

## Michael J. Neilan

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### Education

The University of Tennessee	Mathematics	Ph.D.	2009
The University of Tennessee	Mathematics	B.S.	2004
The University of Tennessee	Computer Science	B.S.	2004

### Professional Appointments

Associate Professor	University of Pittsburgh, Department of Mathematics	2016–present
Assistant Professor	University of Pittsburgh, Department of Mathematics	2011–2016
NSF Postdoctoral Research Fellow	Louisiana State University	2009–2011
Graduate Research Assistant	The University of Tennessee	2006–2009
Graduate Teaching Assistant	The University of Tennessee	2005–2006

### Honors and Awards

Sloan Research Fellowship, 2014  
Leslie Fox Prize in Numerical Analysis (first prize), 2013  
NSF Mathematical Sciences Postdoctoral Research Fellowship, 2009–2011  
Yates Dissertation Fellowship, 2008–2009  
UTK Mathematics Graduate Student Achievement Award, 2007, 2009

### Research Interests

Numerical PDEs ◦ finite element methods ◦ fully nonlinear PDEs ◦ structure preserving discretizations ◦ discontinuous Galerkin methods ◦ mixed methods

### Research Support

PI: National Science Foundation conference grant, “Structure Preserving Discretizations: Finite Elements, Splines, and IGA,” 2019, \$10,000.

PI: IMA conference grant, “Structure Preserving Discretizations: Finite Elements, Splines, and IGA,” 2019, \$5,000.

PI: National Science Foundation grant DMS-1719829, “Finite element methods for incompressible flow yielding divergence-free approximations,” 2017–2020, \$157,489.

PI: National Science Foundation conference grant DMS-1541585, “Nonlinear PDEs, Numerical Analysis, and Applications,” 2015, \$10,000.

PI: IMA conference grant, “Nonlinear PDEs, Numerical Analysis, and Applications,” 2015, \$5,000.

PI: National Science Foundation grant DMS-1417980, “Finite Element Methods for Non–Divergence Form Partial Differential Equations and the Hamilton–Jacobi–Bellman Equation,” 2014–2017, \$207,555

Sloan Research Fellowship, 2014–2016, \$50,000

PI: CRDF, University of Pittsburgh, 2013–2015, \$15,800

PI: National Science Foundation grant DMS-1115421, “Novel Discretization Schemes for Fully Nonlinear Partial Differential Equations,” 2011–2014, \$127,184

PI: National Science Foundation grant DMS-0902683, “Postdoctoral Research Fellowship,” 2009–2011, \$135,000

Yates Dissertation Fellowship, The University of Tennessee, 2008–2009, \$15,000

## Publications

53. A. LINKE, C. MERDON, AND M. NEILAN, *Pressure-robustness in quasi-optimal a priori estimates for the Stokes problem*, submitted.
52. M. NEILAN, *The Stokes Complex: A review of exactly divergence-free finite element pairs for incompressible flows*, submitted.
51. J. GUZMÁN, A. LISCHKE, AND M. NEILAN, *Exact sequences on Powell–Sabin splits*, submitted.
50. M. NEILAN, A. SALGADO, AND W. ZHANG, *Fully nonlinear PDEs*, Handbook of Numerical Analysis, submitted.
49. M. NEILAN AND A. ZYTOON, *Low-order Raviart–Thomas approximations of axisymmetric Darcy flow*, Journal of Mathematical Analysis and Applications, 473(2):905–917, 2019.
48. G. FU, J. GUZMÁN, AND M. NEILAN, *Discrete and smooth de Rham complexes on Alfeld splits*, submitted.
47. M. NEILAN AND M. WU, *Discrete Miranda–Talenti estimates and applications to linear and nonlinear PDEs*, Journal of Computational and Applied Mathematics, 356:358–376, 2019.
46. M. NEILAN AND W. ZHANG, *Rates of convergence in  $W_p^2$ -norm for the Monge–Ampère equation*, SIAM Journal on Numerical Analysis, 56(5):3099–3120, 2018.
45. J. GUZMÁN AND M. NEILAN, *Inf-sup stable finite elements on barycentric refinements producing divergence-free approximations in arbitrary dimensions*, SIAM Journal on Numerical Analysis, 56(5):2826–2844, 2018.
44. F. NEUMANN, A. LINKE, C. MERDON, AND M. NEILAN, *Quasi optimality of a pressure-robust nonconforming finite element method for the Stokes problem*, Mathematics of Computation, 87(312):1543–1566, 2018.
43. M. NEILAN AND D. SAP, *Macro Stokes elements on quadrilaterals*, International Journal of Numerical Analysis and Modeling, 15(4-5):729–745, 2018.
42. X. FENG, M. NEILAN, AND S. SCHANKE, *Interior penalty discontinuous Galerkin methods for second order linear non-divergence for elliptic PDEs*, Journal of Scientific Computing, 74(3):1651–1676, 2018.
41. A. LINKE, M. NEILAN, L. REBHOLZ, AND N. WILSON, *Improving efficiency of coupled schemes for Navier–Stokes equations by a connection to grad-div stabilized projection methods*, Journal of Numerical Mathematics, 25(4):229–248, 2017.
40. M. NEILAN, *Convergence analysis of finite element methods for second order non-variational elliptic problems*, Journal of Numerical Mathematics, 25(3):169–184, 2017.
39. V. JOHN, A. LINKE, C. MERDON, M. NEILAN, AND L.G. REBHOLZ, *On the divergence constraint in mixed finite element methods for incompressible flows*, SIAM Review, 59(3):492–544, 2017.
38. H. HAKULA, M. NEILAN, AND J. OVAL, *A posteriori estimates using auxiliary subspace techniques*, Journal of Scientific Computing, 72(1):97–127, 2017.
37. S.C. BRENNER, M. NEILAN, A. REISER, AND L.-Y. SUNG, *A  $C^0$  interior penalty method for a von Kármán Plate*, Numerische Mathematik, 135(3):803–832, 2017.
36. M. NEILAN, A. SALGADO, AND W. ZHANG, *Numerical analysis of strongly nonlinear PDEs*, Acta Numerica, 26:137–303, 2017.
35. X. FENG, L. HENNINGS, AND M. NEILAN,  *$C^0$  discontinuous Galerkin finite element methods for second order linear elliptic partial differential equations in non-divergence form*, Mathematics of Computation, 86(307):2025–2051, 2017.
34. J.S. HOWELL, M. NEILAN, AND N. WALKINGTON, *A dual-mixed finite element method for the Brinkman problem*, SMAI-JCM, 2:1–17, 2016.

