# Matthias S. Maier

*Curriculum Vitae*

*Department of Mathematics*
*Texas A&M University, 3368 TAMU*
*College Station, TX 77843, USA*
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## Academic positions

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|---|---|
| 09/2022 – | Associate Professor (with tenure)<br>Department of Mathematics, Texas A&M University |
| 08/2018 – 08/2022 | Assistant Professor<br>Department of Mathematics, Texas A&M University |
| 07/2015 – 08/2018 | Dunham Jackson Assistant Professor<br>School of Mathematics, University of Minnesota |
| 10/2011 – 06/2015 | Research Associate (Wissenschaftlicher Mitarbeiter),<br>Numerical Analysis Group, Institute of Applied Mathematics<br>Ruprecht-Karls-Universität Heidelberg |

## Education

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| 06/2015 | Dr. rer. nat. with grade summa cum laude<br>Ruprecht-Karls-Universität Heidelberg<br>Thesis: *Duality-based adaptivity of model and discretization in multiscale finite-element methods*, supervised by Prof. Dr. Dr. h. c. Rolf Rannacher |
| 02/2012 – 06/2015 | Member (with research fellowship) of the Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences, Ruprecht-Karls-Universität Heidelberg |
| 10/2006 – 09/2011 | Diplom (equivalent to M. Sc.) in Mathematics, Ruprecht-Karls-Universität Heidelberg<br>Final grade: "sehr gut" (excellent)<br>Minor subjects: Computer Science, Physics |
| 10/2005 – 02/2011 | Diplom (equivalent to M. Sc.) in Physics, Ruprecht-Karls-Universität Heidelberg<br>Final grade: "sehr gut" (excellent)<br>Diplom thesis: *Simulation of Boundary Layer Flow over Riblet Structures*<br>Minor subjects: Computer Science, Mathematics |

## Research interests

- *Multiscale effects in Maxwell's equations:* surface plasmon-polaritons on 2D materials, plasmonic crystals
- *Multiscale methods:* heterogeneous multiscale methods, variational multiscale methods; asymptotic analysis and homogenization theory, model adaptation
- Computational fluid dynamics: hyperbolic conservation laws, compressible Euler and Navier-Stokes equations, coupled Euler-Poisson and Euler-Maxwell systems
- Finite element methods and finite element software

## Grants and allocations

11/2022 – 10/2025 AFOSR FA9550-23-1-0007 "Robust approximation of hyperbolic-dominated models" (co-PI with J.-L. Guermond and B. Popov) , $ 609,386.

09/2021 – 08/2026 NSF DMS 2045636 "CAREER: Robust and high-performance computational methods for simulating metamaterial-based optical devices", $ 470 000.

06/2021 – 05/2022 TACC Frontera allocation, NSF DMS 21004 "'`ryujin` — towards robust and efficient computation of supersonic hyperbolic flow at large and small scales"', 160 000 SUs (8.96M core hours).

09/2019 – 08/2022 NSF DMS 1912847 "Efficient and Adaptive Methods for Simulating Multiscale Effects in Optical Metamaterials", $ 125 000.

01/2019 – 12/2020 T3 Texas A&M Triads for Transformation, Co-PI with Q. Michaudel and M. Green, $ 30 000.

## Honors and awards

2021 NSF CAREER Award

2017 Highlight of the Year award, *On the Wiener-Hopf Method for Surface Plasmons: Diffraction from Semi-infinite Metamaterial Sheet*, Studies in Applied Mathematics, 2017

02/2012 – 06/2015 Research fellowship, Heidelberg Graduate School of Mathematical and Computational Methods for the Sciences, Ruprecht-Karls-Universität Heidelberg

## Software development

Since 10/2014 Developer, Gentoo Linux Distribution (`http://www.gentoo.org`)

Since 07/2014 Principal developer and project administrator, deal.II Library (`http://www.dealii.org`)

11/2013 – 07/2014 Developer, deal.II Library (`http://www.dealii.org`)

