Min Hyung Cho

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Research Area

- Computational Mathematics/Electromagnetics
- Numerical solutions of PDEs
- Fast Multipole Method (FMM)
- Wave propagation in layered media
- High Performance Computing

Employment

Sep., 2015 ∼ present:	Assistant Professor Department of Mathematical Sciences, University of Massachusetts Lowell
July, 2012 ∼ Aug. 2015:	Instructor in Applied and Computational Mathematics Department of Mathematics, Dartmouth College
July, 2009 ∼ June, 2012:	Postdoctorate Researcher Department of Mathematics and Statistics, The University of North Carolina at Charlotte
Mar., 2006 ∼ Mar., 2009:	Full-time Researcher Quantum Photonic Science Research Center, Hanyang University, Seoul, Korea
Sep., 2005 ∼ Dec., 2005:	Postdoctorate Researcher Department of Mathematics and Statistics, The University of North Carolina at Charlotte

Education

Aug. 2005:	Ph.D in Applied Mathematics, The University of North Carolina at Charlotte
Aug. 2004:	M.S. in Mathematics, The University of North Carolina at Charlotte
Feb. 1999:	B.S. in Mathematics, Ajou University, Suwon, Korea

Grants

- *Robust and fast computational method for electromagnetics*, Simons Foundation, Mathematics and Physical Sciences - Collaboration Grants for Mathematicians, #404499, Sep. 2016 - Aug. 2021.

Award

- 2017 Teaching Excellence award (4/28/2017). UMass Lowell

Publications - Submitted & In preparation

- M.H. Cho, *Spectrally-accurate numerical method for acoustic scattering from doubly-periodic 3D multilayered media*, arXiv:1806.03813, 2018.

Publications (Google Scholar - http://goo.gl/vTuv1A)

1. M.H. Cho, J. Huang, Dangxing Chen, and W. Cai, *A Heterogeneous FMM for Layered Media Helmholtz Equation I: Two-layered media in* $\mathbb{R}^2$, 369, 237-251, J. Comput. Phys., 2018.
2. I. Tsantili, M.H. Cho, W. Cai, and G. Karniadakis, *A computational stochastic methodology for the design of random meta-materials under geometric constraints*, 40, B353-B378, SIAM J. Sci. Comput., 2018.
3. Duan Chen, M.H. Cho, W. Cai, *Accurate and efficient Nyström volume integral equation method for electromagnetic scattering of 3-D Meta-materials in layered media*, 40, B259-B282, SIAM J. Sci. Comput., 2018
4. M.H. Cho and W. Cai, *Efficient and accurate computation of electric field dyadic Green's function in layered media*, 71, 1319-1350, J. Sci. Comput., 2017.
5. Duan Chen, W. Cai, B. Zinser, and M.H. Cho, *Accurate and efficient Nyström volume integral equation method for the Maxwell equations for 3-D scatterers*, 321, 303-320, J. Comput. Phys., 2016
6. M.H. Cho, and Alex Barnett, *Robust fast direct integral equation solver for quasi-periodic scattering problems with a large number of layers*, 23, 2, 1775-1799, Optics Express, 2015
7. M.H. Cho and W. Cai, *Fast integral equation solver for Maxwell's equations in layered media with FMM for Bessel function*, Science China Mathematics - Dedicated to Prof. Zhongci Shi on the occasion of his 80th birthday, Invited paper, 56, 12, 2561-2570, 2013
8. C. Davis, J.G. Kim, H.-S. Oh, and M.H. Cho, *Meshfree particle methods in the framework of boundary element methods for Helmholtz equation*, J. Sci. Comp., 55, 1, 200-230, 2013