33. I. SMEARS, L. JOHN, AND M. NEILAN, *Stable discontinuous Galerkin FEM without penalty parameters*, Numerical Mathematics and Advanced Applications ENUMATH 2015. Lecture Notes in Computational Science and Engineering, 112:165–174.
32. E. COLMENARES AND M. NEILAN, *Dual-mixed finite element methods for the stationary Boussinesq problem*, Computers and Mathematics with Applications, 72(7):1828–1850, 2016.
31. X. FENG, T. LEWIS, AND M. NEILAN, *Discontinuous Galerkin finite element calculus and applications to numerical solutions of linear and nonlinear partial differential equations*, Journal of Computational and Applied Mathematics, 299:68–91, 2016.
30. M. NEILAN AND D. SAP, *Stokes elements on cubic meshes yielding divergence-free approximations*, Calcolo, 53(3):263–283, 2016.
29. M. NEILAN, *Discrete and conforming smooth de Rham complexes in three dimensions*, Mathematics of Computation, 84(295):2059–2081, 2015.
28. J. GUZMÁN AND M. NEILAN, *Conforming and divergence-free Stokes elements in three dimensions*, IMA Journal of Numerical Analysis, 34(4):1489–1508, 2014.
27. M. NEILAN, *A unified analysis of three finite element methods for the Monge-Ampère equation*, Electronic Transactions on Numerical Analysis, 41:262–288, 2014.
26. X. FENG AND M. NEILAN, *Finite element approximations of general fully nonlinear second order elliptic partial differential equations based on the vanishing moment method*, Computers and Mathematics with Applications, 68:2182–2204, 2014.
25. J. GUZMÁN AND M. NEILAN, *Conforming and divergence-free Stokes elements on general triangular meshes*, Mathematics of Computation, 83(285):15–36, 2014.
24. J. GUZMÁN AND M. NEILAN, *Symmetric and conforming mixed finite elements for plane elasticity using rational bubbles*, Numerische Mathematik, 126(1):153–171, 2014.
23. M. NEILAN, *Finite element methods for fully nonlinear second order PDEs based on the discrete Hessian*, Journal of Computational and Applied Mathematics, 263:351–369, 2014.
22. T. LEWIS AND M. NEILAN, *Convergence analysis of a symmetric dual-wind discontinuous Galerkin method*, Journal of Scientific Computing, 59(3):602–625, 2014.
21. S.B.G. KARAKOC AND M. NEILAN, *A  $C^0$  finite element method for the biharmonic problem without extrinsic penalization*, Numerical Methods for Partial Differential Equations, 30(4):1254–1278, 2014.
20. X. FENG AND M. NEILAN, *Convergence analysis for a fourth order singular perturbation of the radially symmetric Monge-Ampère equation*, Applicable Analysis, 93(8):1626–1646, 2014.
19. R.S. FALK AND M. NEILAN, *Stokes complexes and the construction of stable finite elements with pointwise mass conservation*, SIAM Journal on Numerical Analysis, 51(2):1308–1326, 2013.
18. M. NEILAN, *Quadratic finite element approximations of the Monge-Ampère equation*, Journal of Scientific Computing, 54(1):200–226, 2013.
17. X. FENG, R. GLOWINSKI, AND M. NEILAN, *Recent developments in numerical methods for fully nonlinear second order partial differential equations*, SIAM Review, 55(2):205–267, 2013.
16. S.C. BRENNER, M. NEILAN, AND L.-Y. SUNG, *Isoparametric  $C^0$  interior penalty methods for plate bending problems*, Calcolo, 50(1):35–67, 2013.
15. J. GUZMÁN AND M. NEILAN, *A family of non-conforming elements for the Brinkman problem*, IMA Journal of Numerical Analysis, 32(4):1485–1508, 2012.
14. J. GUZMÁN, D. LEYKEKHMEN, AND M. NEILAN, *A family of non-conforming elements and analysis of Nitsche’s method for a singularly perturbed biharmonic problem*, Calcolo, 49(2):95–125, 2012.