Since 02/2011 Contributor, Finite Element Toolkit Gascoigne 3D (`http://www.gascoigne.de`)

## Submitted journal articles

1. B. Clayton, J.-L. Guermond, M. Maier, B. Popov, and E. J. Tovar. Robust second-order approximation of the compressible euler equations with an arbitrary equation of state. *Submitted*, 2022. URL `http://arxiv.org/abs/2207.12832`
2. D. Arndt, W. Bangerth, M. Feder, M. Fehling, R. Gassmöller, T. Heister, L. Heltai, M. Kronbichler, M. Maier, P. Munch, J.-P. Pelteret, S. S. andBruno Turcksin, and D. Wells. The deal.II Library, Version 9.4. *Journal of Numerical Mathematics*, Accepted, 2022. doi: 10.1515/jnma-2022-0054
3. M. Maier, J. Shadid, and I. Tomas. Local-in-time structure-preserving finite-element schemes for the Euler-Poisson equations. *Submitted*, 2022. URL `https://arxiv.org/abs/2207.07860`

## Journal articles (* with student)

*The list of authors on mathematical publications is predominantly in alphabetical order.*

4. J.-L. Guermond, M. Kronbichler, M. Maier, B. Popov, and I. Tomas. On the implementation of a robust and efficient finite element-based parallel solver for the compressible navier-stokes equations. *Computer Methods in Applied Mechanics and Engineering*, 389:114250, 2022. doi: 10.1016/j.cma.2021.114250. URL https://arxiv.org/abs/2106.02159

5. W. Li, R. Lipton, and M. Maier. Lorentz resonance in the homogenization of plasmonic crystals. *Proceedings of the Royal Society A: Mathematical, Physical, and Engineering Sciences*, 477:20210609, 2021. doi: 10.1098/rspa.2021.0609. URL https://arxiv.org/abs/2009.12166

6. D. Arndt, W. Bangerth, B. Blais, M. Fehling, R. Gassmöller, T. Heister, L. Heltai, U. Köcher, M. Kronbichler, M. Maier, P. Munch, J.-P. Pelteret, S. Proell, K. Simon, B. Turcksin, D. Wells, and J. Zhang. The deal.II Library, Version 9.3. *Journal of Numerical Mathematics*, 29(3): 171–186, 2021. doi: 10.1515/jnma-2021-0081

7. M. Maier and M. Kronbichler. Efficient parallel 3d computation of the compressible euler equations with an invariant-domain preserving second-order finite-element scheme. *ACM Transactions on Parallel Computing*, 8(3):16:1–30, 2021. doi: 10.1145/3470637. URL https://arxiv.org/abs/2007.00094

8. J.-L. Guermond, M. Maier, B. Popov, and I. Tomas. Second-order invariant domain preserving approximation of the compressible navier–stokes equations. *Computer Methods in Applied Mechanics and Engineering*, 375(1):113608, 2021. doi: 10.1016/j.cma.2020.113608. URL https://arxiv.org/abs/2009.06022

9. D. Arndt, W. Bangerth, D. Davydov, T. Heister, L. Heltai, M. Kronbichler, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The deal.II finite element library: design, features, and insights. *Computers & Mathematics with Applications*, 81(1):407–422, 2021. doi: 10.1016/j.camwa.2020.02.022. URL http://arxiv.org/abs/1910.13247

* 10. J. H. Song, M. Maier, and M. Luskin. Nonlinear eigenvalue problems for coupled Helmholtz equations modeling gradient-index graphene waveguides. *Journal of Computational Physics*, 423(15):109871, 2020. doi: 10.1016/j.jcp.2020.109871. URL https://arxiv.org/abs/2003.06531

11. M. Maier, D. Margetis, and M. Luskin. Finite-size effects in wave transmission through plasmonic crystals: A tale of two scales. *Physical Review B*, 102:075308, 2020. doi: 10.1103/PhysRevB.102.075308. URL https://arxiv.org/abs/2005.12778

