

Curriculum vitae

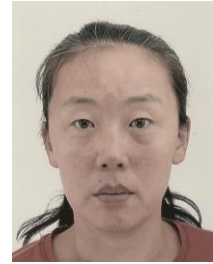
Jing-Rebecca Li

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Inria-Saclay, Équipe Idefix
ENSTA Paris, Unité de Mathématiques Appliquées (UMA)
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Education

10/2013 HDR (Habilitation à Diriger des Recherches)
Université Paris-Sud, Orsay, France
Title : *Modélisation et simulation de la diffusion*

09/2000 Ph.D. in Applied Mathematics
Massachusetts Institute of Technology, Cambridge, MA, USA
Title: *Efficient model reduction of large linear systems.*

05/1995 Bachelor of Science in Honors Mathematics
University of Michigan, Ann Arbor, MI, USA
With Highest Distinction

Employment

11/2003 – present Research Scientist
Institut National de Recherche en Informatique et en Automatique (INRIA)
INRIA-Saclay, France

09/2000 – 09/2003 Post-Doctoral Researcher
Courant Institute of Mathematical Sciences, New York, NY, USA

Research Experience

07/2010 – present Equipe Idefix, INRIA-Saclay, France
Numerical Methods for PDEs, Diffusion MRI for brain and cardiac imaging, Numerical Linear Algebra,
Machine learning algorithms for inverse problems in PDEs.

10/2008 – 10/2013 external collaborator at Neurospin, Saclay, France
Modeling and simulation of diffusion MRI in biological tissue.

11/2003 – 06/2010 member of Equipe POEMS, INRIA-Rocquencourt, France
Time-stepping schemes for evaluating fractional integrals and derivatives.
Artificial boundary conditions for periodic waveguides with local perturbations.
Simulation of dendritic solidification using the phase field model.

09/2000 – 09/2003 Courant Institute of Mathematical Sciences, New York, USA
Efficient numerical solution of the diffusion equation
Explicit time-stepping schemes for the wave equation in complex geometry
Artificial boundary conditions for the wave equation.

09/1996 – 08/2000 Research Lab. of Electronics, MIT, Massachusetts, USA
Numerical linear algebra, Reduced models for on-chip interconnect modeling

Teaching

Lecturer of *MAP502 - Refresher Course in Math and a Project on Numerical Modeling Done in Pairs*, The Energy Environment: Science Technology and Management (STEEM) Master Program, Ecole Polytechnique, 2023.

MO102 Introduction à Matlab, ENSTA Paris, 2023, 2024.

PRB101 Probabilités, TD, ENSTA Paris, 2024.

STA101 Statistiques, TD, ENSTA Paris, 2024.

Lecturer of *Mathematical and numerical foundations of modeling and simulation using partial differential equations*, French-Vietnam Master in Applied Mathematics, 2017-2020. University of Science, Ho Chi Minh City, Vietnam. 2 weeks per year.

Co-organizer of *Ecole d'Été France Excellence, Data science for document analysis and understanding*, sponsored by the French Embassy in China, 2018, 2019. 4 weeks per year.

Organizer of *Ecole d'Été France Excellence, Mathematical and computational methods for life sciences*, sponsored by the French Embassy in China, 2017. 3 weeks.

1995-2007, ENSTA, Ecole des Mines, New York University, Massachusetts Institute of Technology.