13. S.C. BRENNER AND M. NEILAN, *Finite element approximations of the three dimensional Monge-Ampère equation*, ESAIM: Mathematical Modeling and Numerical Analysis, 46(5):979–1001, 2012.
12. M. NEILAN, *Localized pointwise and global  $L^p$  estimates for Nitsche’s method*, International Journal of Numerical Analysis & Modeling, Series B, 2(4):338–354, 2011.
11. S.C. BRENNER AND M. NEILAN, *A  $C^0$  interior penalty method for a fourth order elliptic singular perturbation problem*, SIAM Journal on Numerical Analysis, 49(2):869–892, 2011.
10. X. FENG AND M. NEILAN, *Error analysis of Galerkin approximations of the fully nonlinear Monge-Ampère equation*, Journal of Scientific Computing, 47:303–327, 2011.
9. S.C. BRENNER, T. GUDI, M. NEILAN, AND L.-Y. SUNG,  *$C^0$  penalty methods for the fully nonlinear Monge-Ampère equation*, Mathematics of Computation, 80:1979–1995, 2011.
8. T. GUDI AND M. NEILAN, *An interior penalty method for a sixth order elliptic equation*, IMA Journal of Numerical Analysis, 31(4):1734–1753, 2011.
7. X. FENG AND M. NEILAN, *Nonconforming finite element and discontinuous Galerkin methods for a bi-wave equation modeling d-wave superconductors*, Mathematics of Computation, 80:1303–1333, 2011.
6. X. FENG AND M. NEILAN, *Finite element methods for a bi-wave equation modeling d-wave superconductors*, Journal of Computational Mathematics, 28(3):331–353, 2010.
5. M. NEILAN, *A nonconforming Morley finite element method for the Monge-Ampère equation*, Numerische Mathematik, 115(3):371–394, 2010.
4. X. FENG AND M. NEILAN, *A modified characteristic finite element method for a fully nonlinear formulation of the semigeostrophic flow equations*, SIAM Journal on Numerical Analysis, 47(4):2952–2981, 2009.
3. X. FENG AND M. NEILAN, *Error analysis for mixed finite element approximations of the fully nonlinear Monge-Ampère equation based on the vanishing moment method*, SIAM Journal on Numerical Analysis, 47(2):1226–1250, 2009.
2. X. FENG AND M. NEILAN, *Vanishing moment method and moment solutions for second order fully nonlinear partial differential equations*, Journal of Scientific Computing, 38(1):74–98, 2009.
1. X. FENG, M. NEILAN, AND A. PROHL, *Error analysis of finite element approximations of the inverse mean curvature flow arising from general relativity*, Numerische Mathematik, 108(1):93–119, 2007.

### Conference Organization

Conference organizer, *Structure Preserving Discretizations: FEMs, Splines, and IGA*, University of Pittsburgh, May 31–June 1, 2019.

Conference organizer, *Nonlinear PDEs, Numerical Analysis, and Applications*, University of Pittsburgh, October 2–3, 2015.

Local organizer of the Fall 2012 Finite Element Circus, University of Pittsburgh, October 19–20, 2012.

### Minisymposium Organization

*Structure Preserving Discretizations*, Dynamics, Equations and Applications, Krakow, Poland, 2019.

*Divergence-free and pressure-robust discretizations for the NSE*, ICIAIM 2019, Valencia, Spain, co-organized with Christian Merdon (WIAS).

*Recent trends in finite element methods*, AMS Southeast Sectional Meeting 2017, Charleston, S.C., co-organized with Leo Rebholz (Clemson).

*Advances in finite and boundary elements*, WONAPDE 2016, University of Concepcion, co-organized with Francisco-Javier Sayas (U. of Delaware).