12. D. Arndt, W. Bangerth, B. Blais, T. C. Clevenger, M. Fehling, A. V. Grayver, T. Heister, L. Heltai, M. Kronbichler, P. Munch, M. Maier, J.-P. Pelteret, R. Rastak, B. Turcksin, Z. Wang, and D. Wells. The deal.II Library, Version 9.2. *Journal of Numerical Mathematics*, 28(3):131–146, 2020. doi: https://doi.org/10.1515/jnma-2020-0043

13. M. Maier, D. Margetis, and A. Mellet. Homogenization of Maxwell's equations in nonhomogeneous plasmonic structures. *Journal of Computational and Applied Mathematics*, 377, 2020. doi: 10.1016/j.cam.2020.112909. URL https://arxiv.org/abs/1805.07671

14. D. Margetis, M. Maier, T. Stauber, T. Low, and M. Luskin. Nonretarded edge plasmon-polaritons in anisotropic two-dimensional materials. *Journal of Physics A: Mathematical and Theoretical*, 53(5), 2020. doi: 10.1088/1751-8121/ab5ff9. URL https://arxiv.org/abs/1910.04840

15. D. Arndt, W. Bangerth, T. C. Clevenger, D. Davydov, M. Fehling, D. Garcia-Sanchez, G. Harper, T. Heister, L. Heltai, M. Kronbichler, R. M. Kynch, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The deal.II Library, Version 9.1. *Journal of Numerical Mathematics*, 27(4):203–213, 2019. doi: 10.1515/jnma-2019-0064

16. M. Maier, M. Mattheakis, E. Kaxiras, M. Luskin, and D. Margetis. Homogenization of plasmonic crystals: Seeking the epsilon-near-zero effect. *Proceedings of the Royal Society A: Mathematical, Physical, and Engineering Sciences*, 475, 2019. doi: 10.1098/rspa.2019.0220. URL `https://arxiv.org/abs/1809.08276`

* 17. J. H. Song, M. Maier, and M. Luskin. Adaptive finite element simulations of waveguide configurations involving parallel 2d material sheets. *Computer Methods in Applied Mechanics and Engineering*, 351:20–34, 2019. doi: 10.1016/j.cma.2019.03.039. URL `https://arxiv.org/abs/1809.06516`

18. G. Alzetta, D. Arndt, W. Bangerth, V. Boddu, B. Brands, D. Davydov, R. Gassmöller, T. Heister, L. Heltai, K. Kormann, M. Kronbichler, M. Maier, J.-P. Pelteret, B. Turcksin, and D. Wells. The deal.II Library, Version 9.0. *Journal of Numerical Mathematics*, 26(4): 173–184, 2018. doi: 10.1515/jnma-2018-0054

19. M. Maier, M. Mattheakis, E. Kaxiras, M. Luskin, and D. Margetis. Universal behavior of dispersive Dirac cone in gradient-index plasmonic metamaterials. *Physical Review B*, 97(3), 2018. doi: 10.1103/PhysRevB.97.035307. URL `https://arxiv.org/abs/1711.02210`

20. M. Maier and R. Rannacher. A duality-based optimization approach for model adaptivity in heterogeneous mutliscale problems. *SIAM Multiscale Modeling and Simulation*, 16(1): 412–428, 2018. doi: 10.1137/16M1105670. URL `http://arxiv.org/abs/1611.09437`

21. M. Maier, A. Nemilentsau, T. Low, and M. Luskin. Ultracompact amplitude modulator by coupling hyperbolic polaritons over a graphene-covered gap. *ACS Photonics*, 5(2):544–551, 2018. doi: 10.1021/acsphotonics.7b01094. URL `https://arxiv.org/abs/1709.06626`

