Nathan Collier

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EXPERTISE
earth system modeling, benchmarking, environmental modeling, surface flow, solid and fluid mechanics, computational hydrology, discretization methods, finite element methods, numerical linear algebra, isogeometric analysis, geometry, meshing

EXPERIENCE

Oak Ridge National Laboratory, Oak Ridge, TN 2014-present
Research Staff in the Computational Sciences and Engineering Division

Oak Ridge National Laboratory, Oak Ridge, TN 2013-2014
Post-doctoral fellow in the Environmental Sciences Division

King Abdullah University of Science and Technology, Thuwal, Saudi Arabia 2012-2013
Research scientist in the Center for Numerical Porous Media

King Abdullah University of Science and Technology, Thuwal, Saudi Arabia 2009-2012
Postdoctoral fellow with Victor Calo
Applied Mathematics and Computational Science
Earth Sciences and Engineering

Universidad de los Andes, Bogota, Colombia Summer 2010, 2012
Lectured jointly with Victor M. Calo two courses on Nonlinear Finite Element Analysis

University of Texas, Austin, TX Summer 2009
Postdoctoral fellow at the Institute for Computational and Engineering Sciences.

University of South Florida, Tampa, FL 2002-2009
Graduate student, Instructor, Research associate

EDUCATION

University of South Florida Tampa, FL
– Ph.D. in Civil Engineering, 2009
– M.S. in Mechanical Engineering, 2004
– B.S. in Mechanical Engineering, 2001

Florida College Tampa, FL
– Associate of Arts, 1999

COURSES TAUGHT

Programming for Engineers, 3 semesters

Basic Fluid Mechanics, 2 semesters

Nonlinear Finite Element Analysis, 2 semesters

Scientific Software Design, 1 semester

PERSONAL

Citizenship: United States of America

Languages: English (native), Spanish (fluent)

REVIEWER

Journal of Advances in Modeling Earth Systems

Computer Methods in Applied Mechanics and Engineering

Advances in Engineering Software

Journal of Computational Science

Procedia Computational Science

SIMULATION: Transactions of The Society for Modeling and Simulation International

Journal Publications

J30 - M Bode, N Collier, F Bisetti, H Pitsch. Adaptive chemistry lookup tables for combustion simulations using optimal B-spline interpolants. Combustion Theory and Modelling, 1-26.

J29 - D Garcia, M Ghommem, N Collier, BON Varga, VM Calo. PyFly: A fast, portable aerodynamics simulator. Journal of Computational and Applied Mathematics 344, 875-903.

J28 - N Collier, FM Hoffman, DM Lawrence, G Keppel-Aleks, CD Koven, *et al.*. The International Land Model Benchmarking (ILAMB) system: design, theory, and implementation. Journal of Advances in Modeling Earth Systems 10 (11), 2731-2754.

J27 - O Ogunro, S Elliott, O Wingenter, C Deal, W Fu, N Collier, F Hoffman. Evaluating Uncertainties in Marine Biogeochemical Models: Benchmarking Aerosol Precursors. Atmosphere 9 (5), 184.

J26 - C Grenier, H Anbergen, V Bense, Q Chanzy, E Coon, N Collier, F Costard, *et al.*. Groundwater flow and heat transport for systems undergoing freeze-thaw: Intercomparison of numerical simulators for 2D test cases. Advances in water resources 114, 196-218.

J25 - J. Kumar, F.M. Hoffman, W.W. Hargrove, N. Collier. Understanding the representativeness of FLUXNET for upscaling carbon flux from eddy covariance measurements. Earth System Science Data Discussions.

J24 - L. Dalcin, N. Collier, P. Vignal, A.M.A. Côrtes, V.M. Calo "PetIGA: A framework for high-performance isogeometric analysis" Computer Methods in Applied Mechanics and Engineering 308, 151–181.

J23 - D. Garcia, D. Pardo, L. Dalcin; M. Paszyński, N. Collier, V.M. Calo, "The Value of Continuity: Refined Isogeometric Analysis and Fast Direct Solvers," Computer Methods in Applied Mechanics and Engineering. Volume 316, 1 April 2017, Pages 586–605.

J22 - A.F. Sarmiento, A.M.A. Cortes, D.A. Garcia, L. Dalcin, N. Collier, V.M. Calo, "PetIGA-MF: a multi-field high-performance toolbox for structure-preserving B-splines spaces," Journal of Computational Science. Volume 18, January 2017, Pages 117—131.

J21 - A. Cortes, L. Dalcin, A. Sarmiento, N. Collier, V.M. Calo, "A scalable block-preconditioning strategy for divergence-conforming B-spline discretizations of the Stokes problem," Volume 316, 1 April 2017, Pages 1179–1214.

J20 - P. Vignal, N. Collier, L. Dalcin, D.L. Brown, V.M. Calo, "An energy-stable time-integrator for phase-field models," Computer Methods in Applied Mechanics and Engineering. Volume 316, 1 April 2017, Pages 1179–1214.