*Numerical methods for fully nonlinear elliptic equations*, MAFELAP 2013, Brunel University, co-organized with Klaus Böhmer (Philipps-Universität Marburg) and Susanne C. Brenner (LSU).

*Recent Developments of numerical methods for nonlinear PDEs*, SIAM Conference on Computational Science and Engineering (2013), Boston MA, co-organized with Xiaoming He (Missouri University of Science and Technology).

*Numerical approximations of viscous flows*, 2012 SIAM Annual Meeting, Minneapolis, MN, co-organized with Francisco-Javier Sayas (U. of Delaware).

*Numerical Methods for Monge-Ampère equations and optimal transportation*, ICIAM 2011, Vancouver, BC, co-organized with Adam Oberman (Simon Frasier),

*Numerical methods for high order nonlinear equations*, 2010 SIAM Annual Meeting, Pittsburgh, PA, co-organized with Susanne C. Brenner (LSU).

### **Editorial Board Member**

Calcolo, 2019–present

IMA Journal of Numerical Analysis, 2019–present

Mathematics of Computation, 2017–present

Advances in Applied Mathematics and Mechanics, 2014–2018

### **Journal Referee**

*Advances in Applied Mathematics and Mechanics* ◦ *Advances in Computational Mathematics* ◦ *Applicable Analysis* ◦ *Applied Mathematics Letters* ◦ *Applied Numerical Mathematics* ◦ *BIT Numerical Mathematics* ◦ *Calcolo* ◦ *Computer Methods in Applied Mechanics and Engineering* ◦ *Computers and Mathematics with Applications* ◦ *Communications on Pure and Applied Analysis* ◦ *Electronic Journal of Differential Equations* ◦ *Electronic Transactions on Numerical Analysis* ◦ *IMA Journal of Numerical Analysis* ◦ *Indian Journal of Mathematics* ◦ *International Journal of Numerical Analysis and Modeling* ◦ *International Journal of Computer Mathematics* ◦ *Journal of Computational and Applied Mathematics* ◦ *Journal of Computational Physics* ◦ *Journal of Foundations of Computational Mathematics* ◦ *Journal of Mathematical Analysis and Applications* ◦ *Journal of Numerical Mathematics* ◦ *Journal of Scientific Computing* ◦ *Mathematical Modeling and Numerical Analysis (ESAIM)* ◦ *Mathematical Models and Methods in Applied Sciences (M3AS)* ◦ *Mathematics of Computation* ◦ *Mathematics and Computers in Simulation* ◦ *Methods and Applications of Analysis* ◦ *Numerical Functional Analysis and Optimization* ◦ *Numerical Methods for Partial Differential Equations* ◦ *Numerical Mathematics: Theory, Methods and Applications* ◦ *Numerische Mathematik* ◦ *Science China Mathematics* ◦ *SIAM Journal on Numerical Analysis* ◦ *SIAM Journal on Scientific Computing* ◦ *Symmetry* ◦ *Transactions on Mathematical Software*

### **Book Referee**

*Springer Series in Computational Mathematics*

### **Book Review**

*Numerical methods for nonlinear partial differential equations [book review of MR3309171]*, SIAM Review, 58(3):590–592, 2016.

### **Panel Review**

National Science Foundation Division of Mathematical Sciences, Computational Mathematics

National Science Foundation, Division of Mathematical Sciences, CAREER

### **External Review**

Department of Energy, Applied Mathematics Program

Swiss National Science Foundation

University of Missouri Research Board

NASA EPSCoR

Fondecyt CONICYT

Research Grants Committee of Hong Kong

European Research Council

### **Professional Membership**

Society of Industrial and Applied Mathematics

### **Committees/Service**

Computational Math Seminar Organizer, University of Pittsburgh, 2012–2018

Colloquium Committee Chair, University of Pittsburgh, 2018–present

Colloquium Committee Member, University of Pittsburgh, 2014–present

Analysis Prelim Committee Member, University of Pittsburgh, April 2014, August 2014

Chair of the Computer Committee, University of Pittsburgh, Spring 2014

SIAM Student Chapter Faculty Advisor, University of Pittsburgh, 2012–present

Member of Pitt Goldwater Selection Committee, 2014.

### **Other**

Intel ISEF Volunteer Grand Awards Judge, May 15–16, 2012

### **Research Talks**

98. Minisymposium on Structure Preserving Discretizations, Dynamics, Equations and Applications, Krakow, Poland, September 16–20, 2019.

97. Minisymposium on Numerical Approximations of Geometric Partial Differential Equations, ICIAM, Valencia, July 15–19, 2019.