22. M. Maier, D. Margetis, and M. Luskin. Generation of surface plasmon-polaritons by edge effects. *Communications in Mathematical Sciences*, 16(1):77–95, 2018. doi: 10.4310/CMS.2018.v16.n1.a4. URL `http://arxiv.org/abs/1702.00848`

23. D. Margetis, M. Maier, and M. Luskin. On the Wiener-Hopf method for surface plasmons: Diffraction from semi-infinite metamaterial sheet. *Studies in Applied Mathematics*, 139(4): 599–625, 2017. doi: 10.1111/sapm.12180. URL `http://arxiv.org/abs/1701.02784`

24. D. Arndt, W. Bangerth, D. Davydov, T. Heister, L. Heltai, M. Kronbichler, M. Maier, B. Turcksin, and D. Wells. The deal.II Library, Version 8.5. *Journal of Numerical Mathematics*, 25 (3):137–145, 2017. doi: 10.1515/jnma-2017-0058

25. M. Maier, D. Margetis, and M. Luskin. Dipole excitation of surface plasmon on a conducting sheet: finite element approximation and validation. *Journal of Computational Physics*, 339: 126–145, 2017. doi: 10.1016/j.jcp.2017.03.014. URL `http://arxiv.org/abs/1605.08456`

26. M. Maier and R. Rannacher. Duality-based adaptivity in finite element discretization of heterogeneous multiscale problems. *Journal of Numerical Mathematics*, 24(3):167–187, 2016. doi: 10.1515/jnma-2014-0074. URL `http://www-users.math.umn.edu/~msmaier/preprint-maierrannacher-jnma14.pdf`

27. M. Maier, M. Bardelloni, and L. Heltai. LinearOperator—a generic, high-level expression syntax for linear algebra. *Computers & Mathematics with Applications*, 72(1):1–24, 2016. doi: 10.1016/j.camwa.2016.04.024. URL `http://www-users.math.umn.edu/~msmaier/preprint-maierbardelloniheltai-camwa15.pdf`

28. W. Bangerth, D. Davydov, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, B. Turcksin, and D. Wells. The deal.II Library, Version 8.4. *Journal of Numerical Mathematics*, 24(3):135–141, 2016. doi: 10.1515/jnma-2016-1045

29. W. Bangerth, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, and B. Turcksin. The deal.II Library, Version 8.3. *Archive of Numerical Software*, 4, 2016. doi: 10.11588/ans.2016.100.23122

30. W. Bangerth, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, and B. Turcksin. The deal.II Library, Version 8.2. *Archive of Numerical Software*, 3, 2015. doi: 10.11588/ans.2015.100.18031

## Publications in conference proceedings (* with student)

* 31. M. Mattheakis, M. Maier, W. X. Boo, and E. Kaxiras. Graphene epsilon-near-zero plasmonic crystals. In *Proceedings of the Sixth Annual ACM International Conference on Nanoscale Computing and Communication*, NANOCOM '19, pages 2:1–2:6, 2019. doi: 10.1145/3345312.3345496. URL `https://arxiv.org/abs/1906.00018`

## Preprints, reports and software publications

32. I. Tomas, J. Shadid, M. Maier, and A. Salgado. Final report of activities for the LDRD-CIS project 226834 titled: Asymptotic preserving methods for fluid electron-fluid models in the large magnetic field limit with mathematically guaranteed properties. Technical report, Sandia National Laboratories, Albuquerque, NM, 2022

33. M. Bezbaruah and M. Maier. deal.II step-81: A time-harmonic Maxwell solver for lower-dimensional inclusions, 2022. URL `https://github.com/tamiko/step-81`

34. I. Tomas, J. Shadid, M. Crockatt, R. Pawlowski, M. Maier, and J.-L. Guermond. Final report of activities for the LDRD-express project 223796 titled: Fluid models of charged species transport: numerical methods with mathematically guaranteed properties. Technical report, Sandia National Laboratories, Albuquerque, NM, 2021

