

Heyrim Cho

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APPOINTMENTS

Brin Postdoc Fellow, University of Maryland, College Park, MD, USA	Fall 2015-present
Research Assistant, Department of Nuclear Medicine, Seoul National University Hospital	Jan 2009 -Jun 2009

EDUCATION

Ph.D. in Applied Mathematics Brown University, Providence, RI, USA	May 2015
Thesis: High-Dimensional Response-Excitation PDF Methods for Uncertainty Quantification and Stochastic Modeling (Advisor: Professor George E. Karniadakis)	
M.S. in Mathematics Korea Advanced Institute of Science and Technology (KAIST), South Korea	Aug 2009
Thesis: Implementation of Dual Iterative Substructuring methods on a Parallel computer (Advisor: Professor Chang-Ock Lee)	
B.S. in Applied Mathematics in Summa Cum Laude KAIST, South Korea	Feb 2007

RESEARCH INTEREST

Stochastic Modeling / Stochastic Simulations	Stochastic dynamical system, Kinetic equations, Stochastic/Deterministic multi-scale modeling, Series expansion methods of Random fields, Polynomial Chaos, Probabilistic Collocation
Numerical PDE / Scientific computing	Spectral method, Discontinuous Galerkin method, High-dimensional numerical techniques (Sparse grid and ANOVA approximation, Tensor Decomposition, Reduced Basis method) Domain decomposition, Parallel algorithms
Mathematical Biology Computational Biology	Cancer dynamics and simulation, Multi drug resistance, Optimal drug control, Continuum based cancer models, Cell motility, Mutation

CURRENT RESEARCH

- H. Cho, ‘Tensor Train method for response-excitation PDF equations, Malakhov-Saichev equation,
- H. Cho, D. Levy, ‘Efficient numerical method of multiple phenotypes to study multi-drug resistance’,
- H. Cho, D. Levy, ‘Drug optimization considering cell competition in tumor growth’,
- H. Cho, K. Lee, B. Sousedik, ‘Dual-primal domain decomposition method with augmented Lagrangian for stochastic PDEs’

PREPRINT

- E. Kim, R. Schenck, J. West, W. Cross, V. Harris, J. McKenna, H. Cho, E. Coker, S. L-Kramer, K. Tsai, E. Flores, C. D. Gatenbee ‘Targeting the Untargetable: Predicting Pramlintide Resistance Using a Neural Network Based Cellular Automata’ bioRxiv, <https://doi.org/10.1101/211383>
- H. Cho, K. Ayers, L. DePillis, Y-H. Kuo, J. Park, A. Radunskaya, R. Rockne, ‘Cell fate decisions: trajectories and flows in a differentiation space’

JOURNAL PUBLICATIONS

- H. Cho, H. Elman, ‘Adaptive reduced basis collocation method based on mePCM for anisotropic stochastic PDEs’, Int. J. Uncertain. Quantif. (accepted IJUQ 2017)
- H. Cho, D. Levy, ‘Modeling the chemotherapy-induced selection of drug-resistant traits during tumor growth’, J. Theor. Biol. 436(7), 2018
- H. Cho, D. Levy, ‘Modeling the dynamics of heterogeneity of solid tumors in response to chemotherapy’, Bull. Math. Bio. (accepted, 2017)
- H. Cho, D. Venturi, G. E. Karniadakis, ‘Numerical methods for high-dimensional probability density function

equations', J. Comput. Phys. 305, 2016

- H. Cho, X. Yang, D. Venturi, G. E. Karniadakis, '*Algorithms for propagating uncertainty across heterogeneous domains*', SIAM J. Sci. Comput. 37(6), 2015
- H. Cho, D. Venturi, G. E. Karniadakis, '*Statistical Analysis and Simulation of Random Shocks in Burgers Turbulence*', Proc. R. Soc. A, 470(2171), 2014.
- H. Cho, D. Venturi, G. E. Karniadakis, '*Karhunen–Loève expansion for multi-correlated stochastic processes*', Prob. Eng. Mech., 34, 2013.
- H. Cho, D. Venturi, G. E. Karniadakis, '*Adaptive Discontinuous Galerkin Method for Response-Excitation PDF Equations*', SIAM J. Sci. Comput., 35(4), 2013.
- D. Venturi, T. P. Sapsis, H. Cho, G. E. Karniadakis, '*A computable evolution equation for the joint response - excitation probability density function of stochastic dynamical systems*', Proc. R. Soc. A, 468(2139), 2012.