9. M.H. Cho and W. Cai, *A parallel fast algorithm for computing Helmholtz integral operator in 3-D layered media*, J. Comp. Phys., 231, 17, 5910-5925, 2012
10. M.H. Cho and W. Cai, *Revision of wFMM - A wideband fast multipole method for two-dimensional complex Helmholtz equation*, Computer Phys. Commun., 183, 2, 446-447, 2012
11. M.H. Cho, H. Zheng, Y.H. Lu, Y.P. Lee, and W. Cai, *Improved rigorous coupled wave analysis for polar magnetic grating*, Computer Phys. Commun., 182, 2, 360-365, 2011
12. M.H. Cho and W. Cai, *A wideband fast multipole method for two-dimensional complex Helmholtz equation*, Computer Phys. Commun., 181, 12, 2086-2090, 2010
13. J.B. Kim, Y.H. Lu, M.H. Cho, Y.P. Lee, J.Y. Rhee, and K.-M. Ho, *Diffracted magneto-optical Kerr effect of a magnetic Ni grating*, J. Appl. Phys., 06, 093103, 2009
14. M.H. Cho, Y.H. Lu, Y.P. Lee, and J.Y. Rhee, *Magneto-optic study in a transverse gyrotropic gratings*, J. Korean Phys. Soc., 55, 1210-1214, 2009
15. N.T. Tung, V.D. Lam, J.W. Park, M.H. Cho, J.Y.Rhee, W.H. Jang, and .P. Lee, *Single- and double-negative refractive indices of combined metamaterial structure*, J. Appl. Phys., 106, 053109, 2009
16. V.D. Lam, N.T. Tung, M.H. Cho, J.W. Park, W.H. Jang, and Y.P. Lee, *Influence of lattice parameters on the resonance frequencies of a cut-wire pair medium*, J. Appl. Phys., 105, 113102, 2009
17. J.B. Kim, Y.H. Lu, M.H. Cho, G.J. Lee, Y.P. Lee, J.Y. Rhee, and C.S. Yoon, *Diffracted magneto-optical Kerr effect in one-dimensional magnetic gratings*, Appl. Phys. Lett., 94, 151110, 2009
18. N.T. Tung, V.D. Lam, M.H. Cho, J.W. Park, W.H. Jang, and Y.P. Lee, *Influence of the dielectric-spacer thickness on the left-handed behavior of fishnet metamaterial structure*, Photonics and Nanostructures, 7, 206-211, 2009
19. V.D. Lam, N.T. Tung, M.H. Cho, J.W. Park, W.H. Jang, and Y.P. Lee, *Effect of the dielectric layer thickness on the electromagnetic response of cut-wire-pair and combined structures*, J. Phys. D, 42, 115404, 2009
20. M.H. Cho, Y.H. Lu, J.Y. Rhee, and Y.P. Lee, *Rigorous approach on diffracted magneto-optical effects from polar and longitudinal gyrotropic gratings*, Optics Express, 16, 16825, 2008
21. Y.H. Lu, M.H. Cho, Y.P. Lee, and J.Y. Rhee, *Polarization-independent extraordinary optical transmission in one-dimensional metallic gratings with broad slits*, Appl. Phys. Lett., 93, 061102, 2008
22. Y.H. Lu, M.H. Cho, J.B. Kim, G.J. Lee, Y.P. Lee, and J.Y. Rhee, *Correlation between the diffracted magneto-optical Kerr effect and structure in gyrotropic gratings*, J. Korean Phys. Soc., 53, 2275, 2008

23. Y.H. Lu, M.H. Cho, J.B. Kim, Y.P. Lee, J.Y. Rhee, and J.H. Lee, *Control of diffracted magneto-optical enhancement in Ni gratings*, IEEE Trans. Mag., 44, 3300, 2008
24. W.C. Nam, M.H. Cho, and Y.P. Lee, *Finite difference method for the Landau-Lifshitz equation*, J. Korean Phys. Soc., 53, 1626, 2008
25. Y.H. Lu, M.H. Cho, J.B. Kim, G.J. Lee, Y.P. Lee, and J.Y. Rhee, *Magneto-optical enhancement through gyrotropic gratings*, Optics Express, 16, 5378, 2008
26. M.H. Cho, W. Cai, and Y.P. Lee, *Modeling of 2D photonic crystal with a boundary integral equation*, J. Korean Phys. Soc., 51, 1507, 2007
27. M.H. Cho, W. Cai, and T.-H. Her, *Boundary integral equation method for photonic crystal fibers*, J. Sci. Comp., 28, 263-278, 2006
28. B. Benedict, M.H. Cho, J.E. Gishe, R. Marter, R. Strain, and B. Tate, *Energy consumption and interference in Bay Area Rapid Transit (BART) system*, Center for Research in Scientific Computation (CRSC) at NC State University Technical report, CRSC-TR03-37, 2002