35. M. Maier and M. Kronbichler. Ryujin: High-performance second-order collocation-type finite-element scheme for solving the compressible euler equations of gas dynamics on unstructured meshes, 2020. URL `https://github.com/conservation-laws/ryujin`

36. M. Maier and I. Tomas. deal.II step-69: A first-order hydrodynamics code for the compressible Euler equations, 2020. URL `https://github.com/tamiko/step-69`

37. M. Maier. rspa-2019: Computational resources for "homogenization of plasmonic crystals: Seeking the epsilon-near-zero effect", 2020. URL `https://github.com/tamiko/rspa-2019`

38. M. Licht and M. Maier. Robust global and goal-oriented a posteriori error estimation for reaction-diffusion equations. 2017. URL `https://arxiv.org/abs/1707.09659`

39. M. Maier, M. Bardelloni, and L. Heltai. LinearOperator Benchmarks, Version 1.0.0, 2016

40. W. Bangerth, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, B. Turcksin, and T. D. Young. The deal.II Library, Version 8.1. 2013. URL `http://arxiv.org/abs/1312.2266v4`

41. W. Bangerth, T. Heister, L. Heltai, G. Kanschat, M. Kronbichler, M. Maier, B. Turcksin, and T. D. Young. The deal.II Library, Version 8.0. 2013. URL `http://arxiv.org/abs/1312.2266v3`

## Theses

42. M. Maier. *Duality-based adaptivity of model and discretization in multiscale finite-element methods*. Doctoral thesis, Heidelberg University, 2015

43. M. Maier. Simulation von Grenzschichtströmungen über Ribletstrukturen (simulation of boundary layer flow over riblet structures). Diplom thesis, Heidelberg University, 2011

## Service

I have reviewed articles for a number of journals (last 4 years): ACM Trans. Math. Softw. (three times); ACM Trans. Parallel Comput. (one time); Comput. Math. Appl. (two times); Comput. Methods Appl. Mech. Eng. (four times); J. Math. Anal. Appl. (one time); J. Open Source Softw. (one time); J. Opt. Soc. Am (two times); Numer. Math. (one time); SIAM J. Appl. Math. (two times); Stud. Appl. Math. (two times)

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|---|---|
| 11/2022 | Organizer (with D. Massatt) of Minisymposium *Advances in theory and computation of functional optical materials*, SIAM Texas-Louisiana Sectional Conference in Applied Mathematics, Houston, TX, USA |
| 2022 | Grant review panelist (two times), National Science Foundation |
| 7/2021 | Organizer (with J. Lin) of Minisymposium *Mathematical Theories and Computational Algorithms for Novel Optical Materials*, SIAM AN 2021, USA (online) |
| 3/2021 | Organizer (with P. Cazeaux) of Minisymposium *Frontiers in Material Modeling and Device Simulation: From Nano- to Meso-Scale*, SIAM CSE 2021, USA (online) |
| 2021 | Grant review panelist, National Science Foundation |
| 10/2020 | Organizer (with J.-L. Guermond and B. Popov) of Minisymposium *Structure preserving techniques for nonlinear conservation equations*, 3rd SIAM Texas-Louisiana Sectional Conference in Applied Mathematics, College Station, TX, USA (online) |
| 10/2020 | Organizer (with R. Lipton) of Minisymposium *Analytic and computational approaches for metamaterial and nanoscale optics*, 3rd SIAM Texas-Louisiana Sectional Conference in Applied Mathematics, College Station, TX, USA (online) |
| 10/2020 | Organizing Committee, 3rd SIAM Texas-Louisiana Sectional Conference in Applied Mathematics, College Station, TX, USA |
| 11/2013 – 06/2015 | Deputy member of the Diplom Examination Board, Ruprecht-Karls-Universität Heidelberg |
| 08/2013 | Organizing Committee, 4th deal.II Workshop, College Station, TX, USA |
| 08/2012 | Organizing Committee, 3rd deal.II Workshop, Heidelberg, Germany |