96. Minisymposium on Finite element exterior calculus and applications, ICIAM, Valencia, July 15–19, 2019.

95. Numerical Analysis Seminar, University of Maryland, March 5, 2019.

94. Minisymposium on recent developments of numerical methods for PDEs, SIAM CSE, Spokane, February 25–March 1, 2019.

93. Minisymposium on divergence-free/pressure robust FEMs, JMM, Baltimore, January 16–19, 2019.

92. Minisymposium on New Trends in Numerical Methods for PDEs: Theory and Applications, AMS Central Sectional Meeting, Ann Arbor, October 20–21, 2018.

91. BIRS-CMO Workshop: Numerical Analysis of Coupled and Multi-Physics Problems with Dynamic Interfaces, Oaxaca, Mexico, July – August 3, 2018.

90. ESI Workshop: Geometric Processing and Finite Elements, Vienna, Austria, July 16–20, 2018.

89. Numerical Analysis and PDEs Seminar, University of Delaware, May 17, 2018.

88. Numerical Mathematics and Scientific Computing Seminar, Weierstrass Institute, Berlin, April 12, 2018.

87. The University of Tennessee, Computational and Applied Math Seminar, April 4, 2018.

86. Clemson University, Computational Math Seminar, April 3, 2018.

85. Minisymposium on Recent Advances in Finite Element Methods for Partial Differential Equations, AMS Sectional Meeting, Columbus OH, March 17–18, 2018.

84. Minisymposium, SIAM conference on analysis of PDEs, Baltimore, December 9–12, 2017.

84. Finite element circus, UMPC, October 19–20, 2017.

83. Workshop on Foundations of Numerical PDEs, FoCM2017, Barcelona, July 17, 2017.
82. Rutgers University, Applied and Computational Mathematics Seminar, April 20, 2017.
81. Minisymposium on Advances in Quadrilateral and Hexahedral Finite Elements, SIAM CSE, Atlanta, February 28, 2017.
80. University of South Carolina, Applied and Computational Mathematics Seminar, November 18, 2016.
79. Minisymposium on Above and Beyond Fluid Flow Studies, AMS Sectional Meeting, Denver, Colorado, October 8–9, 2016.
78. Minisymposium on Recent Advances in Finite Element Methods for Nonlinear PDEs, SIAM Annual Meeting, Boston, Massachusetts, July 11–15, 2016.
77. Minisymposium on Adaptive Methods and Singular Solutions of Nonlinear Problems, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 14–17, 2016.
76. Minisymposium on Numerical Methods for Viscous Flow in Porous media, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 14–17, 2016.
75. Minisymposium on Numerical Methods for Fourth Order Problems, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 14–17, 2016.
74. University of Arizona, Colloquium, March 4, 2016.
73. University of Houston, Scientific Computing Seminar, March 3, 2016.
72. Minisymposium on Advances in Finite and Boundary Element Methods, WONAPDE, Concepcion, Chile, January 14, 2016.
71. Minisymposium on Advances in Numerical Methods for PDEs with Applications, SIAM Conference on Analysis of PDEs, Scottsdale, Arizona, December 10, 2015.
70. Numerical Analysis Seminar, University of Maryland, October 27, 2015.
69. University of Pittsburgh, Colloquium, September 11, 2015.
68. Minisymposium on Decoupling Methods for Multi-physics and Multi-Scale Problems, ICIAM, Beijing, China, August 10–14, 2015.
67. Minisymposium on Divergence-Free Elements, Grad-Div Stabilization, and Related Methods for Incompressible Flow Problems, ICIAM, Beijing, China, August 10–14, 2015.
66. Minisymposium on Recent Advances in Finite Element Analysis and Applications, AMS Western Sectional Meeting, Las Vegas, April 18–19, 2015.
65. Wayne State University, Applied Math Seminar, April 14, 2015.
64. Wayne State University, Colloquium, April 13, 2015.
63. Minisymposium on Mixed Finite Element Methods, SIAM CSE, Salt Lake City, March 14–18, 2015.
62. Auburn University, Applied Math Seminar, November 13, 2014.
61. Minisymposium on Recent Advances in Numerical Methods for Fluid Flow Problems, AMS Sectional Meeting, Greensboro, November 8–9, 2014.
60. IMA Workshop on Structure Preserving Discretizations of PDEs, October 22–24, 2014.
59. George Mason, Applied Math Seminar, September 5, 2014.
58. Minisymposium on High Order Numerical Methods for Systems of Partial Differential Equations with Applications, SIAM Annual Meeting, Chicago, IL, July 2014.
57. Portland State University, Colloquium, May 30, 2014.

