

BAMDAD HOSSEINI

Computing and Mathematical Sciences
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Male
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EDUCATION

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- Ph.D. in Applied and Computational Mathematics, Simon Fraser University (SFU), Burnaby, BC, Canada. 2013-2018
Thesis: "Finding beauty in the dissonance: analysis and applications of Bayesian inverse problems"
(Supervisors: Profs. John M. Stockie and Nilima Nigam)
 - M.Sc. in Applied and Computational Mathematics, SFU, Burnaby, BC, Canada. 2011–2013
Thesis: "Dispersion of pollutants in the atmosphere: a numerical study"
(Supervisor: Prof. John M. Stockie)
 - B.Sc. in Mechanical Engineering, Sharif University of Technology, Tehran, Iran. 2006–2011
Thesis: "Simulating electrophoresis of dilute polymer solutions with dissipative particle dynamics"
(Supervisor: Prof. Mohammad Said Saidi)

ACADEMIC EXPERIENCE

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- Von Kármán Instructor in Computing and Mathematical Sciences, California Institute of Technology (Caltech), Pasadena, CA, USA. Jan 2020–Sep 2020
(Sponsor: Prof. Andrew M. Stuart)
 - Postdoctoral Fellow, Department of Computing and Mathematical Sciences, Caltech, Pasadena, CA, USA. Jan 2018–Jan 2020
(Supervisor: Prof. Andrew M. Stuart)

PUBLICATIONS

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- [1] Franca Hoffmann, Bamdad Hosseini, Assad A Oberai, and Andrew M Stuart. "Spectral analysis of weighted Laplacians arising in data clustering" (2019). *Submitted to Applied and Computational Harmonic Analysis*. URL: <https://arxiv.org/abs/1909.06389>.
 - [2] Franca Hoffmann, Bamdad Hosseini, Zhi Ren, and Andrew M Stuart. "Consistency of semi-supervised learning algorithms on graphs: Probit and one-hot methods" (2019). *Submitted to Journal of Machine Learning Research*. URL: <https://arxiv.org/abs/1906.07658>.
 - [3] Nicolás García-Trillos, Franca Hoffmann, and Bamdad Hosseini. "Geometric structure of graph Laplacian embeddings" (2019). *Submitted to Journal of Machine Learning Research*. URL: <https://arxiv.org/abs/1901.10651>.
 - [4] Bamdad Hosseini and James E Johndrow. "Spectral gaps and error estimates for infinite-dimensional Metropolis-Hastings with non-Gaussian priors" (2019). URL: <https://arxiv.org/abs/1810.00297>.
 - [5] Juan G García, Bamdad Hosseini, and John M Stockie. "Simultaneous model calibration and source inversion in atmospheric dispersion models". *Pure and Applied Geophysics* (2019). (In press). URL: <https://arxiv.org/abs/1806.05744>.

- [6] Bamdad Hosseini. “Two Metropolis–Hastings algorithms for posterior measures with non-Gaussian priors in infinite dimensions”. *SIAM/ASA Journal on Uncertainty Quantification* 7 (4 2019), pp. 1185–1223. DOI: 10.1137/18M1183017.
- [7] Bamdad Hosseini, Charles Mougenot, Samuel Pichardo, Elodie Constantiel, James Drake, and John M Stockie. “A Bayesian approach for estimating acoustic aberrations in high intensity focused ultrasound treatment”. *Communications in Computational Physics* 25 (5 2019), pp. 1564–1590. DOI: 10.4208/cicp.0A-2018-0007.
- [8] Bamdad Hosseini. “Well-posed Bayesian inverse problems with infinitely divisible and heavy-tailed prior measures”. *SIAM/ASA Journal on Uncertainty Quantification* 5 (1 2017), pp. 1024–1060. DOI: 10.1137/16M1096372.
- [9] Bamdad Hosseini and Nilima Nigam. “Well-posed Bayesian inverse problems: priors with exponential tails”. *SIAM/ASA Journal on Uncertainty Quantification* 5 (1 2017), pp. 436–465. DOI: 10.1137/16M1076824.
- [10] Bamdad Hosseini and John M Stockie. “Estimating airborne particulate emissions using a finite-volume forward solver coupled with a Bayesian inversion approach”. *Computers and Fluids* 154 (2017), pp. 27–43. DOI: 10.1016/j.compfluid.2017.05.025.
- [11] Bamdad Hosseini and John M Stockie. “Bayesian estimation of airborne fugitive emissions using a Gaussian plume model”. *Atmospheric Environment* 141 (2016), pp. 122–138. DOI: 10.1016/j.atmosenv.2016.06.046.
- [12] Bamdad Hosseini, Nilima Nigam, and John M Stockie. “On smooth regularizations of the Dirac delta distribution”. *Journal of Computational Physics* 305 (2016), pp. 423–447. DOI: 10.1016/j.jcp.2015.10.054.
- [13] Bamdad Hosseini and Roohollah Hashemi. “Solution of Burgers’ equation using a local-RBF meshless method”. *International Journal for Computational Methods in Engineering Science and Mechanics* 12 (1 2011), pp. 44–58. DOI: 10.1080/15502287.2010.540303.

