

Curriculum Vitae

Sanghyun Lee

Department of Mathematics, Florida State University
 lee@math.fsu.edu
<https://www.math.fsu.edu/~lee/>

 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

- 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 subsurface.

- Analyses and computations of newly developed ‘enriched Galerkin’ approximation methods for coupling flow and transport for complexed fluid in porous media.

FUNDED PROJECTS

- 2023-2026 **DOE Science Foundations for the Energy Earthshots**, PI: University of Texas at El Paso, Co-PIs: Florida State University, University of Utah, Sandia National Lab; *Advanced Multi-Physics Machine Learning for Subsurface Energy Systems Across Scales*
- 2023 **NSF DCL Supplemental Award DMS- 2208402**, PI: Sanghyun Lee, *Dear Colleague Letter: Non-Academic Research Internships for Graduate Students in Geothermal Energy Supplemental Funding Opportunity (Geothermal INTERN)*
- 2022 - 2025 **NSF Award DMS- 2208402** (Computational Mathematics), PI: Sanghyun Lee, *Collaborative Research: Physics-preserving adaptive finite element methods for thermo-poroelasticity*
- 2020 - 2021 **MDS::#045490** (The Multidisciplinary Support) Florida State University, Co-PI: Sanghyun Lee, *Studies for Degradation of Lignin-based Biodegradable Plastics to Prevent Marine Debris*
- 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*
- 2018 **CRC::041950** (First Year Assistant Professor Award) Florida State University, PI: Sanghyun Lee, *Optimal error estimate of flow problems with Dirac sources in subsurface for discontinuous and enriched Galerkin methods*

PUBLICATIONS

46. S. Lee, Y. Shin* ; On the training and generalization of deep operator networks, submitted
45. F. Ballarin*, S. Lee, S. Yi ; Projection-based reduced order modeling of an iterative coupling scheme for thermo-poroelasticity, submitted
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, submitted
43. S-Y Yi, S.Lee* ; Physics-preserving enriched Galerkin method for a fully-coupled thermo-poroelasticity model, submitted
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

PARTICIPATED PROJECTS

- | | |
|-----------|---|
| 2016-2019 | BIGDATA: Collaborative Research: IA: F: Fractured Subsurface Characterization using High Performance Computing and Guided by Big Data, NSF Award #1546553, PI: Mary F. Wheeler |
| 2014-2018 | Center for Frontiers of Subsurface Energy Security (CFSES), an Energy Frontier Research Center funded by the U.S. Department of Energy, Office of Science, and Office of Basic Energy Sciences, DOE Project #DE-SC0001114, Director: Larry Lake |
| 2014-2018 | Development of Geomechanical Screening Tools to Identify Risk: An Experimental and Modeling Approach for Secure CO ₂ Storage, Department of Energy National Energy Technology Laboratory grant #DE-FE0023314, PI: Mary F. Wheeler |
| 2014-2016 | Statoil grant #STNO-4502931834, PI: Mary F. Wheeler |
| 2014-2016 | ConocoPhillips grant #UTA 10-000444, PI: Mary F. Wheeler |

VISITING RESEARCHER

- | | |
|-------------|---|
| Summer 2022 | J.T. Oden Visitors Program, PI: Mary F. Wheeler |
| Summer 2019 | J.T. Oden Visitors Program, PI: Mary F. Wheeler |

INVITED SEMINAR/COLLOQUIUM TALKS/VISITING RESEARCHER

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

PRESENTED TALKS/POSTERS AT CONFERENCES AND MEETINGS

- 2023 **The Spring 2023 Finite Element Circus**, 20-21st Oct 2023, The University 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 Manufacturing 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, Montgomery, 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 Sequestration 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

PARTICIPATED CONFERENCES/WORKSHOPS/SUMMER SCHOOL

- 2023 **17th U. S. National Congress on Computational Mechanics**, 23-27th July 2023, Albuquerque, New Mexico, U.S.A
- 2020 **The 50th John H. Barrett Memorial Lectures, A3N2M: Approximation, Applications, and Analysis of Nonlocal, Nonlinear Models**, May 11-13 2020, The University of Tennessee, U.S.A, *delayed due to Covid-19 pandemic*
- 2019 **ARPA-E Subsurface Cohort Kickoff**, Dec 12 2019, Denver, CO, U.S.A
- 2016 **The 7th Pacific RIM Conference on Mathematics**, June 27-July 1, 2016, Seoul National University, Seoul, South Korea
- 2016 **SPE Hydraulic Fracturing Technology Conference**, Feb 9-11 2016, The Woodlands, TX, USA
- 2014 **DOE Center for Frontiers of Subsurface Energy Security (CFSES)**, Sep 30 2014, Albuquerque, New Mexico, USA
- 2013 **IMA Summer Graduate Student Program, Flow, Geometric Motion, Deformation and Mass Transport in Physiological Processes**, July 15- Aug 2 2013, University of Minnesota, USA

SERVICES; CONFERENCES

- 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 resources modeling and parameter estimation”

SERVICES; JOURNALS

- 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 PH.D. STUDENTS

- 3 Jonathan Valrou, Ph.D. Department of Mathematics. Florida State University.
- 2 Yi-Yung Yang, Ph.D. Department of Mathematics. Florida State University.
- 1 Joshua Gonzalez, Ph.D. Department of Mathematics. Florida State University. Supported by NSF DMS-1913016, *topic: Linear/NonLinear Elasticity by employing enriched Galerkin methods*
- Sogo Shiozawa, Ph.D. Student in Petroleum Engineering, University of Texas at Austin, *topic: Realistic applications of proppant transport in hydraulic fracturing*. Chair advisor: Mary F. Wheeler
 - Rencheng Dong, Ph.D. Student in Petroleum Engineering, University of Texas at Austin, *topic: Enriched Galerkin approximations for chemical compositional flow in reservoir simulators* . Chair advisor: Mary F. Wheeler

TEACHING EXPERIENCE

- Fall 2022 **Applied Computational Mathematics Seminar**
Department of Mathematics, Florida State University
- Fall 2022 **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

 SERVICES IN THE UNIVERSITY

- 2022-2023 **Postdoc Search Committee**, *Department of Mathematics, Florida State University*
- 2022-2023 **ACM Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*
- 2021-2022 **ACM Tenure-Track Faculty Search Committee**, *Department of Mathematics, Florida State University*
- 2021-2022 **ACM Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*
- 2020-2021 **ACM Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*
- 2019-2020 **ACM Graduate Student Admission Committee**, *Department of Mathematics, Florida State University*
- 2018-2019 **Postdoc Search Committee**, *Department of Mathematics, Florida State University*

 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.