Curriculum Vitae

Sanghyun Lee

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EMPLOYMENT

Aug. 2023 -	**Associate Professor**, *Department of Mathematics*, Florida State University, Tallahassee, Florida, USA
Aug. 2017 -	**Assistant Professor**, *Department of Mathematics*, Florida State University, Tallahassee, Florida, USA
	Associate, *Geophysical Fluid Dynamics Institute*, Florida State University, Tallahassee, Florida, USA

RESEARCH EXPERIENCES

Summer 2022	**J.T. Oden Visitors Program**, *The Center for Subsurface Modeling, The Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin*
Summer 2019	**J.T. Oden Visitors Program**, *The Center for Subsurface Modeling, The Oden Institute for Computational Engineering and Sciences, The University of Texas at Austin*
Apr. 2016 - Aug. 2017	**Research Associate**, *The Center for Subsurface Modeling*, The Institute for Computational Engineering and Sciences (ICES), The University of Texas at Austin, USA
Sep. 2014 - Mar. 2016	**Postdoctoral Fellow**, *The Center for Subsurface Modeling*, (Director: Mary F. Wheeler), The Institute for Computational Engineering and Sciences (ICES), The University of Texas at Austin, USA
Sep. 2010 - Aug. 2014	**Research Assistant**, *Department of Mathematics*, (Research advisor: Andrea Bonito), Texas A&M University, USA
Dec. 2012 & Dec. 2013	**Visiting Researcher**, *High Speed Fluids Imaging Lab (Sigurdur Thoroddsen)*, Mechanical Engineering, KAUST, Saudi Arabia, Experimental studies for the Kaye Effect (Link)

EDUCATION

Aug. 2014	**Ph.D. in Mathematics** Department of Mathematics, Texas A&M University, Texas, USA Dissertation : 'Numerical Simulations of the Bouncing Jets'
Mar. 2002 - Feb. 2008	**Bachelor in Mathematics** Department of Mathematics, Sogang University, Seoul, Korea **Bachelor in Computer Science** Department of Computer Science, Sogang University, Seoul, Korea

RESEARCH INTERESTS

- Design, analysis and implementation of numerical methods for partial differential equations in engineering and applied physical science.

- Computational mathematics with high-performance computing in the area of interdisciplinary multiphysics and multiscale real-world problems
- Free boundary multiphase problems employing projection methods for Navier Stokes systems and level set methods with adaptive finite element methods. Link
- Big data analytics, neural networks, and physics-informed machine learning for advanced computational approaches for solving applications in the subsurface.
- Analyses and computations of newly developed 'enriched Galerkin' approximation methods for coupling flow and transport for complex fluid in porous media.

Contracts and Grants

2024	**NSF DCL Supplemental Award DMS- 2208402**, PI: Sanghyun Lee, Co-PI J. White (Lawrence Livermore National Lab); *Non-Academic Research Internships for Graduate Students in Geothermal Energy Supplemental Funding Opportunity (Geothermal INTERN)*; FSU budget $41,334
2023-2026	**DOE Science Foundations for the Energy Earthshots**, PI: S. Yi (University of Texas at El Paso), Co-PIs: Sanghyun Lee, F. Bao (Florida State University), P. Newell (University of Utah), H. Yoon (Sandia National Lab), J. Kubicki (University of Texas at El Paso); *Advanced Multi-Physics Machine Learning for Subsurface Energy Systems Across Scales*; Total budget $4.9 million, FSU budget $0.85 million
2023	**NSF DCL Supplemental Award DMS- 2208402**, PI: Sanghyun Lee, Co-PI (H. Yoon, Sandia National Lab); *Non-Academic Research Internships for Graduate Students in Geothermal Energy Supplemental Funding Opportunity (Geothermal INTERN)*; FSU budget $41,284
2022 - 2025	**NSF Award DMS- 2208402** (Computational Mathematics), PI: Sanghyun Lee, *Collaborative Research: Physics-preserving adaptive finite element methods for thermo-poroelasticity*; FSU budget $240,220
2020 - 2021	**MDS::#045490** (The Multidisciplinary Support) PI: H. Chung (Florida State University) Co-PI: Sanghyun Lee, *Studies for Degradation of Lignin-based Biodegradable Plastics to Prevent Marine Debris*; FSU budget $25,000
2019 - 2022	**NSF Award DMS-1913016** (Computational Mathematics), PI: Sanghyun Lee, *Fluid-filled Fracture Propagation with a Phase Field Approach in Subsurface by Employing Nonlinear Strain Limiting Models and Enriched Galerkin Methods*; FSU budget $100,000
2018	**CRC::041950** (First Year Assistant Professor Award) Florida State University, PI: Sanghyun Lee, *Optimal error estimate of flow problems with Dirac sources in the subsurface for discontinuous and enriched Galerkin methods*

Scholarships and Awards

Fall 2019	The Funding Agency Travel (FAT) program, Florida State University
Spring 2019	Provost's Travel Award, Florida State University
Fall 2018	Dean's Travel Award, Florida State University
Summer 2018	The First Year Assistant Professor (FYAP) Award, Florida State University
June 2015	SIAM Travel Award
June 2013	Innovation Award for "the Kaye Effect"; Institute for Applied Mathematics and Computational Science (IAMCS-TAMU).
Feb 2012	Institute for Applied Mathematics and Computational Science (IAMCS-TAMU)-KAUST Graduate Fellow.
2010	Houston A&M Mother's Club Outstanding TA Award.