FELLOWSHIPS AND SCHOLARSHIPS

• Postdoctoral Fellowship, <i>Ranked first amongst 44 candidates in the Mathematical Sciences committee. Valued at \$90,000 over two years.</i>	NSERC	2018–2020
• Michael Stevenson Graduate Scholarship, <i>Awarded to one Ph.D. student every year valued at \$27,000.</i>	SFU	2016–2017
• Department of Mathematics Graduate Scholarship	SFU	Sep 2016
• President’s Ph.D. Scholarship	SFU	Jan 2016
• Department of Mathematics Graduate Scholarship	SFU	May 2015
• Nominated for the Vanier Canada Graduate Scholarship	SFU	Nov 2014
• Special Graduate Entrance Scholarship	SFU	Sep 2013
• Department of Mathematics Graduate Scholarship	SFU	May 2013

AWARDS AND RECOGNITIONS

• Governor General’s Academic Gold Medal, SFU, <i>awarded to the two top graduate students at SFU in each graduating class.</i>	Jun 2018
• Quirks & Quarks Graduate Award for Best PhD Thesis, SFU, <i>awarded annually to one graduating Ph.D. student.</i>	Jun 2018
• SIAM Student Paper Prize for “Well-posed Bayesian inverse problems: priors with exponential tails” [9], <i>awarded annually to up to three student author(s) of outstanding papers accepted by SIAM journals.</i>	Jul 2017
• Runner Up Prize for the Student Presentation in a Special Session award, AMMCS-CAIMS Congress, Waterloo, Canada.	Jun 2015
• Best Poster Award, Symposium on Mathematics and Computation, SFU, Burnaby, Canada.	Aug 2014
• SIAM Student Chapter Certificate of Recognition.	Sep 2014

SUPERVISION EXPERIENCE

- M.Sc. thesis projects at SFU:

–Juan García, M.Sc., co-supervised with Prof. John Stockie. *Thesis: Parameter estimation and uncertainty quantification applied to advection-diffusion problems arising in atmospheric source inversion.* 2015–2017

- Summer Undergraduate Research Fellows (SURFs) at Caltech:

–Yanke Song, co-supervised with Krithika Manohar, Melike Sirlanci, and Andrew M. Stuart. *Project: Optimal design of experiments in atmospheric source inversion.* Jun 2019– Aug 2019

–Anish Senapati, co-supervised with Alfredo Garbuno Iñigio, Andrew M. Stuart, and Alessandro Zocca. *Project: Failure of power networks with linear dynamics.* Jun 2019– Aug 2019

–Maya Mutic, co-supervised with Alfredo Garbuno Iñigio, Andrew M. Stuart, and Alessandro Zocca. *Project: Stochastic modelling of frequency violations in linear power networks.* Jun 2019– Aug 2019

–Rupesh Jeyaram, co-supervised with Andrew M. Stuart and Tapio Schneider. *Project: Online parameter estimation in chaotic dynamical systems using ensemble Kalman inversion.* Jun 2018– Aug 2018

–Jonathan P. Rosser, co-supervised with Andrew M. Stuart and Tapio Schneider. *Project: Parameter estimation and uncertainty quantification in chaotic dynamical systems using Gaussian process emulators.* Jun 2018– Aug 2018