Graduate level supervision

- Ph.D. of Zheyi Yang (10/2020 – 12/2023). Topic: *Numerical methods to estimate brain micro-structure from diffusion MRI data*.
- Ph.D. of Chengran Fang (10/2019 – 2/2023). Topic: *Enabling cortical cell-specific sensitivity on clinical multi-shell diffusion MRI microstructure measurements*. Co-advisor: Demian Wassermann.
- Ph.D. of Khieu Van Nguyen (02/2014 – 04/2017). Topic: *Modeling, simulation and experimental verification of water diffusion in neuronal network of the Aplysia ganglia*. Co-advisor: Luisa Ciobanu.
- Ph.D. of Simona Schiavi (09/2013 – 12/2016). Topic: *Homogenized models for diffusion MRI*. Co-advisor: Housseem Haddar.
- Ph.D. of Gabrielle Fournet (11/2013 – 11/2016). Topic: *Computational imaging of the aging cerebral microvasculature*. Co-advisor: Luisa Ciobanu.
- Ph.D. of Hang Tuan Nguyen (10/2010 – 01/2014). Topic: *Tissue parameters estimation for dMRI signals in biological tissue*. Co-advisors: Cyril Poupon and Denis Grebenkov.
- Ph.D. of Dang Van Nguyen (10/2010 – 01/2014). Topic: *Efficient finite elements code for the simulation of dMRI signals in complex geometry*. Co-advisor: Denis Grebenkov.
- Post-doc of Imen Mekkaoui (11/2017 – 7/2019). Topic: *In-vivo cardiac diffusion magnetic resonance imaging: simulations and parameters estimation*. Collaborators: Jan Hesthaven (EPFL), Jerome Pousin (Université de Lyon, INSA de Lyon).
- Post-doc of Fabien Caubet (01/2013-08/2013). Topic: *New transmission condition accounting for diffusion anisotropy in thin layers applied to diffusion MRI*. Co-supervisor: Housseem Haddar.
- Post-doc of Julien Coatleven (03/2012–08/2012). Topic: *Asymptotic models for multiple compartments diffusion using mathematical homogenization*. Co-supervisor: Housseem Haddar.
- Research Engineer Alex Mcsweeney-Davis (11/2023-9/2024). Topic: *SpinDoctor: Diffusion MRI Simulation Toolbox in Matlab*.
- Research Engineer Syver Agdestein (10/2019-5/2020). Topic: *SpinDoctor: Diffusion MRI Simulation Toolbox in Matlab*.
- Numerous Master level internships.

Grants

- Coordinator of the project *Investigation of potential biomarkers to detect chronic inflammation in Multiple Sclerosis through diffusion MRI*, funded by the Engineering for Health (E4H) interdisciplinary center of Institut Polytechnique de Paris, in the "Biomedical Engineering Seed Grant Program" by the Fondation Bettencourt Schueller. Partners : Inria Saclay, CHU de Rennes, Service de neurologie, Equipe Empenn, Univ Rennes. Total : 140K euros. Duration: 09/2023 - 12/2025.

- Coordinator of the project *Simulation of diffusion MRI signals in biological tissue*, funded by Agence Nationale de la Recherche (French National Research Agency) in the program COSINUS 2010. Partners: INRIA (200K euros) and Neurospin (200K euros). Duration: Nov 2010-Jan 2014.
- Partner coordinator of the project *Computational imaging of the aging cerebral microvasculature*, funded by Agence Nationale de la Recherche in the program US-French Collaboration. Partners: INRIA (132K euros) and Neurospin (160K euros) and Univ of Illinois Dept of Bio-Engineering. Duration: Sept 2013-Feb 2017.

Service to the community/Organization

- Member of INRIA *Comité Parité et Egalité des Chances*, 2016-present.
- Member of INRIA *Commission d'Evaluation*, 2015-2023.
- Member of the SIAM *Committee on Programs and Conferences*, 2017-2022.
- Responsible for Ecole Polytechnique of the *France-Vietnam Master's program in Applied Mathematics*, 2016-2020.
- Organizer of *Ecole d'Été France Excellence*, summer school for Chinese students, sponsored by the French Embassy in China, Palaiseau, France, 07/2017, 07/2018.
- Member of Organizing Committee of Society for Industrial and Applied Mathematics (SIAM) *Conference on Computational Science and Engineering*, 2017.
- Chair of *Student Careers Panel*, SIAM CSE Conference, 2017.
- Member of Scientific Committee of *Conference Analysis, probability, from theory to industrial applications: ten years of the French-Vietnamese Master in Applied Mathematics*, 2016.
- Associate editor of Society for Industrial and Applied Mathematics (SIAM) *Journal on Scientific Computing*, 2010-2015.
- Member of organizing committee of *WAVES*, 2007.
- Editor of special issue of *Journal of Computational and Applied Mathematics for the International Conference on Mathematical and Numerical Aspects of Waves (WAVES)*, 2007.