━━━━━━━ PUBLICATIONS

57. Hemanta Kunwar, Sanghyun Lee, Son-Young Yi*, Non-intrusive global-local method for poroelasticity problems with localized pressure effects. , submitted 2025

56. Jihoon Kim*, Sanghyun Lee, Mary Wheeler Stability analysis of the fixed stress schemes in poroelastodynamics, submitted 2025

55. Ryuou Hu, Sanjeeb Poudel, Feng Bao, Sanghyun Lee* Ensemble Score Filter for Data Assimilation of Two-Phase Flow Models in Porous Media, submitted 2025

54. Seungmin Lee, Sanghyun Lee* Convergence and Numerical Simulations of the Continuous Data Assimilation for Biot's Poroelasticity System, submitted 2025

53. Dabin Park, Sanghyun Lee, Sunghwan Moon* A Machine Learning and Finite Element Framework for Inverse Elliptic PDEs via Dirichlet-to-Neumann Mapping, submitted 2025

52. Hyun-Geun Shin, Yi-Yung Yang, Sanghyun Lee* A Posteriori Error Estimation for Parabolic Equations with Enriched Galerkin Finite Element Methods, submitted 2025

51. Dmitri Kuzmin, Sanghyun Lee*, Yi-Yung Yang, Bound-preserving and entropy stable enriched Galerkin methods for nonlinear hyperbolic equations, submitted 2024

50. Sanghyun Lee*, Mary F. Wheeler, Thomas Wick, A phase-field diffraction model for thermo-hydro-mechanical propagating fractures, Volume 239, April 2025, 126487, International Journal of Heat and Mass Transfer

49. Sanghyun Lee, Henry von Wahl*, Thomas Wick, A thermo-flow-mechanics-fracture model employing a high-accuracy phase-field interface approach, International Journal for Numerical Methods in Engineering, 2025

48. SeongHee Jeong*, Sanghyun Lee, Optimal Control for Darcy's flow in a heterogeneous porous media, , Applied Numerical Mathematics, Volume 207 , January 2025, Pages 303-3222

47. Sanjeeb Poudel*, Xiaoqiang Wang, Sanghyun Lee A novel technique for minimizing energy functional using neural networks, Volume 133, Part D, July 2024, 108313, Engineering Applications of Artificial Intelligence

46. S. Lee, Y. Shin* ; On the training and generalization of deep operator networks, SIAM Journal on Scientific Computing, Vol. 46, Iss. 4 2024

45. F. Ballarin*, S. Lee, S. Yi ; Projection-based reduced order modeling of an iterative coupling scheme for thermo-poroelasticity, Results in Applied Mathematics Volume 21, February 2024, 100430

44. Yifan Dai, Bing Hou*, Sanghyun Lee, Thomas Wick ; A thermal-hydraulic-mechanical-chemical coupling model for acid fracture propagation based on a phase-field method, Rock Mechanics and Rock Engineering , 10.1007/s00603-024-03769-x, 2024

43. S-Y Yi, S.Lee*; Physics-preserving enriched Galerkin method for a fully-coupled thermo-poroelasticity model, Numeriche Mathmatik. 156, 949–978 (2024). https://doi.org/10.1007/s00211-024-01406-x

42. S.Lee, S-Y Yi*; Locking-Free and Locally Conservative Enriched Galerkin Method for Poroelasticity, Journal of Scientific Computing, volume 94, Article number: 26, 2023

41. S-Y Yi, X. Ju, S. Lee*, J. Adler, L. Zikatanov; An Enriched Galerkin Method for the Stokes Equations, Computers & Mathematics with Applications, Volume 120, 15 August 2022, Pages 115-131

40. T. Kadeethum, D. O'Malley, F. Ballarin, I. Ang, J. N. Fuhg, N. Bouklas, V. L. S. Silva, P. Salinas, C. E. Heaney, C. C. Pain, S. Lee, Hari S. Viswanathan, H. Yoon, Scientific Reports 12 (1), 1-15, 2022

39. B. Hou, Y. Dai, M. Fan, K. Zhang, T. Wick, S. Lee Numerical simulation of pores connection by acid fracturing based on phase field method, Acta Petrolei Sinica, 2022, 43(6), pp. 849-859

38. S. Lee*, H.M. Nick, T. Kadeethum; Choice of interior penalty coefficient for interior penalty discontinuous Galerkin method for Biot's system by employing neural network and machine learning, submitted, arXiv:2007.10119, 2021

37. S.Lee*, T. Kadeethum. Physics-Informed Neural Networks for solving coupled flow and transport system, AAAI 2021, vol2964, 2021

36. S-Y Yi*, S. Lee, L. Zikatanov Locking-free enriched Galerkin method for linear elasticity, 60:1, 52-75, SIAM Numerical Analysis, 2021

35. T. Kadeethum*, S.Lee, F. Ballarin, J. Choo, H.M. Nick A Locally Conservative Finite Element Framework for Coupled Hydro-Mechanical-Chemical Processes in Heterogeneous Porous Media, Computers & Geosciences 152, 104774, 2021

34. T. Kadeethum*, H.M. Nick, S. Lee, F. Ballarin; Enriched Galerkin discretization for modeling poroelasticity and permeability alteration in heterogeneous porous media, Journal of Computational Physics, Volume 427, 2021

33. Yoon, H.C., Lee, S. and Mallikarjunaiah, S.M., Quasi-static anti-plane shear crack propagation in nonlinear strain-limiting elastic solids using phase-field approach. International Journal of Fracture, pp.1-20, 2021

32. S. Lee, S.M. Mallikarjunaiah, H. Yoon* Finite element simulation of quasi-static tensile fracture in nonlinear strain-limiting solids with the phase-field approach, Journal of Computational and Applied Mathematics 399, 113715, 2021

31. M. F. Wheeler*, S. Lee Hydraulic Fracture Propagation Simulations in Porous Media with Natural Fractures by IPACS, 2020; Unconventional Resources Technology Conference, 20-22 July 2020. Unconventional Resources Technology Conference (URTeC)

30. A. Rupp, S.Lee* Continuous Galerkin and enriched Galerkin methods with arbitrary order discontinuous trial functions for the elliptic and parabolic problems with jump conditions, Journal of Scientific Computing 84 (1), 1-25, 2020

29. T. Kadeethum*, S. Lee, H.M. Nick Finite Element Solvers for Biot's Poroelasticity Equations in Porous Media, Mathematical Geosciences, 1-30, 2020

28. M.F. Wheeler, T. Wick*, S. Lee IPACS: Integrated Phase-Field Advanced Crack Propagation Simulator. An adaptive, parallel, physics-based-discretization phase-field framework for fracture propagation in porous media, Computer Methods in Applied Mechanics and Engineering 367, 113124, 2020