TEACHING EXPERIENCE

• Clustering and Classification on Graphs	Lecturer	Caltech	Spring 2020
• Introductory Methods of Computational Mathematics	Lecturer	Caltech	Fall 2019
• Introduction to PDEs	Lecturer	Caltech	Fall 2018
• Numerical Analysis I	Lecturer	SFU	Summer 2017
• Computational Workshop Coordinator	Head TA	SFU	Fall 2016
• Computational Workshop Coordinator	Head TA	SFU	Spring 2016
• Computational Workshop Coordinator	Head TA	SFU	Fall 2015
• Intro. to. Math. Methods in Physics	TA	SFU	Fall 2014
• Numerical Analysis I	TA	SFU	Fall 2014
• Numerical Analysis I	TA	SFU	Summer 2014
• Numerical Analysis I	TA	SFU	Spring 2013
• Numerical Analysis I	TA	SFU	Spring 2012
• Calculus Workshop	TA	SFU	Fall 2012
• Calculus Workshop	TA	SFU	Spring 2011
• Calculus Workshop	TA	SFU	Fall 2011

RESEARCH FUNDING AND GRANT APPLICATIONS

• Mitacs-Accelerate graduate research internship program	\$30,000	Mitacs and Teck Resources Ltd.	2013–2014
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INVITED TALKS

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- “Perturbation theory for function space MCMC”, SIAM UQ20, Technical University of Munich, Garching, Germany. Mar 2020
 - “Perturbation theory for a function space MCMC algorithm with non-Gaussian priors”, Bayes Comp, University of Florida, FL, USA. Jan 2020
 - “Consistency of probit semi-supervised learning in the continuum limit”, SIAM PD19, La Quinta, CA, USA. Dec 2019
 - “Function space Metropolis-Hastings with non-Gaussian priors”, MIT UQ Group, Boston, MA, USA. Jul 2019
 - “Consistency of semi-supervised learning algorithms”, CAIMS 2019, Whistler, BC, Canada. Jun 2019
 - “Consistency of semi-supervised learning algorithms”, Inverse Problems and Machine Learning workshop, Mathematical Research Center (CRM), Montreal, QC, Canada. May 2019
 - “Consistency of semi-supervised learning algorithms”, SOCAMS 2019, Caltech, Pasadena, CA, USA. Apr 2019
 - “Prior-aware Metropolis-Hastings for posterior measures with non-Gaussian priors”, Workshop on Uncertainty Quantification, Mathematical Research Institute of Oberwolfach, Oberwolfach, Germany. Mar 2019
 - “Generalized graph based probit in the continuum limit”, Inverse Problems in Machine learning minisymposium, SIAM CSE19, Sopot, WA, USA. Feb 2019
 - “Continuum limit of semi-supervised learning and spectral clustering on graphs”, Mathematical Foundations of Data Science, University of British Columbia, Vancouver, BC, Canada. Aug 2018
 - “Function space MCMC for posteriors with non-Gaussian priors”, CAIMS 2018, Ryerson University, Toronto, ON, Canada. Jun 2018
 - “A Metropolis-Hastings algorithm for posterior measures with self-decomposable priors”. SOCAMS 2018, University of California Santa Barbara, Santa Barbara, CA, USA. Apr 2018
 - “Non-Gaussian priors in Bayesian inverse problems: from theory to applications”. CMX Seminar Series, Caltech, Pasadena, CA, USA. Jan 2018
 - “Non-Gaussian priors in Bayesian inverse problems: from theory to applications”. SCAIM Seminar Series, University of British Columbia, Vancouver, BC, Canada. Oct 2017
 - “Well-posed Bayesian inverse problems: Priors with exponential tails”. SIAM Annual Meeting, Pittsburgh, PA, USA. Jul 2017
 - “Well-posed Bayesian inverse problems beyond Gaussian priors”. Applied Inverse Problems, Hangzhou, China. May 2017
 - “An MCMC algorithm for Bayesian inference with self-decomposable priors”. CASCADE RAIN, Vancouver, BC, Canada. Apr 2017
 - “Bayesian inverse problems with infinitely divisible priors”. SIAM Conference on Computational Science and Engineering, Atlanta, GA, USA. Mar 2017
 - “Well-posed Bayesian inverse problems: beyond Gaussian priors”. Center for Computational Geoscience and Optimization, ICES, Austin, TX, USA. Sep 2017
 - “Bayesian estimation of acoustic aberrations in high intensity focused ultrasound treatment”. CAIMS Annual Meeting, Edmonton, AB, Canada. Jun 2016
 - “Smooth regularizations of the Dirac delta distribution”. AMMCS-CAIMS Congress, Waterloo, ON, Canada. Jun 2015
 - “Estimating fugitive emissions of airborne particulates using a Gaussian plume model”. AMMCS-CAIMS Congress, Waterloo, ON, Canada. Jun 2015

