Erjun Zhang

PhD | Biomedical Engineering | University of Montreal (PolyMTL)

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Focus Areas : Diffusion MRI ; microstructure modeling ; multimodal imaging ; pathology-specific biomarkers ; brain development and injury ; machine learning ; neonatal brain segmentation, registration, and atlas building

Education

PhD in Biomedical Engineering (neonatal brain & diffusion MRI) — October 2025

- Institute of Biomedical Engineering, University of Montreal (PolyMTL), Canada
- PhD Thesis : DBM : A Spectrum-Based Diffusion MRI Framework for Neonatal Brain Segmentation, Developmental Assessment, and Injury Characterization
- Supervisors : Professor Benjamin De Leener & Professor Gregory Lodygensky

M.Eng in Optical Engineering (super-resolution microscopy) — July 2018

- Institute of Laser Engineering, Beijing University of Technology, China
- Master Thesis : Numerical Simulation and Image Reconstruction for Structured Illumination Super-Resolution Fluorescence Microscopy
- Supervisor : Professor Jian Wu

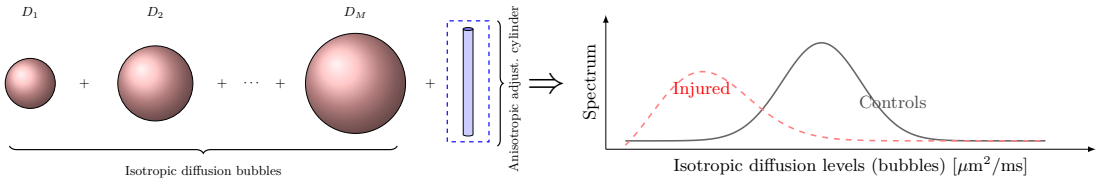
B.Eng in Optoelectronic Information Engineering — June 2014

- School of Optoelectronic Engineering, Shenzhen University, China
- Information optics ; Digital image Processing ; Computational imaging ; Image analysis

Research experience

Neonatal brain diffusion MRI — Sep 2019-Oct 2025

- Neuropoly Lab (lab director : Julien Cohen-Adad, Canada research chair in quantitative MRI)
- Developed a novel dMRI model (published in NeuroImage) that can be used for neonatal clinical brain imaging
- Found two subtypes of neonatal brain punctate white matter lesion
- Built end-to-end dMRI-based framework for neonatal brain recon., segmentation and analysis
- Established a neonatal brain MRI cohort (N=88) with structural and diffusion MRI protocols



Preterm brain structure and lesion segmentation — Nov 2023-Oct 2025

- TransMedTech Institute, CHU Sainte-Justine hospital research center, Montreal, Canada
- Developed an automated segmentation pipeline for punctate white matter lesions in clinical-grade, low-SNR MRI ;
- Solve problem of fine tissue segmentation when lacking structural MRI

Mouse brain MRI processing and analysis pipeline design — Nov 2025-Feb 2026

- CHU Sainte-Justine hospital research center, Montreal, Canada
- Developed an end-to-end preprocessing and analysis pipeline (T1w, T2w, diffusion MRI), including skull stripping, registration, atlas building, and subject-wise brain segmentation with quality control for large-size mouse MRI datasets
- Performed ROI-based quantitative analyses to extract imaging biomarkers of small-animal brain disease models

Computational models of Radiation Physics (Doctoral Research) — Sep 2018-Aug 2019

- Lab of Professor Maksim Skorobogatiy (Canada Research Chair Tier I ; APS/Optica/SPIE Fellow) at Polytechnique Montreal, Montreal, Canada
- Built physics-based theoretical models of energy transfer from the Sun to room window ; first-author publication (Applied Optics, 2020).

Optical imaging and computational reconstruction (M.Sc.) — Sep 2015-Aug 2018

- Beijing University of Technology, Beijing, China
- Developed numerical simulations and image reconstruction methods for structured illumination super-resolution microscopy (2 patterns).

Award & Competitive Funding

QBIN Mentorship Grant (×2), QBIN/FRQS — July 2023 & 2024
University of Montreal & China Scholarship Council Joined Scholarship — 2020-2023
Academic Innovation Award, Beijing University of Technology (×2) — 2017 & 2018
Academic Excellence Award, Beijing University of Technology — 2015-2016

Skills

Language

- English (professional proficiency), Chinese (native), French (elementary proficiency)

Coding

- Python (advanced) : developed frameworks for MRI data processing, recon. and analysis
- Matlab (advanced) : developed image super-resolution recon. and processing pipeline
- Latex (advanced) : completed a 200-page advanced mathematic book, and a 180-page biomedical doctoral thesis
- Deep learning (advanced) : UNet-style segmentation ; training/inference workflows

Teaching & Mentoring Experience

Introd. to Python-based MRI Data Analysis: Part III (Mentor, Dawson) Summer 2025

- Segmentation-guided, two abstracts (student as 1st author) were submitted to conferences
- Students : Hoi Ching Wat & Keiara Baker (McGill), Feodor Gornostayev (Dawson)

Introd. to Python-based MRI Data Analysis: Part II (Mentor, QBIN) Summer 2024

- Injury-guided, two abstracts (student as 1st author)
- Students : Hanna Ton That (Waterloo), Josephine Emadoye (McGill), Kylie Xu (UdeM)

Introd. to Python-based MRI Data Analysis: Part I (Mentor, QBIN) Summer 2023

- Development-guided, one abstracts (student as 1st author), best presentation, best student
- Students : Kylie Xu (UdeM), Sara hernandez (Waterloo)

