Nicholas A. Danes

Computational Scientist

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SUMMARY

Computational scientist with over 10 years combined experience in industry and academia:

- Extensive background in the implementation of computational algorithms within existing finite element method codes for mathematical modeling coupled to CFD; modifying computational physics methods with innovative extensions using object oriented and distributed-memory parallel programming
- Experience with developing, building, benchmarking and running codes on high performance computing (HPC) clusters
- On and off-site technical customer support for HPC applications, modeling & simulation projects
- Excellent teamwork through interpersonal communication and interdisciplinary collaboration with experimentalists, mathematicians and engineers
- Flexibility in completing self-conducted review to learn new tools for a project, whether it be a programming language, numerical method or modeling program

EDUCATION

Colorado School of Mines, PhD in Computational & Applied Mathematics   **December 2019**

PhD Advisor: Dr. Karin Leiderman

- Dissertation: *Computational modeling of extravascular platelet aggregation under flow*
- MATH440 - Parallel Scientific Computing

Ph.D., Applied Mathematics (Continued at Mines) August 2013 - July 2016   **August 2013 - July 2016**

University of California, Merced, Left to Colorado School of Mines Research: Computational Model of Extravascular Platelet Aggregation Advisor: Dr. Karin Leiderman

California State University, Bakersfield, BS in Mathematics - Applied   **June 2013**

- 3.82 GPA, Magna Cum Laude
- Minor in Computer Science

WORK EXPERIENCE

Computational Scientist
Colorado School of Mines, Information Technology (IT)   **August 2020 – Present**

- Member of the Research Computing (RC) group under IT where main duties include:
  - Supporting HPC users on technical and non-technical issues with research computing
  - Building, porting and scaling applications & software libraries on Mines' HPC cluster systems
  - Lead on developing and providing new technical information & user guides for Mines HPC users via RC Mines website
  - Providing per-semester training workshops on Intro to HPC & Intro to MPI using Python
  - Fostering community through "Tech Talk Tuesdays" monthly meetings

Computational Engineer I
Ball Aerospace & Technologies   September 2019 – August 2020

- Utilized massively parallel coupled multi-physics codes for modeling and simulation
- Aided in code development of a Python written model using object-oriented principles with user documentation in a version control environment (git)
- Conducted parallel scaling studies on massively parallel coupled multiphysics codes to benchmark runtimes and identify solver bottlenecks for specific modeling problems
- Built scientific computing (MPI-enabled) libraries from source on workstation and high-performance computing clusters; provided user documentation on successful builds
- Collaborated with a team of Ball engineers and sub-contractors to develop and verify/validate coupled multiphysics codes

RESEARCH EXPERIENCE

Graduate Student Researcher
Colorado School of Mines, Department of Applied Mathematics & Statistics   August 2016 – 2019
University of California, Merced, Department of Applied Mathematics   August 2014 – 2016

Advisor: Dr. Karin Leiderman | Funding: NIH R01HL120728

- Developed and validated a 2D computational model of extravascular platelet aggregation within the FEniCS software suite; model involves solving a large system of partial differential equations to account for fluid dynamics & platelet aggregation
- Code development includes novel changes to existing numerical algorithms; solved using multiple processing cores on Colorado School of Mines' "Mio" high performance computing cluster
- Compared and cross-validated model outputs with microfluidic experiments and reduced-order mathematical models
- Wrote technical reports, papers and presented research at major conferences

Research Intern
National Renewable Energy Lab (NREL), Computational Science Center   June – August 2017

Mentors: Drs. H. Sitarman, J. Stickel & M. A. Sprague | Funding: NSF DMS-155122

- Implemented, and validated a 3D model of lignocellulosic biomass conversion into an existing CFD code
  - Simulations of model were run using the NREL high performance computing cluster "Peregine"
- Presented work at the 2017 APS-DFD conference
- Edited and reviewed manuscript submitted for publication