27. T. Kadeethum*, H.M. Nick, S. Lee, F. Ballarin; Flow in Porous Media with Low Dimensional Fractures by Employing Enriched Galerkin Method, Advances in Water Resources 142, 103620, 2020

26. S. Lee*, M.F. Wheeler; Modeling interactions of natural and two phase fluid filled fracture propagation in porous media, Computational Geosciences, 1-25 2020

25. T. Kadeethum*, H. M. Nick, and S. Lee; Comparison of Two- and Three-field Formulation Discretizations for Flow and Solid Deformation in Heterogeneous Porous Media, International Association for Mathematical Geosciences, 2019

24. T. Kadeethum*, H.M. Nick, S. Lee, C.N. Richardson, S. Salimzadeh, F. Ballarin; A Novel Enriched Galerkin Method for Modelling Coupled Flow and Mechanical Deformation in Heterogeneous Porous Media, American Rock Mechanics Association, 2019

23. Rencheng Dong*, M.F. Wheeler, S. Lee; Numerical Simulation of Matrix Acidizing in Fractured Carbonate Reservoirs Using Adaptive Enriched Galerkin Method, 2019, SPE 193830-MS, SPE Reservoir Simulation Conference 2019

22. M.F. Wheeler*, S. Srinivasan, S. Lee, M. Singh; Unconventional Reservoir Management Modeling Coupling Diffusive Zone/Phase Field Fracture Modeling and Fracture Probability Maps, 2019, SPE 193862-MS, SPE Reservoir Simulation Conference 2019

21. W. Choi, S. Lee*; Optimal error estimate of elliptic problems with Dirac sources for discontinuous and enriched Galerkin methods, 2019, Applied Numerical Mathematics, https://doi.org/10.1016/j.apnum.2019.09.010

20. S. Shiozawa*, S. Lee, M.F. Wheeler; The effect of stress boundary conditions on fluid-driven fracture propagation in porous media using a phase field modeling approach, International Journal for Numerical and Analytical Methods in Geomechanics, Volume43, Issue6 25 April 2019 Pages 1316-1340, https://doi.org/10.1002/nag.2899

19. J. Choo*, S. Lee; Enriched Galerkin Finite Element Method for Locally Mass Conservative Simulation of Coupled Hydromechanical Problems, 2018, Proceedings of China-Europe Conference on Geotechnical Engineering, Springer Nature Switzerland AG

18. S. Lee*, A. Mikelic, M. F. Wheeler, T. Wick; Phase-field modeling of two-phase fluid-filled fractures in a poroelastic medium, 2018, 16-4, pp. 1542-1580, https://doi.org/10.1137/17M1145239, SIAM Multiscale Modeling and Simulation

17. J.Choo*, S. Lee; Enriched Galerkin finite elements for coupled poromechanics with local mass conservation, November 2018, Volume 341, Pages 311-332 Computer Methods in Applied Mechanics and Engineering, doi:10.1016/j.cma.2018.06.022

16. S. Lee*, M. F. Wheeler; Enriched Galerkin approximations for two phase flow in porous media with capillary pressure, Journal of Computational Physics, Volume 367, 15 August 2018, Pages 65-86, doi:10.1016/j.jcp.2018.03.031

15. S. Lee, B. Min*, , M. F. Wheeler; Optimal hydraulic fracturing design using the phase field model coupled with global-objective genetic algorithm, 2018, Computational Geosciences, doi:10.1007/s10596-018-9728-6

14. T. Almani, S. Lee*, M. F. Wheeler, T. Wick; Multirate Coupling for Flow and Geomechanics Applied to Hydraulic Fracturing Using an Adaptive Phase-Field Technique, SPE-182610-MS, SPE Reservoir Simulation Conference 2017, doi:10.2118/182610-MS

13. G. Scovazzi*, M.F. Wheeler, A. Mikelić, S. Lee, Analytical and variational numerical methods for unstable miscible displacement flows in porous media, Journal of Computational Physics, Volume 335, 15 April 2017, Pages 444-496, doi:10.1016/j.jcp.2017.01.021

12. S. Lee*, M.F. Wheeler; An adaptive enriched Galerkin method for miscible displacement and viscous fingering problems with entropy residual stabilization, Journal of Computational Physics, Volume 331, 15 February 2017, Pages 19-37, doi:10.1016/j.jcp.2016.10.072

11. S. Lee*, M.F. Wheeler, T. Wick; Iterative coupling of flow, geomechanics and adaptive phase-field fracture including a level-set crack width approach, Journal of Computational and Applied Mathematics. Volume 314, April 2017, Pages 40-60, doi: 10.1016/j.cam.2016.10.022

10. S. Lee , J.E. Reber* , M.F. Wheeler, N.W. Hayman; Investigation of wing crack formation with a combined phase-field and experimental approach, Geophysical Research Letters, 43, 2016, doi:10.1002/2016GL069979

9. S. Lee*, A.J. Salgado; Stability analysis of pressure correction schemes for the Navier-Stokes equations with traction boundary conditions, Computer Methods in Applied Mechanics and Engineering, Volume 309, 2016, Pages 307-324, doi: 10.1016/j.cma.2016.05.043

8. S. Lee, M.F.Wheeler*, T.Wick, S.Srinivasan; Initialization of phase-field fracture propagation in porous media using probability maps of fracture networks, Mechanics Research Communications, Volume 80, March 2017, Pages 16-23, doi:10.1016/j.mechrescom.2016.04.002

7. S. Lee*, Y-J Lee, M.F.Wheeler,; A Locally Conservative Enriched Galerkin Approximation and Efficient Solver For Elliptic and Parabolic Problems, SIAM Journal on Scientific Computing, 2016, 38(3), A1404-A1429. doi: 10.1137/15M1041109

6. S. Lee, A.Mikelić, M.F.Wheeler*, T.Wick; Phase-field modeling of a proppant-filled fracture in a poroelastic medium, Computer Methods in Applied Mechanics and Engineering, 2016, Volume 312, Pages 509 - 541, Phase Field Approaches to Fracture doi : 10.1016/j.cma.2016.02.008