56. Finite Element Circus, Wayne State University, March 28–29, 2014.
55. Spring 2014 AMS Southeastern Sectional Meeting, Knoxville, TN, March 21–23, 2014.
54. University of California, Irvine, Applied and Computational Math Seminar, March 17, 2014.
53. Minisymposium on Numerical Ordinary and Partial Differential Equations, International Conference on Engineering and Computational Mathematics (ECM2013), Hong Kong, December 16–18, 2013.
52. Simon Frasier, Applied Math Seminar, November 8, 2013.
51. Finite Element Circus, University of Delaware, October 18–19, 2013.
50. Leslie Fox Prize, Edinburgh, UK, June 24, 2013.
49. Minisymposium for Finite element methods for Fully Nonlinear Second Order Equations, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 11–14, 2013.
48. Minisymposium for Global and Local Error Estimates for Problems with Singularities or Low Regularity, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 11–14, 2013.
47. Minisymposium for Multi Physics Problems, The Mathematics of Finite Elements and Applications (MAFELAP), London, UK, June 11–14, 2013.
46. Minisymposium for Geometric Partial Differential Equations, 2013 Spring Central AMS Meeting, Iowa State University, Ames, IA, April 27–28, 2013.
45. University of Pittsburgh, ECE Department Graduate Seminar, April 10, 2013.
44. Finite Element Circus and Rodeo, Louisiana State University, March 8–9, 2013.
43. Minisymposium on Recent Developments of Numerical Methods for Nonlinear PDEs, SIAM Conference on Computational Science and Engineering, Boston, MA, February 25–March 1, 2013.
42. University of Pittsburgh, Computational Mathematics Seminar, February 5, 2013.
41. Minisymposium on Mathematical Aspects of the Finite Element Method, WONAPDE, Concepcion, Chile, January 14–18, 2013.
40. Minisymposium on Finite Element Exterior Calculus and Applications, AMS JMM, San Diego, January 10, 2013.
39. University of Pittsburgh, Computational Mathematics Seminar, September 11, 2012.
38. Missouri University of Science and Technology, Colloquium, November 09, 2012.
37. University of Maryland, Numerical Analysis Seminar, September 18, 2012.
36. Minisymposium on Numerical Approximations of Viscous Flows, SIAM Annual Meeting, Minneapolis, MN, July 9, 2012.
35. Finite Element Circus, Rutgers University, April 13–14, 2012.
34. Minisymposium on Recent Developments of Finite Element Methods for Partial Differential Equations, AMS SE Sectional Meeting, Tampa, FL, March 10–11, 2012.
33. University of Delaware, Numerical Analysis and PDE Seminar, November 17, 2011.
32. Penn State, CAM Colloquium, November 11, 2011.
31. Penn State, Pizza Seminar, November 11, 2011.
30. University of Pittsburgh, Computational Mathematics Seminar, October 26, 2011.
29. Finite Element Circus, University of Connecticut, October 14–15, 2011.
28. Discontinuous Galerkin Methods for PDEs Workshop, Heraklion, Crete, September 26–28, 2011.



27. Minisymposium on Numerical Methods for First and Second Order Fully Nonlinear PDEs, AMMCS, Waterloo, ON, July 25, 2011.
26. Minisymposium on Numerical Methods for Monge Ampere Equations and Optimal Transportation, ICIAM, Vancouver, BC, July 18, 2011.
25. Minisymposium on  $C^0$  Interior Penalty Methods for High Order PDEs, ICIAM, Vancouver, BC, July 18, 2011.
24. Brown University, Scientific Computing Seminar, March 4, 2011.
23. Finite Element Rodeo, Texas A&M, February 25, 2011.
22. Scientific Computing Around Louisiana, New Orleans, LA, January 28, 2011.
21. Minisymposium on Mathematics of Computation: Differential Equations, Linear Algebra, and Applications, AMS JMM, New Orleans, LA, January 6, 2011.
20. Louisiana State University, Applied Math Seminar, November 15, 2010.
19. Poster Presentation, IMA Novel Discretizations Workshop, University of Minnesota, November 1, 2010.
18. Minisymposium on Numerical Methods for High-Order Nonlinear Equations, SIAM Annual Meeting, Pittsburgh, PA, July 15, 2010.
17. Finite Element Circus, Brown University, May 1, 2010.
16. Finite Element Rodeo, Southern Methodist University, March 5, 2010
15. Scientific Computing Around Louisiana, Baton Rouge, LA, February 5, 2010.
14. Minisymposium on Recent Progress in Numerical Methods for Partial Differential Equations, SE Sectional AMS Meeting, University of Kentucky, March 27, 2010.
13. Northern Illinois University, Colloquium, February 12, 2010.
12. University of Pittsburgh, Colloquium, January 26, 2010.
11. Minisymposium on Computational Mathematics, AMS JMM, San Francisco, CA, January 10, 2010.
10. Finite Element Circus, The University of Tennessee, October 16, 2009.
9. Computational Math Seminar, Louisiana State University, August 25, 2009.
8. Finite Element Circus, University of Delaware, April 24, 2009.
7. Special session of the AMS JMM, Wash. D.C., January 6, 2009.
6. University of Kentucky, Applied Math Seminar, November 6, 2008.
5. Finite Element Circus, Rensselaer Polytechnic Institute, October 24, 2008.
4. SIAM Annual Meeting, San Diego, CA, July 5, 2008.
3. Finite Element Circus and Rodeo, Louisiana State University, March 7, 2008.
2. Applied Math Seminar, The University of Tennessee, October 1, 2007.
1. Finite Element Circus, Cornell University, October 19, 2007.