Presentations

1. Computational Science and Engineering (CSE19), Feb. 25-Mar. 1, 2018, Spokane, WA (Scheduled)
2. SIAM Annual meeting, July 9-13, 2018, Portland, OR
3. SIAM Conference on Analysis of Partial Differential Equations, Dec. 12, 2017, Baltimore, MD
4. Massachusetts HPC day, May, 25, 2017, UMass Dartmouth
5. Scientific Computing Seminar, April, 14, 2017, Brown University
6. Computational Science and Engineering (CSE17), Feb. 27-Mar. 3, 2017, Atlanta, GA (Poster presentation with Kennedy Udechukwu - Undergraduate Student)
7. Space Physics Seminar, Sep. 9, 2016, University of Massachusetts Lowell
8. SIAM Annual meeting, July 11-15, 2016, Boston, MA
9. Computational Science Seminar at Univ. of Massachusetts Dartmouth, Apr. 4, 2016
10. Numerical Analysis and PDE Seminar at Univ. of Delaware, Mar. 17, 2016
11. Numerical Simulation and Theoretical Analysis in Computational Physics, workshop at Peking University, Dec. 27-28, 2015, Beijing, China
12. Colloquium talk at University of Massachusetts Lowell, Nov. 18, 2015

13. The 7th International Congress on Industrial & Applied Mathematics (ICIAM 2015), Aug. 10, 2015, Beijing, China
14. Colloquium talk at Dartmouth College, Nov. 13, 2014
15. SIAM Annual meeting, July 7-11, 2014, Chicago, IL
16. Applied Mathematics Seminar Talk, Sep. 3, 2013, Ehwa Womans University, Seoul, Korea
17. SIAM Annual meeting, July 8-12, 2013, San Diego, CA
18. Colloquium talk at Univ. of Wisconsin at Milwaukee, Mar. 11, 2013
19. Computational Science and Engineering (CSE13), Feb. 25-Mar. 1, 2013, Boston, MA
20. Computational Science Seminar talk at Univ. of Massachusetts Dartmouth, Oct. 3, 2012
21. Scientific Computing and Applications (SCA) 2012, Apr. 1-4, Las Vegas, NV
22. SIAM-South Eastern Atlantic Section (SIAM-SEAS), Mar. 24, 2012, Huntsville, AL
23. The 7th International Congress on Industrial & Applied Mathematics (ICIAM 2011), July 18, 2011, Vancouver, Canada
24. SIAM-South Eastern Atlantic Section (SIAM-SEAS), Mar. 26, 2011, Charlotte, NC
25. Computational Science and Engineering (CSE11), Mar. 1, 2011, Reno, NV
26. The 1st Computational Mathematics and Applications, Jun. 18, 2010, invited talk, Ulsan National Institute of Science and Technology, Ulsan, Korea
27. Metamaterials: Applications, Analysis and Modeling, Jan. 25, 2010, poster presentation, UCLA, CA
28. The 53rd annual conference on magnetism and magnetic materials (MMM), Nov. 13, 2008, Austin, TX
29. Korean Society for Industrial and Applied Mathematics (KSIAM) spring meeting, May 31, 2008, Postech, Korea
30. The 10th Asia Pacific Physics Conference (APPC10), Aug. 2007, Postech, Korea
31. The Conference on Lasers and Electro-Optics (CLEO), May 2007, Baltimore, MD
32. Korean Physical Society (KPS) spring meeting, Apr. 2007, invited talk, Phoenix Park, Pyongchang, Korea
33. Korean Society for Industrial and Applied Mathematics (KSIAM) annual meeting, Nov. 2006, Konkuk University, Seoul, Korea
34. Optics in Southeast (OISE), 2004, Charlotte, NC