5. S. Lee*, M.F.Wheeler, T.Wick; Pressure and fluid-driven fracture propagation in porous media using an adaptive finite element phase field model, Computer Methods in Applied Mechanics and Engineering, 2016, Volume 305, 15 June 2016, Pages 111-132, doi:10.1016/j.cma.2016.02.037

4. A. Bonito*, J.-L. Guermond, S. Lee; Numerical simulations of bouncing jets, International Journal for Numerical Methods in Fluids, 2016, 80: 53-75. doi: 10.1002/fld.4071

3. T.Wick*, S. Lee, M.F.Wheeler; 3D Phase-field for pressurized fracture propagation in heterogeneous media, VI International Conference on Computational Methods for Coupled Problems in Science and Engineering 2015 Proceedings;

2. A.Bonito*, J-L.Guermond, S.Lee; Modified Pressure-Correction Projection Methods: Open Boundary and Variable Time Stepping, Numerical Mathematics and Advanced Applications - ENUMATH 2013, Lecture Notes in Computational Science and Engineering, 103, 623–631, 2015.

1. S. Lee, E.Q. Li, J.O. Martson, A.Bonito, S.T. Thoroddsen*; Leaping shampoo glides on a lubricating layer, Phys. Rev. E 87, 061001(R) (2013), doi: 10.1103/PhysRevE.87.061001

0. S. Lee. Numerical Simulations of the Bouncing Jets, PhD Thesis, Texas A&M University, 2014

Invited Seminar and Colloquium Talks

38 Lecture Series, Department of Mathematics, Kyungpook National University, South Korea, Sep 25th-26th 2024

37 Applied Math Seminar, Institute of Applied Mathematics Leibniz University Hannover, Germany, May 16th 2024

36 Seminar, Institut fur Baumechanik und Numerische Mechanik (IBNM) Leibniz University Hannover, Germany, May 15th 2024

35   Applied Math Seminar, Department of Mathematics, Technical University Dortmund, Germany, May 14th 2024

34   Machine Learning Seminar, Department of Mathematics, Florida State University, USA, Apr 12th, 2024

33   Applied Math Seminar, Department of Mathematics, University of Georgia, Oct 24th, 2023

32   Numerical Analysis Seminar, Department of Mathematics, Texas A&M University, Oct 18th, 2023

31   Applied Mathematics and Computation Seminars, Department of Mathematics, Oregon State University, Sep 29, 2023

30   Colloquium, Department of Scientific Computing, FSU, Sep 27, 2023

29   Colloquium, Department of Mechanical Engineering, College of Engineering, FAMU-FSU, Nov, 2022

28   Applied Math Seminar Talk, Texas A&M University at Corpus Cristi, online, Feb, 2022

27   BK Applied Math Seminar Talk, Sungkyunkwan University, online, Jan, 2022

26   Applied Math Seminar Talk, Michigan Tech University, online, Oct, 2021

25   Applied Math Seminar Talk, Kyungpook University, Daegu, South Korea, June, 2021

24   Energy Systems Laboratory, Ewha Womans University, Seoul, South Korea, June, 2021

23   Seminar Talk, Korean Institute of Geoscience and Mineral Resources, Daejun, South Korea, June, 2021

22   Applied Math Seminar Talk, Sungkyunkwan University, Suwon, South Korea, June, 2021

21   Applied Math Seminar Talk, Seoul National University, Seoul, South Korea, June, 2021

20   Department of Earth Science and Engineering Seminar Talk, Division of Physical Science and Engineering, King Abdullah University of Science and Technology, Saudi Arabia, Jan 27, 2020

19   Department of Mathematics, Numerical Applied Math Seminar Talk, Auburn University, Alabama, USA, Sep 20, 2019

18   J.T. Oden Faculty Fellow Visiting Researcher, the Center for Subsurface Modeling (Mary F. Wheeler), the University of Texas at Austin, 15-28 July 2019

17   Geotech/Structure Seminar Series, the University of Central Florida, Orlando, Florida, 27-28 Feb 2019

16   Seminar Series, Department of Scientific Computing, FSU, Nov 15, 2017

15   Seminar Series, Department of Mechanical Engineering, FSU-FAMU, Oct 3, 2017

14   Colloquium Series, Department of Mathematics, Baylor University, Feb 2, 2017

13   Colloquium Series, Department of Mathematical Sciences, Montclair State University, Jan 29, 2017

12   Colloquium Series, Department of Mathematics, Florida State University, Jan 13, 2017

11   Colloquium Series, Department of Mathematical Sciences, The University of Texas at El Paso, Sep 30, 2016

10   Graduate Seminar Colloquium, Department of Petroleum and Geosystems Engineering, The University of Texas at Austin, Sep 12, 2016

9   Math Seminar, Department of Mathematics, Changwon National University, Changwon, South Korea, July 1, 2016

8   Math Seminar, Department of Mathematics, POSTECH (Pohang University of Science and Technology), Pohang, South Korea, June 30, 2016

7   Math Seminar, Department of Mathematics, Seoul National University, Seoul, South Korea, June 28, 2016

6   Math Seminar, UNIST (Ulsan National Institute of Science and Technology), Ulsan, South Korea, June 27, 2016

5   Seminar, Department of Computational Science & Engineering, Yonsei University, Seoul, South Korea, June 22, 2016

4   Applied Math Seminar, Department of Mathematics, Sogang University, Seoul, South Korea, June 21, 2016

3   Discrete Math Seminar, Texas State University, San Marcos, USA, Nov 13, 2015

2   Differential Equations and Applied Math Seminar, Texas State University, San Marcos, Texas, USA, Apr 24, 2015

1   Computational and Applied Math Seminar, The University of Tennessee, Knoxville, USA, Apr 8, 2015

PRESENTATIONS AT CONFERENCES AND WORKSHOPS

2025   **SIAM Conference on Mathematical & Computational Issues in the Geosciences**, Oct 14-17 2025, Baton Rouge, Louisiana, USA

2025   **8th Biot Conference on Poromechanics**, Oct 7-10 2025, Salt Lake City, Utah, USA

2025   **Texas-Louisiana Section of SIAM 8th Annual Meeting**, Sep 26-28 2025, Austin, Texas

2025   **Modeling and Simulation of Transport Phenomena**, July 27-31 2025, Moselle Valley, Germany

2025   **17th Annual International Conference on Porous Media**, May 19-22 2025, Albuquerque, New Mexico, USA.