## Short courses, research stays and visits

01/2020 Visitor, *Workshop on Theory and Computation for 2D Materials*, IPAM, UCLA, Los Angeles, CA, USA, Jan 12 – Jan 21, 2020

05/2019 – 06/2019 Visitor, *IMA Workshop on Hydrodynamic Models for Transport in 2D Materials*, University of Minnesota, Minneapolis, MN, USA, May 06 - June 07, 2019

06/2017 Invited lecturer, *Advanced topics in *nix software development - toolchain, build systems and software testing*, Short course in the Master in High Performance Computing program, SISSA, Trieste, Italy

03/2014 Assistance and exercises, DAAD *Summer School on Numerical Methods with the Finite Element Method*, Universidad Nacional de Trujillo, Peru

## Outreach

02/2019 *Fractals*, K12 Math Club, Texas A&M University, College Station, TX, USA

10/2019 *Potential flow and why does an airplane fly?*, AMUSE Seminar, Texas A&M University, College Station, TX, USA

02/2019 *Finite element methods and adaptive strategies for multiscale problems*, Industrial and Applied Seminar, Texas A&M University, College Station, TX, USA

10/2016 *Finite element methods and adaptive strategies for multiscale problems*, AMS Student Chapter Seminar, University of Minnesota, Minneapolis, MN, USA

4/2016 *Potential flow and why does an airplane fly?*, Undergratue Math Club, University of Minnesota, Minneapolis, MN, USA

## Talks and presentations (last 4 years, * invited talk)

10/2022 *Structure-preserving finite-element schemes for the Euler-Poisson equations*, CAM Seminar, University of Tennessee, Knoxville, TN, USA *

10/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, CNLS Seminar, Los Alamos National Laboratory, USA *

09/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, GCEC Seminar, University of Glasgow, UK (online) *

09/2022 *Structure-preserving finite-element schemes for the Euler-Poisson equations*, AMS Sectional Meeting, El Paso, TX, USA *

08/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, Applied and Computational Math Seminar, University of Minnesota, Minneapolis, MN, USA *

07/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, Oberseminar Mathematische Strömungsmechanik, University of Würzburg, Würzburg, Germany *

07/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, IWR Scientific Computing Seminar, Heidelberg University, Heidelberg, Germany *

07/2022 *Robust and efficient approximation of the compressible Euler and Navier-Stokes equations*, IWR Scientific Computing Seminar, Heidelberg University, Heidelberg, Germany *

03/2022 *Efficient parallel 3d computation of the compressible Navier-Stokes equations*, Computational Math Seminar, Clemson University, SC, USA *

02/2022 *Optical Phenomena, Resonances, and Homogenization of Layered Heterostructures*, Oberseminar Numerische Mathematik, Bochum University, Bochum, Germany *

12/2021 *Efficient parallel 3d computation of the compressible Navier-Stokes equations*, Math Colloquium, University of Houston, TX, USA *

11/2021 *Optical Phenomena, Resonances, and Homogenization of Layered Heterostructures*, SIAM TX-LA Sectional Meeting 2021, South Padre Island, TX, USA *

05/2021 *Efficient parallel 3d computation of the compressible Navier-Stokes equations*, Oberseminar Mathematische Strömungsmechanik, University of Würzburg, Würzburg, Germany (online) *

04/2021 *Efficient parallel 3d computation of the compressible Navier-Stokes equations*, Seminar Special Topics in Numerics, Otto von Guricke University Magdeburg, Magdeburg, Germany (online) *

03/2021 *Optical Phenomena and Resonances in Layered Heterostructures*, SIAM CSE, Dallas, TX, USA (online)

02/2021 *Resonances in Homogenization of Layered Heterostructures*, DMS Applied Mathematics Seminar, Auburn University (online) *

10/2020 *Massively Parallel 3D Computation of the Compressible Euler Equations*, CLASS Seminar, Texas A&M University (online)