J19 - J. Kumar, N. Collier, G. Bisht, R.T. Mills, P.E. Thornton, C.M. Iversen, and V. Romanovsky, "Modeling the spatio-temporal variability in subsurface thermal regimes across a low-relief polygonal tundra landscape," *The Cryosphere*, 2016. 10.5194/tc-10-2241-2016

J18 - P. Vignal, L. Dalcin, D.L. Brown, N. Collier, V.M. Calo, "An energy-stable convex splitting for the phase-field crystal equation", Computers & Structures, Volume 158, 2015, Pages 355-368

J17 - N. Collier, A.L. Haji-Ali, F. Nobile, E. von Schwerin, R. Tempone, "A Continuation Multilevel Monte Carlo algorithm". BIT Numerical Mathematics, 55 (2), 399-432.

J16 - N. Collier, L. Dalcin, and V. M. Calo, "On the Computational Efficiency of Isogeometric Methods for Smooth Elliptic Problems using Direct Solvers," Internation Journal of Numerical Methods in Engineering, (accepted) 2014.

J15 - A. H. Niemi, N. O. Collier, V. M. Calo. "Analysis of the Discontinuous Petrov-Galerkin Method with Optimal Test Functions for the Reissner-Mindlin Plate Bending Model," Computers & Mathematics with Applications, Volume 66, Issue 12, January 2014, Pages 2570-2586.

J14 - A. H. Niemi, N. O. Collier, V. M. Calo. "Automatically stable discontinuous Petrov-Galerkin methods for stationary transport problems: Quasi-optimal test space norm," Computers & Mathematics with Applications, Volume 66, Issue 10, December 2013, Pages 2096-2113.

J13 - M. Ghommem, N. Collier, A. H. Niemi, and V. M. Calo, "On the Shape Optimization of Flapping Wings and their Performance Analysis," Aerospace Science and Technology, November 2013.

J12 - N. Collier, L. Dalcin, D. Pardo, V. M. Calo. "The cost of continuity: performance of iterative solvers on isogeometric finite elements," SIAM Journal on Scientific Computing 2013 35:2, A767-A784.

J11 - V. M. Calo, N. Collier, M. Gehre, B. Jin, H. Radwan and M. Santillana. "A gradient-based estimation of Manning's friction coefficient from noisy data". *Journal of Computational and Applied Mathematics*. 238 (2013). pp 1-13.

J10 - D. Pardo, M. Paszynski, N. Collier, J. Alvarez, L. Dalcin, and V. M. Calo, "Direct Solvers for Galerkin Methods". *Spanish Society for Applied Mathematics Journal* 57 (2012).

J9 - N. Collier, D. Pardo, L. Dalcin, M. Paszynski, and V. M. Calo, "The cost of continuity: a study of the performance of isogeometric finite elements using direct solvers," *Computer Methods in Applied Mechanics and Engineering*, 213-216(0), pp 353–361, 2012.

J8 - N. Collier, H. Radwan, L. Dalcin, and V. M. Calo, "Time Adaptivity in the Diffusive Wave Approximation to the Shallow Water Equations," *Journal of Computational Science*, 2011.

J7 - A. H. Niemi, N. O. Collier, and V. M. Calo, "Discontinuous Petrov-Galerkin method based on the optimal test space norm for, steady transport problems in one space dimension," *Journal of Computational Science*, 2011.

J6 - N. Collier and D. C. Simkins, "The quasi-uniformity condition for reproducing kernel element method meshes," *Computational Mechanics*, vol. 44, pp. 333–342, Mar. 2009.

J5 - D. C. Simkins, A. Kumar, N. Collier, and L. B. Whitenack, "Geometry representation, modification and iterative design using RKEM," *Computer Methods in Applied Mechanics and Engineering*, pp. 4304–4320, 2007.

J4 - N. Collier and S. Kranc, "Optimizing Facilities Placement and Automating Permit Process for Improved Utility Corridor Development," *Transportation Research Record*, vol. 1984, 2006.

J3 - N. Collier, A. Kaw, G. Besterfield, and M. Rahman, "Effects of Staged Cooling in Shrink-Fitting Compounded Cylinders," *The Journal of Strain Analysis for Engineering Design*, vol. 41, pp. 349–361, 2006.

J2 - N. Collier and A. Kaw, "On Comparing Computational Systems - Maple, Mathcad, Mathematica and Matlab," *Computers in Education Journal*, vol. 14, pp. 12–24, 2004.

J1 - A. Kaw, N. Collier, M. Keteltas, J. Paul, and G. Besterfield, "Holistic but Customized Resources for a Course in Numerical Methods," *Computer Applications in Engineering Education*, vol. 11, pp. 203–210, 2003.

BOOK
CHAPTERS

B2 - D. C. Simkins, N. Collier, and J. B. Alford, "Meshfree Modeling in Laminated Composites," *Meshfree Methods for Partial Differential Equations VI*, vol. 89, 2012.