2025   **DOE EarthShot PI Meeting**, May 15-16 2025, The University of Texas at El Paso, El Paso, Texas

2025   **NSF Computational Math Meeting**, May 8-9 2025, The University of Utah, Utah

2024   **SIAM Conference on Mathematics of Data Science**, Oct 21-25 2024, Atlanta, Georgia

2024   **The 11th deal.II Workshop**, Aug 11-16 2024, Colorado State University, Fort Collins, Colorado

2024   **WCCM 2024**, July 21-26 2024, Vancouver, British Columbia, Canada

2024   **NSF PI meeting**, July 15-16 2024, Seattle, Washington

2024   **SIAM Annual Meeting**, July 8-12 2024, Spokane, Washington

2024   **The Eleventh Graduate Student Conference**, Apr 20-21 2024, Clemson University

2024   **Southeast Applied and Computational Math Student Workshop**, Apr 5-7 2024, Georgia Institute of Technology, Atlanta, GA

2024   **AMS Spring Southeastern Sectional Meeting**, March 23-24, 2024, Florida State University, Tallahassee, FL

2024 **Affiliates Meeting, The Center for Subsurface Modeling,**, March 21, 2024, The University of Texas at Austin, Austin, TX

2024 **ICERM Numerical Analysis of Multiphysics Problems**, Feburary 12-16, 2024, Brown University

2023 **The 41st Southeastern-Atlantic Regional Conference on Differential Equations**, November 18-19, 2023, Florida A&M University

2023 **The Spring 2023 Finite Element Circus**, 20-21st Oct 2023, The Univeristy of Notre Dame, Indiana

2023 **SIAM Conference on Mathematical & Computational Issues in the Geosciences**, *Organized a minisymposium and Presented a talk*, 19-22nd Jun 2023, Bergen, Norway

2023 **Florida-Georgia Applied and Computational Math Student Workshop**, *Invited as Plenary Speaker*, Apr 1st-2nd, Florida State University, USA

2023 **Spring Southeastern Sectional Meeting**, *Invited at the minisymposium*, Mar 18th-19th, Georgia Tech University, USA

2022 **SIAM Conference on Mathematics of Data Science**, *Invited at the Minisymposium : MS98 Machine Learning in Numerical PDEs and Their Applications*, Sep 26th-30th, San Diego, USA

2022 **Florida Fluids Symposium**, *Invited speaker in a session*, Computational Method, May 7

2022 **ICCMAE 2022: The Second International Conference on Computational Methods and Applications in Engineering**, *Invited speaker in a minisymposium*, May 7 - May 8 2022, Video online talk

2021 **13th International Conference on Large-Scale scientific computations**, *Invited speaker in a minisymposium (Robust Iterative Solution Methods for Coupled Problems in Poromechanics)* , June 7- June 11 2021, Video online conference

2021 **Interpore 2021**, *Invited speaker in a minisymposium (Mathematical and computational challenges related to porous media - Special session in memory of Andro Mikelic (invitation only))* , May 31- June 4 2021, Video online conference

2021 **The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21)- Combining Artificial Intelligence and Machine Learning with Physics Sciences**, *Organizing committee and presenting a talk*, Mar 23-25 2021, Video Conference

2020 **The 44th SIAM Southeastern Atlantic Section Conference**, *Organized a minisymposium and presenting a talk : Mini-Symposium 13 (MS13): Recent Development of Coupled Problems with Advanced Physics Based Numerical Methods*, Mar 2020, Auburn University, USA, *delayed due to Covid-19 pandemic*

2020 **WCCM & ECCOMAS Congress 2020**, *Nonlinear strain limiting fracture propagation*, July 19-24 2020, Paris, France *Video online conference*

2020 **Computational Methods in Water Resources XXIII (CMWR)**, *Physics Informed Neural Network for coupled flow and transport*, June 21-25 2020, Stanford University, CA, USA, *Video online conference*

2020 **The Center for Subsurface Modeling Annual Industrial Affiliates Meeting**, *Invited Speaker*, Mar 3-4 2020, Institute for Computational Engineering and Sciences, The University of Texas at Austin Austin, TX, USA

2019 **The 20th Annual Conference of the International Association for Mathematical Geosciences (IAMG)**, *Organized a minisymposium : Coupling geomechanics and flow systems in subsurface applications*, Aug 2019, Pennsylvania, USA

2019   **The US National Congress on Computational Mechanics (USNCCM)**, *Presented a talk in Advances in Computational Methods for Subsurface Modeling: In Honor of Professor Mary F. Wheeler*, Aug 2019, Austin, Texas, USA

2019   **Finite Elements in Fluids**, *Organized a minisymposium : Additive Manufacturuing and Digital Rock Physics for Granular and Fractured Materials*, Apr 2019, Chicago, IL, USA

2019   **SIAM Conference on Mathematical & Computational Issues in the Geosciences**, *Organized a minisymposium I : Recent advances in computational modeling of coupled flow and geomechanics in the subsurface environment*, Mar 2019, Houston, TX, USA

2019   **SIAM Conference on Mathematical & Computational Issues in the Geosciences**, *Organized a minisymposium II : Scalable methods for coupling water resources modeling and parameter estimation*, Mar 2019, Houston, TX, USA

2018   **AGU Fall Meeting 2018**, *T31F: Numerical and Laboratory Analogue Models of Dykes, Sills, and Hydraulic Fractures* , Dec 2018, Washington D.C, USA

2018   **Hydraulic Fracturing: Modeling, Simulation, and Experiment (18w5085)**, *Invited speaker (Phase field modeling for fracture propagation in porous medium)*, Jun 3-8 2018, BIRS (Banff International Research Station)

2018   **The Center for Subsurface Modeling Annual Industrial Affiliates Meeting 2018**, Apr 11-12 2018, Institute for Computational Engineering and Sciences, The University of Texas at Austin Austin, TX, USA

2018   **Finite Element Rodeo 2018**, *presented a talk; "Enriched Galerkin Approximation for Coupled Systems"*, Feb 23-24 2018, LSU, Baton Rouge, Louisiana, USA.