10/2020 *Finite-Element Computation Of The Conductivity Feedback Of Nanoscale Optical Devices*, SIAM TX-LA Sectional Meeting 2020 (online)

10/2020 *Massively Parallel 3D Computation of the Compressible Euler Equations With An Invariant-Domain Preserving Second-Order Finite-Element Scheme*, SIAM TX-LA Sectional Meeting 2020 (online)

09/2020 *Optical Phenomena and Resonances in the Homogenization of Layered Heterostructures*, Metamaterials 2020 (online) *

09/2020 *Finite-element computation of the conductivity feedback of nanoscale optical devices*, AMS Central Sectional Meeting (online) *

05/2020 *Parallelization of "stencil-based" methods*, deal.II Developer Hackathon, keynote (online)

05/2020 *Some comments on the 9.2.0 release*, deal.II Developer Hackathon (online)

01/2020 *2D plasmonic computation of layered heterostructures*, IPAM Workshop on Theory and Computation for 2D Materials, UCLA, Los Angeles, CA, USA *

11/2019 *Simulation of Optical Phenomena on 2D Material Devices*, CAAM Colloquium, Rice University, Houston, TX, USA *

11/2019 *Simulation of Optical Phenomena on 2D Material Devices*, Applied Analysis Seminar, Louisiana State University, Baton Rouge, LA, USA *

11/2019 *Simulation of Optical Phenomena on 2D Material Devices*, Applied Mathematics Seminar, Baylor University, Waco, TX, USA *

10/2019 *A Heterogeneous Multiscale Method for Optical Phenomena on Layered Heterostructures*, CCMA 2019, University of Nevada, Las Vegas, NV, USA

10/2019 *Simulation of Optical Phenomena on 2D Material Devices*, Analysis and Applied Mathematics Seminar, University of Illinois at Chicago, Chicago, IL, USA *

08/2019 *Some comments on deal.II packaging*, 7th deal.II Workshop, Fort Collins, CO, USA

07/2019 *Optical Phenomena on Layered Heterostructures*, ICIAM 2019, Valencia, Spain *

06/2019 *Duality-based model adaptivity for multiscale finite element methods*, MAFELAP 2019, London, UK *

06/2019 *A spectral decomposition approach for the conductivity response of a 2D electron fluid*, IMA Workshop on Hydrodynamic Models for Transport in 2D Materials, University of Minnesota, Minneapolis, MN, USA *

02/2019 *Optical phenomena on Layered Heterostructures*, SIAM CSE, Spokane, WA, USA *

10/2018 *Optical phenomena on Layered Heterostructures*, Modeling, Computation, Nonlinearity, Randomness and Waves Seminar, University of Arizona, Tucson, AZ, USA *

07/2018 *Simulation of an optical amplitude modulator involving metamaterials*, SIAM Mathematical Aspects of Materials Science, Portland, OR, USA *

07/2018 *Optical phenomena on Layered Heterostructures*, SIAM Mathematical Aspects of Materials Science, Portland, OR, USA *

04/2018 *Optical phenomena in layered 2D materials*, Applied and Computational Math Colloquium, University of Minnesota, Minneapolis, MN, USA *

01/2018 *Adaptive Finite Element Simulation of Surface Plasmon Polaritons on 2D Materials*, Math Colloquium, Texas A&M University, College Station, TX, USA *

## Graduate advising

*Currently serving on seven graduate committees at TAMU.*

Since 3/2022 Brett Caldwell, Texas A&M University; Master program (advisor)

Since 11/2021 Jordan Hoffart, Texas A&M University; Ph. D. program (advisor)

Since 09/2019 Manaswinee Bezbaruah, Texas A&M University; Ph. D. program (advisor)

09/2020 – 08/2021 Drew Macha, Texas A&M University; Distance Master program (advisor)

07/2015 – 06/2020 Jung Heon Song, University of Minnesota: *Surface plasmon polaritons in waveguide configurations*, Ph. D. program (co-advisor); now working for KLA Corporation