B1 - D. C. Simkins, N. Collier, M. Juha, L. B. Whitenack, "A Framework for Studying the RKEM Representation of Discrete Point Sets," *Meshfree Methods for Partial Differential Equations IV*, vol. 65, pp. 301–314, 2008.

REFEREED
CONFERENCE
PUBLICATIONS

C16 - Y Lu, J Kumar, N Collier, B Krishna, MA Langston. Detecting outliers in streaming time series data from ARM distributed sensors. 2018 IEEE International Conference on Data Mining Workshops (ICDMW), 779-786.

C15 - P. Vignal, L. Dalcin, N. Collier, V.M. Calo "Modeling Phase-transitions Using a High-performance, Isogeometric Analysis Framework", in *Procedia Computer Science*, Volume 29, 2014, Pages 980–990

C14 - A. Sarmiento, D. Garcia, L. Dalcin, N. Collier, V.M. Calo, "Micropolar Fluids Using B-spline Divergence Conforming Spaces", in *Procedia Computer Science*, Volume 29, 2014, Pages 991–1001

C13 - M. Abdelkader, M. Shaqura, M. Ghommem, N. Collier, V.M. Calo, C. Christian, "Optimal multi-agent path planning for fast inverse modeling in UAV-based flood sensing applications", in *2014 International Conference on Unmanned Aircraft Systems (ICUAS)*, 2014, 64–71

C12 - L.M. Bernal, V.M. Calo, N. Collier, G.A. Espinosa, F. Fuentes, J.C. Mahecha, "Isogeometric Analysis of Hyperelastic Materials Using PetIGA", in *Procedia Computer Science*, Volume 18, 2013, Pages 1604-1613

C11 - Philippe A. Vignal, Nathan Collier, V.M. Calo, "Phase Field Modeling Using PetIGA", in *Procedia Computer Science*, Volume 18, 2013, Pages 1614-1623

C10 - M. Ghommem, N. Collier, A. H. Niemi, and V. M. Calo, "Shape Optimization and Performance Analysis of Flapping Wings," in *CST2012: The Eleventh International Conference on Computational Structures Technology*, 2012.

C9 - A. H. Niemi, N. Collier, L. Dalcin, M. Ghommem, V. M. Calo, "Isogeometric Shell Formulation Based on a Classical Shell Model," in *CST2012: The Eleventh International Conference on Computational Structures Technology*, 2012.

C8 - J. Alvarez-Aramberri, D. Pardo, M. Paszynski, N. Collier, L. Dalcin, and V. M. Calo, "On Round-off Error for Adaptive Finite Element Methods," in *Procedia Computer Science*, 2012.

C7 - N. O. Collier, M. Sieniek, "Agent-based algorithm for spatial distribution of objects," in *Procedia Computer Science*, 2012.

C6 - V. M. Calo, N. O. Collier, D. Pardo, and M. R. Paszyński, "Computational complexity and memory usage for multi-frontal direct solvers used in p finite element analysis," in *Procedia Computer Science*, pp. 1854–1861, 2011.

C5 - C. C. Douglas, G. Qin, N. Collier, and B. Gong, "Intelligent fracture creation for shale gas development," in *Procedia Computer Science*, pp. 1745–1750, 2011.

C4 - A. H. Niemi, N. O. Collier, and V. M. Calo, "Discontinuous Petrov-Galerkin method based on the optimal test space norm for one-dimensional transport problems," in *Procedia Computer Science*, pp. 1862–1869, 2011.

C3 - N. Collier, H. Radwan, L. Dalcin, and V. M. Calo, "Diffusive Wave Approximation to the Shallow Water Equations: Computational Approach," in *Procedia Computer Science*, pp. 1828–1833, 2011.

C2 - N. Collier, H. Lee, A. Ahmadia, C. C. Douglas, and V. M. Calo, "GPU Acceleration of the Assembly Process for Isogeometric Analysis," in *High-performance and Hardware-aware Computing: Proceedings of the Second International Workshop on New Frontiers in High-performance and Hardware-aware Computing* (J.-P. Buchty, rainer and Wei\ss, ed.), 2011.

C1 - N. Collier and V. Calo, "Automatic terrain modeling using transfinite element analysis," in *Procedia Computer Science*, vol. 1, pp. 1963–1970, 2010.

Software Projects

S4 - N. Collier, F. Hoffman, The ILAMB Benchmarking System,
`https://bitbucket.org/ncollier/ilamb.git`.

S3 - B. Andre, G. Bisht, N. Collier, G. Hammond, S. Karra, J. Kumar, P. Lichtner, R. Mills, PFLOTRAN: A Massively Parallel Reactive Flow and Transport Model for describing Surface and Subsurface Processes `http://www.pflotran.org/`.

S2 - L. Dalcin, N. Collier, igakit: python toolkit for suitable generation of geometry for isogeometric analysis. `https://bitbucket.org/dalcinl/igakit`.

S1 - L. Dalcin, N. Collier, PetIGA: A framework for high performance Isogeometric Analysis. `https://bitbucket.org/dalcinl/petiga`.