Undergraduate Researcher
California State University, Chico   June – August 2012

Mentor: Dr. Sergei Fomin | Funding: NSF DMS-1156612 Chico, CA

- Used a combination of perturbation methods, asymptotic analysis and numerical simulation to study rimming flow inside a cylinder
- Collaborated with a teacher and other undergraduate math students with research, writing and presentations

AWARDS

GRADS Poster Award Spring 2017

- Colorado School of Mines
- Poster Title: *Toward A Mathematical Model of Hemostasis*
- Awarded 1st place in Session I of the College of Engineering & Computational Science Division

Research Fellowship Summer 2014
- University of California Merced, School of Natural Sciences

Mathematics Chair Award 2013
- California State University, Bakersfield, Department of Mathematics

Jazz Festival Scholarship 2012
- California State University, Bakersfield, Department of Mathematics

PUBLICATIONS

Link, K.G., Sorrells, M.G., **Danes, N.A.**, Neeves, K.B., Leiderman, K. and Fogelson, A.L., 2020. *A mathematical model of platelet aggregation in an extravascular injury under flow.* Multiscale modeling & simulation, 18(4), pp.1489-1524.

Danes, N.A. and Leiderman, K., 2019. *A density-dependent FEM-FCT algorithm with application to modeling platelet aggregation.* International journal for numerical methods in biomedical engineering, 35(9), p.e3212.

Sitaraman, H., **Danes, N.**, Lischeske, J.J., Stickel, J.J. and Sprague, M.A., 2019. *Coupled CFD and chemical-kinetics simulations of cellulosic-biomass enzymatic hydrolysis: Mathematical-model development and validation.* Chemical Engineering Science, 206, pp.348-360.

Schoeman, R.M., Rana, K., **Danes, N.**, Lehmann, M., Di Paola, J.A., Fogelson, A.L., Leiderman, K. and Neeves, K.B., 2017. *A microfluidic model of hemostasis sensitive to platelet function and coagulation.* Cellular and molecular bioengineering, 10, pp.3-15.

Fomin, S., Shankar, R., **Danes, N.**, Yasuda, A. and Chugunov, V., 2014. Rimming flow of a weakly elastic fluid. Theoretical and Computational Fluid Dynamics, 28, pp.485-498.

MENTORING

Undergraduate Research Mentor, Topic: Mathematical modeling of blood coagulation Fall 2018
Mentor for Community College Research Workshop (Colorado School of Mines) June 2018

CONFERENCES & PRESENTATIONS

SIAM Life Sciences, Minneapolis, MN August 2018
- Presentation: A Mathematical Model of Extravascular Platelet Aggregation
- Siession: Multiscale Modeling of Biomechanical and Biochemical Systems - Part II of II

WCCMXIII & PANACM II, New York City, NY July 2018
- Presentation: A Mathematical Model of Extravascular Platelet Aggregation
- Session: Computational Multiphysics Modeling Of Cardiovascular Systems

Colorado School of Mines GRADS, Golden, CO April 2018
- Presentation: A computational model of platelet aggregation under flow

70th Annual Meeting of APS-DFD, Denver, CO November 2017
- Presentation: A coupled CFD and two-phase substrate kinetic model for enzymatic hydrolysis of lignocellulose
- Session: Reacting Flows: General I
- Co-Author(s): Drs. Jonathan Stickel, Michael A. Sprague, Hariswaran Sitaraman

- Other: Student Volunteer

SIAM Central States, Colorado State University, Fort Collins, CO September-October 2017

- Presentation: Toward a Mathematical Model of Hemostasis
- Session: Mathematically-based Insights into Health and Disease

RMFM Research Symposium, CU Boulder, Boulder, CO August 2017

- Presentation: Toward a Mathematical Model of Hemostasis
- Session: Biology, Surfaces and Droplets