2017   **Finite Element Circus 2017**, *presented a talk; "Enriched Galerkin Approximation for Flow and Transport"*, Oct 20-21 2017, UMBC, Baltimore, Maryland, USA.

2017   **SIAM Conference on Mathematical and Computational Issues in the Geosciences**, *Mini-Symposium: Coupled Geomechanics and Flow Systems in Porous Media*, September 11-14, 2017, Erlangen, Germany
"Phase-Field Modeling for Fracture Propagation in Porous Media and its applications"

2017   **14th U.S. National Congress on Computational Mechanics**, *507 - Phase-field Modeling and Simulation in Fluids, Solids and Biomechanics*, July 17-20, 2017, Palais des Congres de Montreal, QC, Canada
"Hydraulic Fracturing in Porous Media using Phase Field Approach"

2017   **Analog Modeling of Tectonic Processes**, *presented a poster*, May 17 - 19 2017, Bureau of Economic Geology, The University of Texas at Austin, USA

2017   **Institute for Pure and Applied Mathematics (IPAM): Computational Issues in Oil Field Applications**, *Invited speaker in Workshop I: Multiphysics, Multiscale, and Coupled Problems in Subsurface Physics*, Apr 3 - 7 2017, UCLA, California, USA

2017   **Advances in Computational Sciences and Engineering: A conference in honor of the 80th birthday of Prof. J. Tinsley Oden**, *Presented a poster*, Mar 20-21, 2017, University of Texas at Austin, USA

2017   **SIAM Conference on Computational Science and Engineering** , *Invited to the MiniSymposium : 'Computational Poromechanics'* , Feb 27- Mar 3, 2017, Atlanta, Georgia, USA

2017   **SPE Reservoir Simulation Conference 2017**, *talk: SPE-182610-MS Multirate Coupling for Flow and Geomechanics Applied to Hydraulic Fracturing Using an Adaptive Phase-Field Technique*, Feb 20-22, 2017, Montogomery, Texas, USA

2016   **The Mathematics of Finite Elements and Applications (MAFELAP) 2016**, *Invited to the mini symposia 'Numerical Methods for Flow and Fractures in Subsurface Modeling'*, June 14-17 2016, Brunel University, London

2016   **Finite Element Rodeo 2016**, *presented a talk; "Enriched Galerkin Approximation for Hydraulic Fracture Propagation"*, Mar 4-5 2016, Texas A&M University, USA

2016   **EFRC-CFSES DOE Review Meeting**, *presented a talk; "Pressure and fluid-driven fracture propagation in porous media using an adaptive finite element phase field model"*, Mar 3 2016, Gaithersburg Marriott Washingtonian Center, Gaithersburg, MD USA

2016   **UT- Third Carbon Capture and Sequestion DOE CFSES Annual Meeting**, *presented a talk; "Pressure and fluid-driven fracture propagation in porous media using an adaptive finite element phase field model"*, Feb 17-18 2016, University of Texas at Austin, USA

2015   **25th CSM Annual Industrial Affiliates Meeting 2015**, *presented a talk; "Phase field modeling for fluid filled fractures in porous media"*, Nov 3-4 2015, AT&T Conference Center, University of Texas at Austin, USA

2015   **2015 Department of Energy (DOE) Carbon Storage RD Project Review Meeting**, *Poster: Fracture Propagation in Porous Media using Phase Field Model*, August 18-20, 2015, Sheraton Station Square Hotel, Pittsburgh, USA

2015   **USACM's 13th U.S. National Congress on Computational Mechanics (USNCCM13)**, *presented a talk; "3D Phase field modeling for fluid filled fracture propagation" in the mini symposia: Phase Field Methods for Moving Interfaces in Physics and Biology;* , July 26-30, 2015, San Diego, California, USA

2015   **SIAM Conference on Mathematical and Computational Issues in the Geosciences**, *presented a talk; "Phase field modeling for fracture propagation", in the minisymposium 'Fluid-rock interactions in fractured media'*, June 29 - July 2, 2015, Stanford University, California USA

2015   **Hydraulic Fracturing: From Modeling and Simulation to Reconstruction and Characterization**, *Poster: "3D Fracture Propagation using Phase Field"*, May 11 - 14, 2015, IMA, Minnesota, USA

2015   **Advanced Numerical Methods in the Mathematical Sciences**, *Poster: "3D Fracture Propagation using Phase Field"*, May 4-8, 2015, Texas A&M University, College Station, Texas, USA

2015   **DOE Center for Frontiers of Subsurface Energy Security (CFSES) Annual Meeting**, *Poster: "Fracture with Gel and Phase Field Model"*, Apr 9-10 2015, University of Texas at Austin

2015   **Finite Element Rodeo 2015**, *presented a talk; "Fluid Filled Fracture Propagation"*, Feb 27-28 2015, Southern Methodist University, Dallas, Texas, USA

2014   **24th CSM Annual Industrial Affiliates Meeting 2014**, *presented a talk: "Phase Field Modeling for Fracture Propagation"*, Nov 17-18 2014, AT&T Conference Center, University of Texas at Austin

2014   **SIAM Annual Meeting 2014**, *presented a talk; "Numerical Investigations of Bouncing Jets", in the Mini Symposium 'Nonlinear Fluids'*, July 7-11 2014, The Palmer House,Chicago, Illinois USA

2014   **Finite Element Rodeo 2014**, *presented a talk: "Bouncing Jets"*, Feb.28-Mar.1 2014, University of Texas at Austin,USA

2013   **ENUMATH(European Numerical Mathematics and Advanced Applications) 2013**, *"Numerical Simulation of the Kaye effects"*, Minisymposia in Numerical methods for fluid flows with free boundaries and interfaces, Aug.26-30 2013; EPFL, Lausanne, Switzerland