AI for Neuro (Teaching Assistant, MAIN) Dec 2022

Advanced Methods Training

MedICSS : UCL Medical Image Computing (MedICSS) — July 2021 & 2020
Neuromatch Academy : Deep Learning for Neuroscience — Summer 2024 & 2022
Brainhack 2020 : Project For Neural Data Science — Summer 2020
MAIN 2019 : Montréal AI and Neuroscience — Winter 2019

Selected journal articles

[1] Diffusion Bubble Model: A novel MRI approach for detection and subtyping of neonatal punctate white matter lesions *Neuroimage* 2025, 317 : 121324
Erjun Zhang, Benjamin De Leener and Gregory Lodygensky

[2] Severe central nervous system demyelination in Sanfilippo disease *Front. Mol. Neurosci.* 2023, 16 : 1323449 (contribution : MRI data acquisition, preprocessing, and quantitative analysis)
Mahsa Taherzadeh, Erjun Zhang, Irene Londono, Benjamin De Leener, Sophie Wang, Jonathan Cooper, Timothy Kennedy, Carlos Morales, Zesheng Chen, Gregory Lodygensky, and Alexey Pshezhetsky

[3] Non-invasive in vivo MRI detects long-term microstructural brain alterations related to learning and memory impairments in a white matter injury *Behav. Brain Res.* 2022, 428 : 113884
Wyston Pierre, Erjun Zhang, Irene Londono, Benjamin De Leener, Frédéric Lesage, Gregory Lodygensky

[4] Synthetic analogue of adrenocorticotropic hormone, ACTH(4-7)PGP delays neurological manifestations in diseases of mucopolysaccharidosis III spectrum by reducing neuroinflammation and rescuing neurotransmission, and axonal demyelination *Science Advances* 2025 (contribution : MRI data acquisition, preprocessing, and quantitative analysis), [under review]
Travis Moore, Patricia Dubot, Gustavo Viana, Poulomee Bose, Erjun Zhang, Behzad Nasseri, Xuefang Pan, Derek Robertson, ... Jannic Boehm, Gregory Lodygensky, Jill Wood and Alexey Pshezhetsky

[5] Improving thermo-optic properties of smart windows via coupling to radiative coolers *Appl. Opt.* 2020, 59-13 : D210–D220 (Optical engineering ; prior to PhD)
Erjun Zhang, Yang Cao, Christoph Caloz and Maksim Skorobogatiy

Manuscripts in Preparation

[1] Preterm brains at term-equivalent age : volumes comparable, microstructure delayed on diffusion MRI 2026, [writing in progress]
Erjun Zhang, Benjamin De Leener and Gregory Lodygensky

[2] Enhancing Neonatal Brain Tissue Segmentation through UNet-Based Deep Learning on Diffusion MRI Data 2026, [writing in progress]
Erjun Zhang, Benjamin De Leener and Gregory Lodygensky

Invited talk

[1] A Novel Diffusion MRI Framework for Neonatal Brain Segmentation, Developmental Assessment, and Injury Characterization *Fetal-Neonatal Neuroimaging Developmental Science Center (FNNDSC LECTURE SERIES), Boston Children's Hospital, Harvard Medical School* Scheduled on March 11, 2026, Boston, MA, USA (Invited by Dr. Ellen Grant, Harvard Medical School)
Erjun Zhang

Selected Conference Presentations

[1] Diffusion Bubble Model: A Novel Method For Detecting Neuroinflammation in Mouse Brain With Sanfilippo Syndrome *ISMRM* 2023, Late-Breaking Abstract (oral), Toronto, Canada
Erjun Zhang, Irene Londono, Jérémie Fouquet, Alexey Pshezhetsky, Benjamin De Leener, and Gregory Lodygensky

[2] Impacts of Prematurity on Neonatal Deep Gray Matter Using DBSI *OHBM* 2023, Montreal, Canada
Erjun Zhang, Londono I, Paquette N, ..., DeLeener B, Lodygensky G

[3] Evaluation Of Neonatal Brain White Matter Development Using Diffusion Basis Spectrum Imaging *Pediatric Academic Societies (PAS) Meeting* 2023, Washington D.C., USA
Erjun Zhang, Benjamin De Leener and Gregory Lodygensky

[4] T1w/T2w Ratio Improves Detection of Neonatal Punctate White Matter Lesions *CNPRM | DOHaD | ENRICH | CAMCCO* 2025, Toronto, Canada
Erjun Zhang, Josephine Emadoye, Kylie X, Hanna Ton That, Benjamin De Leener, Gregory Lodygensky

[5] Major White Matter and Hippocampal Alterations in a Mouse Model of Sanfilippo Syndrome at 7T MRI *OHBM* 2023, Montreal, Canada
Erjun Zhang, Taherzadeh M, Londono I, Fouquet J, DeLeener B, Pshezhetsky A, Lodygensky G

Books

[1] Linear Algebra *BDIC* 2017, BDIC1014J & BDIC1022J
Xin Liu and Erjun Zhang

[2] Supplemental reading book for Advanced Mathematics *BDIC* 2019, BDIC1031J & BDIC1027J
Hao Zhu, and Erjun Zhang and Xin Liu

Patents

[1] A design of structure light generating device using for super resolution microscopy 2018, CN108227174A, Jian Wu (supervisor) and Erjun Zhang

[2] A super-resolution microscope imaging method and structure light generating device 2018, CN108333160A, Jian Wu (supervisor), Erjun Zhang and Zhaowen Chen