ORGANIZED EVENTS AND MINISYMPOSIUMS

• PDEs in Machine Learning Minisymposium	SIAM PD19	Dec 2019
• Inverse Problems in Machine Learning Minisymposium	SIAM CSE19	Feb 2019
• Recent Advances in Scientific Computing Minisymposium	CAIMS2018	Jun 2018
• Applicable Analysis Seminar Series	SFU	2016–2017
• Graduate Mathematical Modelling in Industry Workshop	PIMS/UBC	Aug 2016
• Careers in Math Seminar	SFU	Feb 2014
• Software Carpentry Bootcamp	SFU	Feb 2014
• Finite Element Modelling Workshop	SFU	Feb 2014

OUTREACH AND VOLUNTEER SERVICE

• Co-developed the course “Introduction to Machine Learning and Artificial Intelligence” at Pasadena City College.	Spring 2019
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PROFESSIONAL MEMBERSHIPS

• Member	Society for Industrial and Applied Mathematics (SIAM)	since 2011
• Member	American Mathematical Society (AMS)	since 2011
• Member	American Statistical Association (ASA)	2015–2017
• President	SIAM student chapter at Simon Fraser University	2011–2015

ATTENDED WORKSHOPS AND CONFERENCES

• Uncertainty Quantification Summer School	University of Southern California, Los Angeles, CA, USA	Aug 2018
• Mathematical Foundations of Data Science	University of British Columbia, Vancouver, BC, Canada	Aug 2018
• CRISM Summer School in Computational Statistics	LMS, University of Warwick, Coventry, United Kingdom	Jul 2018
• SIAM Conference on Uncertainty Quantification	Garden Grove, CA, USA	Apr 2018
• Inverse Problems and Machine Learning	CMX, Caltech, Pasadena, CA, USA	Feb 2018
• Short Course on PDEs with Deal.II	PIMS, UBC, Vancouver, BC, Canada	Aug 2016
• Introduction to Uncertainty Quantification	IMA, Minneapolis, MN, USA	Jun 2015
• MASDOC/EQUIP Workshop on Bayesian Inverse Problems	University of Warwick , Coventry, United Kingdom	Jun 2015
• SIAM Conference on Computational Science and Engineering	Utah, UT, USA	Mar 2015
• Inverse Problems from Theory to Applications	Bristol, United Kingdom	Aug 2014
• Fields-Mprime Industrial Problem Solving Workshop	Fields institute, Toronto, ON, Canada	Aug 2014

JOURNAL REVIEWING

• SIAM/ASA Journal on Uncertainty Quantification	SIAM/ASA
• SIAM Journal on Applied Mathematics	SIAM
• SIAM Journal on Scientific Computing	SIAM
• Inverse Problems	IOPscience
• Journal of Computational Physics	Elsevier
• Computer Methods in Applied Mechanics and Engineering	Elsevier
• Atmospheric Environment	Elsevier
• Journal of Hazardous Materials	Elsevier
• Journal of Environmental Chemical Engineering	Elsevier
• Pure and Applied Geophysics	Springer
• International Journal of Environmental Science and Technology	Springer
• Journal of Engineering Mathematics	Springer
• Mathematical Review	AMS

COLLABORATORS

• John Stockie, SFU	• Nilima Nigam, SFU
• Samuel Pichardo, University of Calgary	• Charles Mougnot, Qorvo Inc.
• Andrew M. Stuart, Caltech	• Franca Hoffmann, Caltech
• Krithika Manohar, Caltech	• Melike Sirlanci, Caltech
• Alessandro Zocca, Vrije Universiteit Amsterdam	• Alfredo Garbuno-Iñigo, Caltech
• Youssef Marzouk, Massachusetts Institute of Technology	• Nicolás García-Trillos, University of Wisconsin at Madison
• Assad Oberai, University of Southern California	• Andrea Bertozzi, University of California at Los Angeles (UCLA)
• Mason Porter, UCLA	• Heather Zinn Brooks, UCLA
• James Johndrow, University of Pennsylvania	