Math Bio Alumni Conference, University of Utah, Salt Lake City, UT July 2017

- Poster: Toward A Mathematical Model of Hemostasis

SIAM Dynamical Systems, Snowbird, UT May 2017

Presentation: A Computational Model of Hemostasis

- Session: Mathematical Model of Physiology and Medicine - Part II

Colorado School of Mines GRADS, Golden, CO April 2017

- Poster: Toward A Mathematical Model of Hemostasis

SIAM Computational Science & Engineering, Atlanta, GA Feburary-March 2017

- Poster: Toward A Mathematical Model of Hemostasis

SIAM Life Sciences, Boston, MA July 2016

- Co-organizer of Minisymposium: Mathematical Models of Coagulation
- Presentation: Pressure Boundary Conditions in a Computational Bleeding Chip Model

Computational Biofluids in Physiology, University of Utah, Salt Lake City, UT May 2015

- Poster: A Mathematical Model of Factor Xa Regulation by Rivaroxaban

TEACHING EXPERIENCE

Teaching Assistant - January 2016 - May 2016

- Instructor: Karin Leiderman
- University of California, Merced, Department of Applied Mathematics
  - Ran the discussion section for Numerical Analysis I. Met with students once a week to discuss practical implementations of programs using Matlab, as well as graded homeworks and exams.
  - Held office hours weekly to assist students with homework and general lecture questions.

Teaching Assistant - August 2014 - December 2014

- Instructor: Francois Blanchette
- University of California, Merced, Department of Applied Mathematics
  - Ran the discussion section for Numerical Analysis I. Met with students once a week to discuss practical implementations of programs using Matlab, as well as graded homeworks and exams.
  - Held office hours weekly to assist students with homework and general lecture questions.

Teaching Assistant - January 2014 - May 2014

- Instructor: Dimitrios Mitsotakis
- University of California, Merced, Department of Applied Mathematics - Ran the discussion section for Numerical Analysis I. Met with students once a week to discuss practical implementations of programs using Matlab, as well as graded homeworks and exams. - Held office hours weekly to assist students with homework and general lecture questions.

Teaching Assistant - August 2013 - December 2013

- Instructor: Alexander Yatskar
- University of California, Merced, Department of Applied Mathematics

- Ran the discussion section for Calculus II for the Physical Sciences and Engineering. Assisted students with weekly worksheet/lab sessions, answered questions in class, held weekly office hours, graded and proctored exams. T

Teaching Assistant June 2013 - August 2013

- Instructor: Haik Stephanian
- University of California, Merced, Department of Applied Mathematics
  - Ran the discussion section for Vector Calculus. Assisted students with bi-weekly worksheet/lab sessions, answered questions in class, held weekly office hours, and graded homework and exams.

Teaching Assistant April 2013 - June 2013

- Instructor: Rebecca Larson
- California State University Bakersfield, Department of Mathematics
  - Assisted professor in grading homework, quizzes, and labs for her Calculus III for Engineering course.
  - Led the lab section of the course to serve as a in-class tutor for students.

Teaching Assistant September 2012 - March 2013

- Instructor: Yangsuk Ko
- California State University Bakersfield, Department of Mathematics
  - Assisted professor in grading homework, quizzes, and labs for his Calculus I and Calculus II for Engineering courses.
  - Led the lab section of the course to serve as a in-class tutor for students.

Mathematics Tutor September 2011 - June 2013

- California State University, Bakersfield, Department of Mathematics
  - Tutored students taking undergraduate courses in Finite Math, Pre-Calculus, Trigonometry, Statistics, and Single/Multivariable Calculus through an on-campus mathematics tutoring center

SKILLS

Computer Skills

Proficient	HTML, CSS, Markdown, Git, C/C++, Bash
Intermediate	Matlab, LaTeX, Fortran 77/90, Nek5000, Paraview, MPI, Slurm, Linux
Advanced	Python (NumPy, SciPy, PETSc4Py, Matplotlib), FEniCS

Math

- Numerical Solution of Ordinary & Partial Differential Equations, Numerical Anaylsis, Computational Fluid Dynamics, Linear Algebra

Other

- Formal presentations to groups and/or conferences, technical writing
- Interdisciplinary communication for research projects, papers, and presentations

PROFESSIONAL MEMBERSHIPS

Association for Computing Machinery (ACM)

- 2020 to Present