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)
Sc.M in Applied Mathematics Brown University, Providence, RI, USA **May 2011**
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

Mathematical Biology Computational Biology	Cancer dynamics and simulation, Multi drug resistance, Optimal drug control, Continuum based cancer models, Cell motility, Mutation
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

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, D. Levy, '*The Impact of Competition Between Cancer Cells and Healthy Cells on Optimal Drug Delivery*', (submitted, 2018)

JOURNAL PUBLICATIONS

- H. Cho, D. Levy, '*Modeling continuous levels of resistance to multidrug therapy in cancer'*, (accepted,2018)
- H. Cho, K. Ayers, L. DePillis, Y-H. Kuo, J. Park, A. Radunskaya, R. Rockne, *'Modeling acute myeloid leukemia in a continuum of differentiation states,* Lett. Biomath, 2018, *bioRxiv:https://doi.org/10.1101/237438*
- H. Cho, H. Elman, '*Adaptive reduced basis collocation method based on mePCM for anisotropic stochastic PDEs*', Int. J. Uncertain. Quantif. 8(3), 2018
- 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. 79(12), 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, 2017
- D. Venturi, H. Cho, G. E. Karniadakis, '*Mori-Zwanzig approach to uncertainty quantification',* Springer, Handbook on Uncertainty Quantification, 2017

ONGOING PROJECTS

- H. Cho, *'Modeling spatial and phenotypic heterogeneity in EMT of cancer metastasis'*
- H. Cho, R. Rockne, *'Comparison of continuum models of Hematopoetic stem cell differentiation'*
- H. Cho, '*Tensor Train method for response-excitation PDF equations, Malakhov-Saichev equation'*
- H. Cho, D. Levy, '*Efficient numerical method for high-dimensional phenotypic structed models'*
- H. Cho, D. Levy '*Drug induced resistance and therapy optimization using single-cell RNA sequencing data'*
- H. Cho, K. Lee, B. Sousedik, '*Dual-primal domain decomposition method with augmented Lagrangian for stochastic PDEs'*

TEACHING EXPERIENCE

Mathematics for Life Sciences (MATH135, UMD), Instructor	**Fall2018**
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
- *'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

AWM-NSF Travel Grant (Association for Woman in Math-NSF)	**2018**
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**