2013   **4th deal.II Workshop**, *presented a talk: "Two Phase Flow with Free Boundary: Numerical Simulation of the Kaye effects"*, Aug.19-22 2013, Texas A&M University, USA

2013   **Finite Element Circus and Rodeo 2013**, *presented a talk: "Numerical Simulation of the Kaye effects"*, Mar.8-9 2013, Louisiana State University,USA

2012   **4th IAMCS Annual Spring Symposium**, *presented a talk; "Towards Numerical Simulation of Kaye Effect"*, May.5-6 2012, KAUST,Saudi Arabia

2012   **Finite Element Rodeo 2012**, *presented a talk: "Towards Numerical Simulation of Kaye Effect"*, Mar.2-3 2012, Rice University,Houston,USA

CONFERENCES AND SYMPOSIA ORGANIZED

2025   **Conference Organizer**, *8th Biot Conference on Poromechanics*, 7-10 Oct 2025, Salt Lake City, Utah, USA
Main organizing committee.

2025   **Mini-Symposium Organizer**, *17th Annual International Conference on Porous Media*, 19-22 May 2025, Albuquerque, New Mexico, USA
Organized (MS07) Mathematical and numerical methods for multi-scale multi-physics, nonlinear coupled processes

2025   **Workshop Co-Organizer**, *Southeast Applied and Computational Math Student Workshop*, 4-5 April 2025, Auburn University, USA

2024   **Mini-Symposium Organizer**, *SIAM Conference on Mathematics of Data Science*, 21-25 Oct 2024, Atlanta, USA
Recent Advances in Scientific Machine Learning for Data-Driven Discovery of Dynamical Systems

2024   **Workshop Organizer**, *Florida-Georgia Applied Computational Math Student Workshop 2023*, 1-2 April 2023, Florida State University, USA

2024   **Mini-Symposium Organizer**, *SIAM Conference Texas-Louisiana Section 7th Annual Meeting*, 11-13 Oct 2024, Baylor University, USA
Recent Advancements in Numerical Methods for Subsurface Simulations

2023   **SIAM Conference on Mathematical & Computational Issues in the Geosciences**, *Organized a minisymposium*, 19-22nd Jun 2023, Bergen, Norway

2023   **Workshop Organizer**, *Florida-Georgia Applied Computational Math Student Workshop 2023*, 1-2 April 2023, Florida State University, USA

2024   **Mini-Symposium Organizer**, *AMS Spring Southeastern Sectional Meeting*, 23-24 Mar 2024, Florida State University, USA
Special Session on Advanced Numerical Methods for Partial Differential Equations and Their Applications

2022   **Session Chair**, *Florida Fluids Symposium*, May 7 2022

2021   **Organizing Committee**, *The Thirty-Fifth AAAI Conference on Artificial Intelligence (AAAI-21)- Combining Artificial Intelligence and Machine Learning with Physics Sciences*, Mar 23-25 2021
Video Conference

2020   **Mini-Symposium Organizer**, *The 44th SIAM Southeastern Atlantic Section Conference*, Mar 2020, Auburn University, USA, *delayed due to Covid-19 pandemic*
Mini-Symposium 13 (MS13): Recent Development of Coupled Problems with Advanced Physics-Based Numerical Methods

2019 **Mini-Symposium Organizer**, *The 20th Annual Conference of the International Association for Mathematical Geosciences*, Aug 2019, Pennsylvania, USA.
"Coupling geomechanics and flow systems in subsurface applications"

2019 **Mini-Symposium Organizer**, *Finite Elements in Fluids*, Apr 2019, Chicago, IL, USA.
"Additive Manufacturing and Digital Rock Physics for Granular and Fractured Materials"

2019 **Mini-Symposium Organizer**, *SIAM Conference on Mathematical and Computational Issues in the Geosciences*, Mar 2019, Houston, TX, USA
"Recent advances in computational modeling of coupled flow and geomechanics in the subsurface environment"

2017 **Mini-Symposium Organizer**, *SIAM Conference on Mathematical and Computational Issues in the Geosciences*, Mar 2019, Houston, TX, USA
"Scalable methods for coupling water re- sources modeling and parameter estimation"

Professional Service

Reviewer Panel, *National Science Foundation*, Computational Mathematics, Graduate Research Fellowship Program (GRFP)

Reviewer for Proposals, *Department of Energy*, BES

Reviewer for Proposals, *American Chemical Society*, Petroleum Research Fund

2024 **Editorial Board for the Special Issue**, *Results in Applied Mathematics (RINAM)*, Title: 'Coupled processes: modeling, analysis, and numerics'

Since 2020 **Editorial Board of Fluids as Topic Editor**, *Fluids (2311-5521)*

Since 2014 **Reviewer for peer-reviewed journals**, •*Advances in Water Resources*, •*Applied Numerical Mathematics*, •*Applied Mathematics and Computation*, •*Computational Geosciences*, •*Computers and Fluids*, •*Computers and Mathematics with Applications*, •*Computer Methods in Applied Mechanics and Engineering*, •*Energies*, •*Engineering Fracture Mechanics*, •*International Journal on Geomathematics*, •*Numerical Methods for Partial Differential Equations*, •*SIAM Journal on Scientific Computing*,

Mentor for Postdoctoral Fellows

Fall 2023- Seonghee Jeong, Ph.D, from Department of Mathematics, Louisiana State University.

Summer 2025- Kapil Chawla, Ph.D, from Department of Mathematics, Indiana University Bloomington.