Teaching Experience

UMass Lowell

- Fall, 2018 MATH 2410 - Honors Calculus III (Scheduled)
- Fall, 2018 MATH 1410 - Honors Calculus I (Scheduled)
- Spring, 2018 MATH 1420 - Honors Calculus II
- Fall, 2017 MATH 2410 - Honors Calculus III
- Fall, 2017 MATH 1410 - Honors Calculus I
- Spring, 2017 MATH 5310 - Applied Mathematics II (Graduate course)
- Spring, 2017 MATH 1420 - Honors Calculus II
- Fall, 2016 MATH 5300 - Applied Mathematics I (Graduate course)
- Fall, 2016 MATH 1410 - Honors Calculus I
- Spring, 2016 MATH 4500/5500 - Mathematical Modeling (Graduate course)
- Spring, 2016 MATH 5310 - Applied Mathematics II (Graduate course)
- Fall, 2015 MATH 5300 - Applied Mathematics I (Graduate course)

Dartmouth College

- Spring, 2015 MATH 46 - Introduction to Applied Mathematics
- Spring, 2015 MATH 22 - Linear Algebra with Applications
- Fall, 2014 MATH 23 - Differential Equations
- Winter, 2014 MATH 13 - Calculus of Vector-valued functions
- Fall, 2013 MATH 23 - Differential Equations (2 sections)
- Spring, 2013 MATH 23 - Differential Equations
- Winter, 2013 MATH 13 - Calculus of Vector-valued functions
- Winter, 2013 MATH 23 - Differential Equations

The University of North Carolina at Charlotte

- Spring, 2005 MATH 1103 - Precalculus
- Fall, 2004 MATH 2171 - Differential Equations
- Fall, 2003 MATH 1103 - Precalculus
- Fall, 2002 MATH 1103 - Precalculus
- Fall, 2001 MATH 1103 - Precalculus

Undergraduate Student Mentoring

- Kennedy Udechukwu, UMass Lowell, (July 2016 $\sim$ June 2017)
  Honors College Research/Creativity Student Fellowships
- Kartikeya Menon, Dartmouth 16, Presidential Scholar, 2014$\sim$2015
- Eric Tao, Dartmouth 16

Computer Skills

- C, OpenMP, Matlab, Mathematica, Fortran, MPI, CUDA

Software

- Wideband Fast Multipole Method for 2-D Complex Helmholtz Equation
  (available at `http://www.fastmultipole.org` and `http://cpc.cs.qub.ac.uk`)

- Multilayered grating solver in 2-D
  (available at `http://faculty.uml.edu/min_cho/software`)

Services

- SIAM Annual meeting mini-symposium co-organizer, 2013 (San Diego, CA), 2014 (Chicago, IL), 2016 (Boston, MA), 2018 (Portland, OR)

- The 9th Applied Inverse Problem (AIP), May. 29-Jun. 2, 2017, mini-symposium, co-organizer, Hangzhou, China

- SIAM conference on Computational Science and Engineering (CSE) mini-symposium co-organizer, 2017 (Atlanta, GA), 2019 (Spokane, WA)

- HPC day at UMass Dartmouth, May 17, 2016 and May 25, 2017 co-organizer
  (`http://cscvr1.umassd.edu/HPCday/`)

- 2014 CBMS-NSF Conference: Fast Direct Solvers for Elliptic PDEs, co-organizer (Alex Barnett, Min Hyung Cho, Adrianna Gilman, and Leslie Greengard) at Dartmouth College June 23-29, 2014
  (`http://www.math.dartmouth.edu/~fastdirect/`)

- Applied and Computational Mathematics Seminar co-organizer, Dartmouth College (2012 $\sim$ 2015), (`https://math.dartmouth.edu/~acms`)

- Applied Mathematics Seminar co-organizer, UMass Lowell (2015 $\sim$)
(`https://www.uml.edu/Sciences/mathematics/seminars.aspx`)

- Journal referee -
  SIAM Journal on Numerical Analysis (SINUM),
  Journal of Computational Physics (JCP),
  Communications in Computational Physics (CiCP),
  Journal of Electromagnetics Waves and Applications (JEMWA),
  Progress in Electromagnetics Research (PIER),
  Optics and Photonics Letters (OPL),
  Journal of Korean Physical Society (JKPS),
  Springer Plus.

- Grader, proctor, and exam reviewer for Korean-American Scientists and Engineers Association National Mathematics Competition (Grade 4-11)

- Department Applied Mathematics Seminar Organizer at UML (2015∼)

- Department Hiring Committee at UML (2015∼2017)

- Department Chair Hiring Committee at UML (2017∼2018)

- Department Graduate Curriculum Committee at UML (2016∼)