### **Conference and Workshop Participation**

- NIMBioS sponsored high performance computing workshop, The University of Tennessee, March 17–19, 2009.
- 33rd SIAM Southeastern-Atlantic Section Conference, University of South Carolina, April 4–5, 2009.

CBMS Conference on Adaptive Finite Element Methods for PDEs, Texas A&M University, May 17–22, 2009.

CBMS Conference on The Mathematics of Diffusion, Tulane University, May 17–21, 2010.

Center for Nonlinear Analysis Summer School: New Vistas in Image Processing and PDEs, Carnegie Mellon University, June 7–12, 2010.

IMA Thematic Year on Simulating Our Complex World: Modeling, Computation and Analysis, University of Minnesota,

- Tutorial: Computing with Uncertainty, October 16–17, 2010.
- Workshop: Computing with Uncertainty: Mathematical Modeling, Numerical Approximation and Large Scale Optimization of Complex Systems, October 18–22, 2010.
- Tutorial: Some Novel Discretization Techniques, October 30–31, 2010.
- Workshop: Numerical Solutions of Partial Differential Equations: Novel Discretization Techniques November 1–November 5, 2010.
- Tutorial: Fast Solution Techniques, November 28–29, 2010.
- Workshop: Numerical Solutions of Partial Differential Equations: Fast Solution Techniques, November 29–December 3, 2010.
- Workshop: Large-scale Inverse Problems and Quantification of Uncertainty, June 6–June 10, 2011

Finite Element Circus, University of Minnesota, November 5–6, 2010.

Incompressible Fluids, Turbulence and Mixing, Carnegie Mellon University, October 13, 2011.

OpenMP workshop, University of Pittsburgh, May 1–2, 2012

John Barrett Lectures: Discontinuous Galerkin methods, Knoxville, TN, May 9–11, 2012.

CBMS Conference on Finite Element Exterior Calculus, Brown University, June 11–15, 2012.

Finite Element Circus, University of Pittsburgh, October 19–20, 2012.

MSRI Workshop: Fluid Mechanics, Hamiltonian Dynamics, and Numerical Aspects of Optimal Transportation, Berkeley, CA, October 14–18, 2013.

ICERM Workshop: Robust Discretization and Fast Solvers for Computable Multi-Physics Models, Providence, RI, May 12–16, 2014.

Finite Element Circus, University of Minnesota, October 24–25, 2014.

Finite Element Circus, Rutgers University, April 21–22, 2017.

IMA Workshop: Recent Advances and Challenges in Discontinuous Galerkin Methods and Related Approaches, June 29–July 1, 2017.

Joint Math Meeting, San Diego, January 10–13, 2018.

ICERM's Topical workshop: Celebrating 75 Years of Mathematics of Computation, November 1–3, 2018.

## Visitors for one+ month

Eligo Colmenares, Universidad de Concepción, June-August, 2015.

S. Battal Gazi Karakoc, Nevsehir University, June-September, 2013.

## Undergraduate Research

Michael Schneier, Fall, 2012.

Research topic: Numerical integration of singular functions on simplices.

Highlights:

- M. SCHNEIER, *Numerical integration of rational bubble functions with multiple singularities*, *Involve*, 8(2):233–251, 2015.
- MAA Poster Presentation at Joint Math Meetings, San Diego, January 9, 2013 (awarded Outstanding Presentation Award).
- Michael recently obtained his Ph.D at FSU.

Sameer Punjal, Summer 2015.

Research topic: Axisymmetric Stokes problem.

Eric Peterson, Fall 2017.

Research topic: The mathematics of signal processing.

Donald Falk, Summer 2018–Spring 2019.

Research topic: Anisotropic meshes in fluid flow simulation.

Benjamin Gardiner, Summer 2019.

Research topic: Exactly divergence-free methods.

## Graduate Students

### Former Ph.D. Students

Duygu Sap, Fall 2013–Summer 2017.

Thesis: Conforming Stokes elements yielding divergence-free approximations on quadrilateral meshes.

Current Position: Post-doc at International Computer Science Institute, UC Berkeley.

Mohan Wu, Fall 2015–Summer 2019. Thesis: Discrete Miranda–Talenti estimates and applications to linear and nonlinear PDEs.