Chair/Co-Chair for Ph.D. Students

10 Ruth Ropez, Doctoral Candidate, Department of Mathematics, Florida State University.

9 Sanjeeb Poudel, Doctoral Candidate, Department of Scientific Computing, Florida State University.

8 Latria Campbell, Doctoral Candidate, Department of Mathematics, Florida State University.

7 Seungmin Lee, Doctoral Candidate, Department of Mathematics, Florida State University.

6 Jonathan Valrou, Doctoral Candidate, Department of Mathematics, Florida State University.

5 Yi-Yung Yang, Doctoral Candidate, Department of Mathematics, Florida State University.

4   Alan Sze, Doctoral Candidate, Biomedical Engineering, Duke University

3   Julian Roth, Ph.D (2024), Institute of Applied Mathematics, Leibniz University Hannover.

2   Sogo Shiozawa, Ph.D (2014). Petroleum Engineering, University of Texas at Austin, Chair advisor: Mary F. Wheeler

1   Rencheng Dong, Ph.D (2015). Petroleum Engineering, University of Texas at Austin, Chair advisor: Mary F. Wheeler

MEMBER OF DOCTORAL COMMITTEE

1   AbuShoshah, Mohammed Ahmed; Ph.D (2025), Department of Mathematics. Florida State University.

2   Estebe, Cody Lee; Ph.D (2024), Department of Mathematics, Florida State University.

3   Ream, Julia Alison; Ph.D (2023), Department of Mathematics, Florida State University.

4   Wilson, Azaryah Asher; Ph.D (2024), Department of Mathematics, Florida State University.

5   Samuel Conner; Ph.D (2023), Department of Mathematics, Florida State University.

MEMBER OF COMMITTEE FOR HONORS IN THE MAJOR THESIS

1   Abby Scott; 2024, Department of Biomedical Engineering, Florida State University

2   Carolyn Emerson; 2024, Department of Meteorology, Florida State University

3   Ethan Todd; 2023, Departement of Physics, Florida State University

TEACHING EXPERIENCE

Spring 2025   **MAS 3105 Linear Algebra**

Department of Mathematics, Florida State University

Spring 2024   **MAD 5404 Foundation of Computational Mathematics II**

Department of Mathematics, Florida State University

Fall 2023   **MAD 5403 Foundation of Computational Mathematics I**

Department of Mathematics, Florida State University

Fall 2023   **Applied Computational Mathematics Seminar**

Department of Mathematics, Florida State University

Spring 2023   **MAC 2313: 0008 Calculus with analytical geometry III**

Department of Mathematics, Florida State University

Spring 2023   **MAD 5404 Foundation of Computational Mathematics II**

Department of Mathematics, Florida State University

Fall 2022   **Applied Computational Mathematics Seminar**

Department of Mathematics, Florida State University

Fall 2022   **MAD 5403 Foundation of Computational Mathematics I**

Department of Mathematics, Florida State University

Spring 2022   **MAP 5395 Finite Element Method**

Department of Mathematics, Florida State University

Fall 2021   **MAC 2313: 0005 and 0010 Calculus with analytical geometry III**

Department of Mathematics, Florida State University

Spring 2021	**MAP 5395 Finite Element Method**
	Department of Mathematics, Florida State University
Spring 2021	**MAD 3703 Numerical Analysis**
	Department of Mathematics, Florida State University
Fall 2020	**MAC 2313:006 Calculus with analytical geometry III**
	Department of Mathematics, Florida State University
Spring 2020	**MAP 5395 Finite Element Method**
	Department of Mathematics, Florida State University
Fall 2019	**MAD 3703 Numerical Analysis**
	Department of Mathematics, Florida State University
Fall 2019	**MAC 2313:006 Calculus with analytical geometry III**
	Department of Mathematics, Florida State University
Summer 2019	**MAP 2702 Ordinary Differential Equations**
	Department of Mathematics, Florida State University
Spring 2019	**MAD 3703 Numerical Analysis**
	Department of Mathematics, Florida State University
Fall 2018	**MAC 2313:006 Calculus with analytical geometry III**
	Department of Mathematics, Florida State University
Spring 2018	**MAC 2313:002 Calculus with analytical geometry III**
	Department of Mathematics, Florida State University
Fall 2017	**MAC 2313:005 Calculus with analytical geometry III**
	Department of Mathematics, Florida State University
Spring 2014	**MATH 610:600 Numerical Methods for PDE**
	Responsibilities: Home works, finite element numerical simulations lab sessions
Fall 2013	**MATH 412 Applied Partial Differential Equations**
	Responsibilities: Gradings and help sessions
Spring 2013	**MATH 131:504 Mathematical Concepts - Calculus**, *Instructor*
	Responsibilities: Full management, lectures, home works, quizzes, and exams.
Fall 2012	**MATH 131:501 Mathematical Concepts - Calculus**, *Instructor*
	Responsibilities: Full management, lectures, home works, quizzes, and exams.
Fall 2011	**MATH 609:600 Numerical Analysis**
	Responsibilities: Home works, numerical methods programming lab sessions
Spring 2011	**MATH 610:600 Numerical Methods for PDE**
	Responsibilities: Home works, finite element numerical simulations lab sessions
Fall 2010	**MATH 151:801-803 Engineering Mathematics I**
	Responsibilities: Exercise classes, home works, quizzes and MatLab sessions
Summer 2010	**MATH 308:503-504 Differential Equations**
	Responsibilities: Gradings and help sessions
Spring 2010	**MATH 152:522-524 Engineering Mathematics II**
	Responsibilities: Exercise classes, home works, quizzes and MatLab sessions
Fall 2009	**MATH 151:519-521 Engineering Mathematics I**
	Responsibilities: Exercise classes, home works, quizzes and MatLab sessions
Summer 2009	**MATH 151:301-302 Engineering Mathematics I**
	Responsibilities: Exercise classes, home works, quizzes and MatLab sessions
Spring 2009	**MATH 409 Advanced Calculus**

Responsibilities: Gradings and help sessions

Fall 2008 **MATH 304 Linear Algebra**

Responsibilities: Gradings and help sessions

DEPARTMENTAL SERVICE

2023-2024 **Tenure-Track Faculty Search Committee**, *Department of Mathematics, Florida State University*

2022-2023 **Postdoc Search Committee**, *Department of Mathematics, Florida State University*

2022-2023 **Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*

2021-2022 **Tenure-Track Faculty Search Committee**, *Department of Mathematics, Florida State University*

2021-2022 **Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*

2020-2021 **Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*

2019-2020 **Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*

2018-2019 **Postdoc Search Committee**, *Department of Mathematics, Florida State University*