BOOK CHAPTERS

- H. Cho, D. Venturi, G. E. Karniadakis, '*Numerical methods for high-dimensional kinetic equations*', SEMA SIMAI Springer Series, Uncertainty Quantification for Hyperbolic and Kinetic Equations
- H. Cho, D. Venturi, G. E. Karniadakis, '*Mori-Zwanzig approach to uncertainty quantification*', Springer, Handbook on Uncertainty Quantification

TEACHING EXPERIENCE

Computational Methods (AMSC460, UMD), Instructor	Spring2018
Elementary Calculus I (MATH120, UMD), Instructor	Spring/Fall 2017
Elementary Calculus I (MATH220, UMD), Instructor	Fall2016
Linear Algebra and differential equations (Honors) (MATH341, UMD), Instructor	Spring 2015
Multivariable Calculus (Honors) (MATH340, UMD), Instructor	Fall 2015
Basic College Mathematics (MATH500, Community College of RI), co-Instructor	Summer 2014
Methods of Applied Math: Differential Equation I/II (APMA330/340 Brown Univ.), T. A.	Fall 2010/Spring 2011
Math Resource Center (Brown University), Tutor	Fall 2009
Analysis I/II (MAS241/242, Korea Advanced Institute of Science and Technology), T. A.	Spring/Fall 2008

PROFESSIONAL ACTIVITIES

Research Assistant, CRUNCH group (Prof. George E. Karniadakis, Brown University)	Jun 2010 - Jul 2015
Research Assistant, (Prof. Jae-Sung Lee, Seoul National University Hospital)	Jan 2009 -Jun 2009
Research Assistant, Computational Mathematics Lab (Prof. Chang-Ock Lee, KAIST)	Feb 2007-Dec 2008

CONFERENCE / INVITED TALKS

- '*Numerical methods for uncertainty quantification - from noise parameterization to efficient simulation of parameterized stochastic PDE*', (Applied Mathematics Colloquium, UMBC), 2017
- '*High-dimensional stochastic simulation and dimension reduction techniques*', (MathSci Seminar, KAIST), 2017
- '*Modeling chemotherapy-induced selection of drug-resistant traits during tumor growth*', Math. Meth. In Bio. Medicine. WPI, 2017
- '*Modeling the dynamics of heterogeneity in response to chemotherapy*', (SMB2017), Utah, 2017
- '*Uncertainty propagation across distinct PDF and stochastic spectral systems*', (SIAM-UQ16), EPFL, 2016
- '*Uncertainty quantification based on the response-excitation PDF and reduced order PDF by using Mori-Zwanzig PDF approach*', (SIAM-CSE15), Salt Lake City UT, 2015
- '*High-dimensional response-excitation PDF method: separated representation and ANOVA approximation*', International Conference on Spectral and High Order Methods (ICOSAHOM), Salt Lake City UT, 2014
- '*Karhunen-Loeve expansion for multi-correlated stochastic processes*', SIAM-UQ14, Savannah GA, 2014

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- '*Study of the stochastic inviscid Burgers equation with the joint response-excitation PDF equation*', 4th International congress on Computational Engineering and Sciences (FEMTEC 2013), NV, 2013
 - '*Numerical methods for high-dimensional response-excitation PDF equations*', 14th International conference on Approximation Theory (AT14), TX, 2013
 - '*Spectral/hp element and discontinuous Galerkin methods for response-excitation PDF equations*', SIAM-CSE13, Boston, MA, 2013.
 - '*A new approach to UQ based on the joint excitation-response PDF: Theory and simulation*', SIAM-UQ12, Raleigh NC, 2012

REFEREE/REVIEWER

• SIAM Journal on Scientific Computing • Journal of Computational Physics • Stochastic Partial Differential Equations: Analysis and Computations • Probabilistic Engineering Mechanics • Computer Methods in Applied Mechanics and Engineering

HONORS

Landahl Travel Awards (Society for Mathematical Biology)	2017
Stella Dafermos Award (Brown University)	2015
Academic Excellence Scholarship (KAIST, Department of Applied Mathematics)	2004-2006
National Science Scholarship (Korea Science and Engineering Foundation)	2003-2006