Prizes and Awards

- Invited speaker at the Workshop *Fast Algorithms for Generating Static and Dynamically Changing Point Configurations*, Institute for Computational and Experimental Research in Mathematics, 2018.
- Invited speaker at the *Conference of Groupe d'Etude de Résonance Magnétique (GERM)*, 2015.
- Article Low rank solution of Lyapunov equations chosen as a SIGEST Selection in SIAM Review, 2004, as one of the best papers published in SIAM journals in the previous two years.
- Alston Householder Award for the best dissertation in Numerical Algebra, 2002.
- Leslie Fox Prize in Numerical Analysis, Second Prize, 2001.
- Semiconductor Research Corp. Graduate Fellowship, 1999-2000.
- National Science Foundation Graduate Fellowship, 1995-1998.
- Winner of Alice T. Schafer Prize (given by Assoc. for Women in Mathematics), 1994.

Software

- *SpinDoctor* <https://github.com/SpinDoctorMRI/SpinDoctor>, Matlab software package that performs numerical simulations for diffusion magnetic resonance imaging.

Patent

- United States Patent Application No. 16/002,958; filed June 7, 2018. Title: *Measuring Blood Vessel Characteristics with MRI*. Inventors : Bradley P. Sutton, Alexander M. Cerjanic, Luisa Ciobanu, Gabrielle Fournet, Jing-Rebecca Li, Denis LeBihan.

General audience

- « Mathématiques et biologie » Journées mathématiques X-UPS 2022.

Publications (journal articles)

1. Chengran Fang, Zheyi Yang, Demian Wassermann, Jing-Rebecca Li. *A simulation-driven supervised learning framework to estimate brain microstructure using diffusion MRI*. Medical Image Analysis. 2023.
2. Marwa Kchaou, Jing-Rebecca Li. [A second order asymptotic model for diffusion MRI in permeable media](#) ESAIM: Mathematical Modelling and Numerical Analysis, 2023.
3. Zheyi Yang, Chengran Fang, Jing-Rebecca Li. [Incorporating interface permeability into the diffusion MRI signal representation using impermeable Laplace eigenfunctions](#). IOP Physics in Medicine & Biology, 2023.