### Current Ph.D. Students

Ahmed Zytoon, Fall 2016–present.

Research Topic: Axisymmetric Stokes problem

### M.S. Students

Lauren Hennings, Fall 2013–Summer 2014.

Thesis: *Finite element methods for PDEs in non-divergence form.*

Duygu Sap, Fall 2013–Summer 2014.

Thesis: *A finite element method for the Stokes problem on rectangular grids yielding divergence-free approximations.*

### Summer Projects

Sarah Khankan, Summer 2014.

Research topic: Mixed finite element methods for PDEs in non-divergence form.

Quinn Donahoe, Summer 2015.

Research topic: Variational problems with nonlinear constraints.

### M.A. Oral Exams

Zayd Ghoggali (Spring 2013) ◦ Cesar A. Simon (Spring 2014) ◦ Eric Bentley (Spring 2015) ◦ Yinan Wang (Summer 2017)

### M.S. Committee

Ian Martiny (Spring 2015)

## Comprehensive Exams

Duygu Sap (Spring 2015) ◦ Sarah Khankan (Spring 2015) ◦ Quinn Donahoe (Spring 2015) ◦ Eldar Khattatov (Spring 2015) ◦ Ilona Ambartsumyan (Spring 2015) ◦ Ali Pakzad (Spring 2015) ◦ Truong Nguyen (Summer 2016) ◦ Ahmed Zytoon (Spring 2017) ◦ Mohan Wu (Spring 2017) ◦ Joe Fiordelino (Spring 2017) ◦ Mohan Wu (Spring 2017) ◦ Ahmed Zytoon (Spring 2017) ◦ Xiaoyu Duan (Summer 2018) ◦ Wenlong Pei (Summer 2019)

## Ph.D. Overview Committee

Pu Song (Fall 2014) ◦ Yong Li (Fall 2015) ◦ Sarah Khankan (Fall 2015) ◦ Ilona Ambartsumyan (Summer 2016) ◦ Eldar Khattatov (Summer 2016) ◦ Duygu Sap (Spring 2016) ◦ Truong Nguyen (Fall 2016) ◦ Joe Fiordelino (Fall 2017) ◦ Quinn Donahoe (Fall 2017) ◦ Ali Pakzad (Fall 2017) ◦ Haiyun Zhao (Fall 2018) ◦ Victor DeCaria (Fall 2018) ◦ Michael McLaughlin (Spring 2019)

## Ph.D. Thesis Committee

Xin Xiong (Fall 2013) ◦ Yong Li (Spring 2016) ◦ Sarah Khankan (Fall 2016) ◦ Leitao Chen (Summer 2016, Mechanical Engineering) ◦ Pu Song (Spring 2017) ◦ Duygu Sap (Summer 2017) ◦ Thomas Brown (Spring 2018, University of Delaware, Mathematics) ◦ Ahmet Guzel (Spring 2018) ◦ Ilona Ambartsumyan (Spring 2018) ◦ Eldar Khattatov (Spring 2018) ◦ Joseph Fiordilino (Summer 2018) ◦ Ali Pakzad (Summer 2018) ◦ Quinn Donahoe (Fall 2018) ◦ Haiyun Zhao (Summer 2019) ◦ Victor DeCaria (Summer 2019)

## Teaching Experience

### University of Pittsburgh

Math 0413 - Introduction to Theoretical Mathematics, Fall 2012, Fall 2014  
Math 1070 - Numerical Analysis, Fall 2011, Fall 2013, Fall 2015, Fall 2016, Fall 2017, Fall 2018, Fall 2019  
Math 1080 - Numerical Linear Algebra, Spring 2012  
Math 2030 - Iterative Methods for Linear and Nonlinear Systems, Spring 2014, Spring 2016  
Math 2070 - Numerical Methods in Scientific Computing I, Fall 2012, Fall 2016  
Math 2071 - Numerical Methods in Scientific Computing II, Spring 2013, Spring 2015, Spring 2017.  
Math 2090 - Numerical Solution of Ordinary Differential Equations, Fall 2014, Fall 2018.  
Math 2601 - Advanced Scientific Computing I: Finite Element Methods for Nonlinear PDEs, Fall 2013  
Math 2601 - Advanced Scientific Computing I: Discontinuous Galerkin Methods, Fall 2015  
Math 2601 - Advanced Scientific Computing I: Structure-Preserving Discretizations, Fall 2017  
Math 3071 - Numerical Solutions of PDE, Fall 2019  
Math 3072 - Finite Element Method, Spring 2019

### The University of Tennessee

Math 141 - Calculus I, The University of Tennessee, Fall 2008  
Math 119 - College Algebra, The University of Tennessee, Spring 2006  
Math 125 - Basic Calculus, The University of Tennessee, 2005–2007