses of Ecole Centrale Marseille are graded with the GPA scale, 4.0 being the highest grade. I omitted language, business and sport courses, which I all passed. I missed top grades during my first year at TUM mostly because courses and examinations were in German. I was not fully proficient in that language yet (French is my native language).