4. Mojtaba Lashgari, Nishant Ravikumar, Irvin Teh, Jing-Rebecca Li, David Buckley, Jurgen Schneider, Alejandro Frangi. *Three-dimensional micro-structurally informed in silico myocardium—Towards virtual imaging trials in cardiac diffusion weighted MRI*. Medical Image Analysis, 2022.
5. Chengran Fang, Demian Wassermann, and Jing-Rebecca Li. *Fourier representation of the diffusion MRI signal using layer potentials*. SIAM Journal on Applied Mathematics, 2022.
6. Zheyi Yang, Imen Mekkaoui, Jan Hesthaven, Jing-Rebecca Li. *Asymptotic models of the diffusion MRI signal accounting for geometrical deformations*. MathematicS In Action, 2022.
7. S. D. Agdestein, T. N. Tran, J.-R. Li. [Practical computation of the diffusion MRI signal based on Laplace eigenfunctions: permeable interfaces](#). NMR in Biomedicine, 2021.
8. I. Mekkaoui, J. Pousin, J. Hesthaven, J.-R. Li. [Apparent diffusion coefficient measured by diffusion MRI of moving and deforming domains](#). Journal of Magnetic Resonance. 2020.
9. C. Fang, V.-D. Nguyen, D. Wassermann, J.-R. Li. [Diffusion MRI simulation of realistic neurons with SpinDoctor and the Neuron Module](#). Neuroimage. 2020.
10. J.-R. Li, T. N. Tran, V.-D. Nguyen. [Practical computation of the diffusion MRI signal of realistic neurons based on Laplace eigenfunctions](#). NMR in Biomedicine. 2020.
11. V. Menon, G. Gallardo, M. Pinski, V.-D. Nguyen, J.-R. Li, W. Cai, D. Wassermann. [Microstructural organization of human insula is linked to its macrofunctional circuitry and predicts cognitive control](#). eLife. 2020.
12. V.-D. Nguyen, M. Leoni, T. Dancheva, J. Jansson, J. Hoffman, D. Wassermann, J.-R. Li. [Portable simulation framework for diffusion MRI](#). Journal of Magnetic Resonance. 2019.
13. J.-R. Li, V.-D. Nguyen, T. N. Tran, J. Valdman, C.-B. Trang, K. V. Nguyen, D. T. S. Vu, H. A. Tran, H. T. A. Tran, T. M. P. Nguyen. [SpinDoctor: a Matlab toolbox for diffusion MRI simulation](#). Neuroimage. 2019.
14. K.-V. Nguyen, D. Le Bihan, L. Ciobanu, J.-R. Li. [The time-dependent diffusivity in the abdominal ganglion of Aplysia californica, experiments and simulations](#). Biomedical Physics & Engineering Express. 2019.
15. D. V. Nguyen, J. Jansson, H. T. A. Tran, J. Hoffman, J.-R. Li. [Diffusion MRI simulation in thin-layer and thin-tube media using a discretization on manifolds](#). Journal of Magnetic Resonance. 2019.
16. D. V. Nguyen, J. Jansson, J. Hoffman, J.-R. Li. [A partition of unity finite element method for computational diffusion MRI](#). Journal of Computational Physics. 2018.
17. H. Haddar, J.-R. Li, S. Schiavi. *Understanding the time-dependent diffusion tensor measured by diffusion MRI: the intra-cellular case*. SIAM Journal of Applied Mathematics. 2017.
18. P. Svehla, K. V. Nguyen, J.-R. Li, L. Ciobanu. *Quantitative DLA-based compressed sensing for T1-weighted acquisitions*. Journal of Magnetic Resonance. 2017.
19. G. Fournet, J.-R. Li, A. Cerjanic, B. Sutton, L. Ciobanu, D. Le Bihan. *A two pool model to describe the IVIM cerebral perfusion*. Journal of Cerebral Blood Flow and Metabolism. 2016.
20. H. Haddar, J.-R. Li, S. Schiavi. *A macroscopic model for the diffusion MRI signal accounting for time-dependent diffusivity*. SIAM Journal of Applied Mathematics. 2016.
21. H. Haddar, J.-R. Li, S. Schiavi. *Adapting the Kärger model to account for finite diffusion-encoding pulses in diffusion MRI*. IMA Journal of Applied Mathematics. 2016.
22. F. Caubet, H. Haddar, J.-R. Li, D. V. Nguyen. *New transmission condition accounting for diffusion anisotropy in thin layers applied to diffusion MRI*. ESAIM: Mathematical Modelling and Numerical Analysis. 2016.
23. K. V. Nguyen, J.-R. Li, G. Radecki, L. Ciobanu. *DLA based compressed sensing for high resolution MR microscopy of neuronal tissue*. Journal of Magnetic Resonance. 2015.
24. H. T. Nguyen, D. Grebenkov, D. V. Nguyen, C. Poupon, D. Le Bihan, J.-R. Li. *Parameter estimation using macroscopic diffusion MRI signal models*. Physics in Medicine and Biology. 2015.
25. D. V. Nguyen, D. Grebenkov, D. Le Bihan, J.-R. Li. *Numerical study of a cylinder model of the diffusion MRI signal for neuronal dendrite trees*. Journal of Magnetic Resonance. 2015.
26. J.-R. Li, H. T. Nguyen, D. V. Nguyen, H. Haddar, J. Coatleven, D. Le Bihan. *Numerical study of a macroscopic finite pulse model of the diffusion MRI signal*, Journal of Magnetic Resonance. 2014.
27. D. Grebenkov, D. V. Nguyen, J.-R. Li. *Exploring diffusion across permeable barriers at high gradients. I. Narrow pulse approximation*, Journal of Magnetic Resonance. 2014.
28. D. Nguyen, J.-R. Li, D. Grebenkov, D. Le Bihan. *A finite elements method to solve the Bloch-Torrey equation applied to diffusion magnetic resonance imaging*, Journal of Computational Physics. 2014.
29. J. Coatleven, H. Haddar, J.-R. Li. *A new macroscopic model including membrane exchange for diffusion MRI*, SIAM Journal of Applied Mathematics. 2014.
30. M. Iima, O. Reynaud, T. Tsurugizawa, L. Ciobanu, J.-R. Li, F. Geffroy, B. Djemai, M. Umehana, D. Le Bihan. *Non-Gaussian diffusion MRI assessment of microstructure in rat brain 9L glioma model*, Investigative Radiology. 2014.
31. J.-R. Li, D. Calhoun, C. Poupon, D. Le Bihan. *Numerical simulation of diffusion MRI signals using an adaptive, time-stepping method*. Physics in Medicine and Biology. 2013.

