

BAMDAD HOSSEINI

Computing and Mathematical Sciences
California Institute of Technology
1200 E. California Blvd.
Mail code 305-16
Pasadena, CA, 91125, USA

Email : bamdadh@caltech.edu
Webpage: www.bamdadhosseini.org
Male
Citizenship: Canada and Iran

EDUCATION

- 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

- Postdoctoral Fellow, Department of Computing and Mathematical Sciences, California Institute of Technology (Caltech), Pasadena, CA, USA. Sep 2020-Aug 2022
(Supervisors: Profs. Andrew M. Stuart and Houman Owhadi)
- Von Kármán Instructor in Computing and Mathematical Sciences, 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

Preprints.

- [1] Andrea L Bertozzi, Bamdad Hosseini, Hao Li, Kevin Miller, and Andrew M Stuart. "Posterior consistency of semi-supervised regression on graphs". 2020. URL: <https://arxiv.org/abs/2007.12809>.
- [2] Nikola B Kovachki, Ricardo Baptista, Bamdad Hosseini, and Youssef M Marzouk. "Conditional sampling with monotone GANs". 2020. URL: <https://arxiv.org/abs/2006.06755>.
- [3] Kaushik Bhattacharya, Bamdad Hosseini, Nikola B Kovachki, and Andrew M Stuart. "Model reduction and neural networks for parametric PDEs". 2020. URL: <https://arxiv.org/abs/2005.03180>.

- [4] Franca Hoffmann, Bamdad Hosseini, Assad A Oberai, and Andrew M Stuart. “Spectral analysis of weighted Laplacians arising in data clustering”. 2020. URL: <https://arxiv.org/abs/1909.06389>.
- [5] 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>.
- [6] Nicolás García-Trillos, Franca Hoffmann, and Bamdad Hosseini. “Geometric structure of graph Laplacian embeddings”. 2019. URL: <https://arxiv.org/abs/1901.10651>.

Published articles.

- [1] Franca Hoffmann, Bamdad Hosseini, Zhi Ren, and Andrew M Stuart. “Consistency of semi-supervised learning algorithms on graphs: Probit and one-hot methods”. *Journal of Machine Learning Research* 21.186 (2020), pp. 1–55. URL: <http://jmlr.org/papers/v21/15-900.html>.
- [2] Juan G García, Bamdad Hosseini, and John M Stockie. “Simultaneous model calibration and source inversion in atmospheric dispersion models”. *Pure and Applied Geophysics* (2019). DOI: 10.1007/s00024-019-02348-4.
- [3] 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.
- [4] 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.
- [5] 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.
- [6] 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.
- [7] 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.
- [8] 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.
- [9] 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.
- [10] 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.

AWARDS AND RECOGNITIONS

-
- Governor General’s Academic Gold Medal, SFU, *awarded to the two top graduate students at SFU in each graduating class.* Jun 2018
 - Quirks & Quarks Graduate Award for Best PhD Thesis, SFU, *awarded annually to one graduating Ph.D. student.* Jun 2018
 - SIAM Student Paper Prize for “Well-posed Bayesian inverse problems: priors with exponential tails” [9], *awarded annually to up to three student author(s) of outstanding papers accepted by SIAM journals.* 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, Aug 2014 Canada.
- SIAM Student Chapter Certificate of Recognition. Sep 2014

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

MENTORING

-
- Summer Undergraduate Research Fellows (SURFs) at Caltech:
 - Ishani Karmakar, co-supervised with Andrew M Stuart. *Project: Consistency of probit semi-supervised learning with noisy data* Jun 2020– Aug 2020
 - Haoxuan Chen, co-supervised with Andrew M Stuart. *Project: Continuous Time Opinion Formation on a Graph.* Jun 2020– Aug 2020
 - 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
 - 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

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

INVITED TALKS

• “Banach space supervised learning with neural networks”, SIAM CSE21, Fort Worth, TX, USA.		Mar 2021
• “Model reduction and neural networks for parametric PDEs.”, AMS Fall Western Sectional Meeting (Virtual Meeting).		Oct 2020
• “Data-driven supervised learning: Neural networks and uncertainty quantification”, CRM Applied math seminar, Montreal, QC, Canada.		Jun, 2020
• “Consistency Of Semi-Supervised Learning Algorithms On Graphs”, Applied math seminar, Brigham Young University, UT, USA.		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, Spokane, 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

RESEARCH FUNDING AND GRANT APPLICATIONS

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

ORGANIZED EVENTS AND MINISYMPOSIUMS

-
- CMX Student/postdoc seminar series Caltech since Oct 2021
 - Recent Advances in Computational Probability Minisymposium SIAM CSE21 Mar 2021
 - 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

OUTREACH AND VOLUNTEER SERVICE

-
- Co-developed the course “Introduction to Machine Learning and Artificial Intelligence” at Pasadena City College for students with minimal background in mathematical sciences. Apr 2019
 - Volunteer team mentor during the “PIMS Graduate Mathematical Modelling in Industry Workshop” at UBC. Aug 2016
 - Organized the “Careers in Math Seminar” for mathematics graduate students at SFU looking for careers outside academia. Feb 2014

- Co-organized a “Software Carpentry Bootcamp” jointly between the Departments of Mathematics, Chemistry, and Computer Science at SFU. Feb 2014
- Organized the “Finite Element Modelling Workshop” to familiarize graduate students at SFU with the FreeFEM++ software package. Feb 2014

PROFESSIONAL MEMBERSHIPS

-
- Member Society for Industrial and Applied Mathematics (SIAM) since 2011
 - President SIAM student chapter at SFU 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

-
- Annals of Statistics IMS
 - Applied and Computational Harmonic Analysis Elsevier
 - Atmospheric Environment Elsevier
 - Communications in Computational Physics Global Science Press
 - Computer Methods in Applied Mechanics and Engineering Elsevier
 - IEEE Transactions on Network Science and Engineering IEEE
 - International Journal of Environmental Science and Technology
 - Inverse Problems IOPscience
 - Journal of Computational Physics Elsevier
 - Journal of Hazardous Materials Elsevier
 - Journal of Environmental Chemical Engineering Elsevier
 - Pure and Applied Geophysics Springer
 - SIAM/ASA Journal on Uncertainty Quantification SIAM/ASA

- SIAM Journal on Applied Mathematics
- SIAM Journal on Scientific Computing
- Journal of Engineering Mathematics
- Mathematical Review

SIAM
SIAM
Springer
AMS

COLLABORATORS

- John Stockie, SFU
- Samuel Pichardo, University of Calgary
- Andrew M. Stuart, Caltech
- Krithika Manohar, Caltech
- Alessandro Zocca, Vrije Universiteit Amsterdam
- Youssef Marzouk, Massachusetts Institute of Technology
- Assad Oberai, University of Southern California
- Mason Porter, UCLA
- James Johndrow, University of Pennsylvania
- Hossein Salahshour, Caltech
- Houman Owhadi, Caltech
- Nilima Nigam, SFU
- Charles Mougenot, Qorvo Inc.
- Franca Hoffmann, Caltech
- Melike Sirlanci, Caltech
- Alfredo Garbuno-Iñigo, Instituto Tecnológico Autónomo de México
- Nicolás García-Trillos, University of Wisconsin at Madison
- Andrea Bertozzi, University of California at Los Angeles (UCLA)
- Heather Zinn Brooks, UCLA
- Kaushik Bhattacharya, Caltech
- Amir Sagiv, Columbia University