05/2013 – 05/2014 Niloufar Rahi, Ruprecht-Karls-Universität Heidelberg: *A Priori $L^\infty$-Error Estimation for FE-Galerkin Approximations of linear and non-linear elliptic Partial Differential Equations on Locally Refined Meshes*, Diplom thesis (co-advisor)

## Undergraduate advising and mentoring

01/2020 – 04/2020 Jack Dahlberg and Jordan Hoffart, Texas A&M University: *Numerical study of decay rates of the 1D Klein-Gordon equations*, co-advised with Jonas Lührmann, MATH 491 Undergraduate research project

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| 01/2020 – 04/2020 | Zhiyu Song, Texas A&M University: *Computation of propagating modes in 2D waveguide configurations*, MATH 491 Capstone project |
| 06/2018 – 08/2018 | Wei Xi Boo, University of Minnesota: *Computation of Dispersion Curves for Optical Phenomena in Layered Structures*, Undergraduate Research Opportunities Program stipend |
| 01/2018 – 05/2018 | Noah Wong, University of Minnesota: *Modeling and Simulation of Potential Flow*, Independent Study, B. S. program |
| 01/2017 – 05/2017 | Victor Wright, University of Minnesota: *Linear programming in operations research*, Independent Study, B. S. program |
| 09/2016 – 12/2016 | Evan Henke, University of Minnesota: *Monte-carlo simulation of optimal game strategies*, Independent Study, B. S. program |

## Teaching (Texas A&M University)

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| Fall 2022 | Numerical Partial Differential Equations (Math 610, 8 students)<br>○ Graduate level course covering introductory and advanced topics in numerical analysis of finite difference and finite element approximations of partial differential equations. |
| | Numerical Partial Differential Equations (Distance course, Math 610, 4 students) |
| Fall 2021 | Numerical Partial Differential Equations (Math 610, 14 students) |
| | Principles of Numerical Analysis (Math 437, 18 students)<br>○ Upper-division undergraduate-level course covering introductory topics centered around mathematical principles of numerical analysis and their application to the study of particular methods. |
| Spring 2021 | Finite Element Methods in Scientific Computing (Math 676, 8 students)<br>○ Pioneering project-based graduate level course highlighting practical aspects of the finite element method and scientific software development. |
| Fall 2020 | Numerical Partial Differential Equations (Math 610, 6 students) |
| Spring 2020 | Iterative Methods (Distance course, Math 639, 5 students)<br>○ Graduate level course covering development and analysis of iterative methods applied to the solution of large sparse systems of linear equations. |
| Fall 2019 | Numerical Partial Differential Equations (Math 610, 6 students) |
| Spring 2019 | Finite Element Methods in Scientific Computing (Math 676, 12 students) |
| Fall 2018 | Mathematical Modeling (Math 442, 25 students)<br>○ Upper-division undergraduate-level course covering introductory topics in mathematical models based on optimization, dynamical systems and probability theory. |

## Teaching (University of Minnesota)

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| Spring 2018 & Fall 2017 | Introduction to Numerical Methods (Math 5485 & 5486, 37 students)<br>○ Upper-division undergraduate-level course sequence covering introductory topics in numerical methods about numerical integration, nonlinear equations, systems of linear equations, ordinary and partial differential equations. |

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| Spring 2017 & Fall 2016 | Numerical Analysis and Scientific Computing (Math 8441 & 8442, 10 students)<br>○ Graduate level course sequence covering introductory and advanced topics in numerical analysis and scientific computing about approximation theory, optimization problems, ordinary and partial differential equations. |
| Spring 2016 | Mathematical Modeling (Math 4428, 30 students)<br>○ Upper-division undergraduate-level course covering introductory topics in mathematical models based on optimization, dynamical systems and probability theory. |
| Fall 2015 | Differential Equations and Linear Algebra (Math 2243, 178 students)<br>○ Introductory undergraduate-level course about linear algebra and ordinary differential equations. |