32. D. Grebenkov, H. T. Nguyen, J.-R. Li. *A fast random walk algorithm for computing diffusion-weighted NMR signals in multiscale porous media: a feasibility study for a Menger sponge*, Microporous & Mesoporous Materials. 2013.
33. C.-H. Yeh, B. Schmitt, D. Le Bihan, J.-R. Li, C.-P. Lin, C. Poupon. *Diffusion Microscopist Simulator: A General Monte Carlo Simulation System for Diffusion Magnetic Resonance Imaging*. PLOS ONE. 2013.
34. J.-R. Li. *A fast time stepping method for evaluating fractional integrals*. SIAM Journal on Scientific Computing. 2010.
35. H. Haddar, J.-R. Li, D. Matignon. *Efficient solution of a wave equation with fractional-order dissipative terms*, Journal of Computational and Applied Mathematics. 2010.
36. J.-R. Li, L. Greengard. *High Order Accurate Methods for the Evaluation of Layer Heat Potentials*, SIAM Journal on Scientific Computing. 2009.
37. J.-R. Li, D. Calhoun, L. Brush. *Efficient thermal field computation in phase field models*. Journal of Computational Physics. 2009.
38. P. Benner, J.-R. Li, T. Penzl. *Numerical solution of large-scale Lyapunov equations, Riccati equations, and linear-quadratic optimal control problems*. Numerical Linear Algebra with Applications. 2008.
39. J.-R. Li, L. Greengard. *On the numerical solution of the heat equation I: fast solvers in free space*. Journal of Computational Physics. 2007.
40. P. Joly, J.-R. Li, S. Fliss. *Exact boundary conditions for periodic waveguides containing a local perturbation*. Communications in Computational Physics. 2006.
41. J. Li. *Low order approximation of the spherical nonreflecting boundary kernel for the wave equation*. Linear Algebra and its Applications. 2006.
42. S. Gugercin, J.-R. Li. *Smith-Type methods for balanced truncation of large sparse systems, Dimension Reduction of Large-Scale Systems*. Proceedings of a Workshop held in Oberwolfach, Germany. Series: Lecture Notes in Computational Science and Engineering. 2005.
43. J.-R. Li, J. White. *Low rank solution of Lyapunov equations*. SIAM Review, SIGEST selection. 2004.
44. J.-R. Li, L. Greengard. *High order marching schemes for the wave equation in complex geometry*. Journal of Computational Physics. 2004.
45. J.-R. Li, L. Greengard. *Strongly consistent marching schemes for the wave equation*. Journal of Computational Physics. 2003.
46. J.-R. Li, J. White. *Low rank solution of Lyapunov equations*. SIAM Journal on Matrix Analysis and Applications. 2002.
47. J.-R. Li, J. White. *Reduction of large circuit models via low rank approximate Gramian*. International Journal of Applied Mathematics and Computer Science. 2001.