

# SIBUSISO MABUZA

www.linkedin.com/in/sibusiso-mabuza-math · ssmabuza.github.io

## EDUCATION

---

- University of Houston** *May 2014*  
Ph.D. in Applied Mathematics
- Ohio University** *June 2009*  
M.S. in Applied Mathematics

## EXPERIENCE

---

- JMP Statistical Discovery LLC** April 2022 - Present  
*Sr. Associate Software Developer* *Cary, NC*
- Developer for the JMP software and JSL scripting language, added new features, fixed bugs.
  - Did C++ development for cross platform GUI applications on the JMP API and on OpenGL and Qt.
  - Implemented new features in Statistical Visualization Graph Builder part of the JMP Software.
  - Trained in JMP, Software Development Lifecycle, Statistical Thinking for Industrial Problem Solving.
- Clemson University** August 2019 - April 2022  
*Assistant Professor* *Clemson, SC*
- Taught graduate courses on finite element methods, data structures, and scientific computing.
  - Research work on high order finite element methods for shock and combustion hydrodynamics.
  - Research work on monolithic methods for chemical transport in visco-poroelastic materials.
  - Developed *Valiant*, a parallel C++ CFD solver based on the Kokkos and Trilinos software stack.
  - Wrote peer-reviewed papers, presented work in international conferences, workshops & seminars.
- Sandia National Laboratories** February 2016 - July 2019  
*Postdoctoral Appointee* *Albuquerque, NM*
- Worked on finite element methods for magnetohydrodynamics and multifluid plasma models.
  - Developer for *Drekar* an open source U.S. DOE “C++ Parallel CFD and Plasma Physics code.”
  - Designed algebraic stabilized schemes for continuous finite elements in shock hydrodynamics.
  - Implemented CMake unit tests, did debugging and general software maintenance for *Drekar*.
- University of Würzburg** October 2014 - January 2016  
*Scientific Researcher* *Würzburg, Germany*
- Developer for *DGJAC*, a parallel, adaptive, DG C++ code based on the PETSc software stack.
  - Designed, implemented stabilized discontinuous Galerkin schemes for ideal magnetohydrodynamics.

## PUBLICATIONS

---

- M.M. Crockatt, S. Mabuza, J.N. Shadid, S. Conde, T.M. Smith, and R.P. Pawlowski, “**An Implicit Monolithic AFC Stabilization Method for the CG Finite Element Discretization of the Fully-ionized Collisionless Multifluid Electromagnetic Plasma System,**” *J. Comput. Phys.*, **464** (2022) 111228
- S. Badia, J. Bonilla, S. Mabuza, and J.N. Shadid, “**On differentiable local bounds preserving stabilization for Euler equations,**” *Comput. Methods Appl. Mech. Engrg.* **370** (2020) 113267
- S. Mabuza, J.N. Shadid, E.C. Cyr, R.P. Pawlowski, D. Kuzmin, “**A linearity preserving nodal variation limiting algorithm for continuous Galerkin discretization of ideal MHD equations,**” *J. Comput. Phys.*, **410** (2020) 109390

J. Bonilla, S. Mabuza, J.N. Shadid, and S. Badia, “**On Differentiable Linearity and Local Bounds Preserving Stabilization Methods for First Order Conservation Law Systems,**” in *Center for Computing Research Summer Proceedings 2018*, A. Cangi and M. L. Parks, eds., Sandia National Laboratories, (2018)

S. Mabuza, J.N. Shadid, D. Kuzmin, “**Local bounds preserving stabilization for continuous Galerkin discretization of hyperbolic systems,**” *J. Comput. Phys.*, **361**, 82-110 (2018).

C. Lohmann, D. Kuzmin, J.N. Shadid, S. Mabuza, “**Flux-corrected transport algorithms for continuous Galerkin methods based on high order Bernstein finite elements**”, *J. Comput. Phys.*, **344**, 151-186 (2017)

S. Mabuza, S. Čanić, B. Muha, “**Modeling and analysis of reactive solute transport in deformable channels with wall adsorption-desorption,**” *Math. Meth. Appl. Sci.*, **39 (7)**, 1780-1802 (2016)

S. Mabuza, and D. Kuzmin, “**A nonlinear ALE-FCT scheme for non-equilibrium reactive solute transport in moving domains,**” *Int. J. Numer. Methods Fluids* **76**, no. 11, 875–908 (2014).

S. Mabuza, D. Kuzmin, S. Čanić, and M. Bukač, “**A conservative, positivity preserving scheme for reactive solute transport problems in moving domains,**” *J. Comput. Phys.*, **276**, 563–595 (2014)

## TEACHING

---

### Clemson University

*Assistant Professor*

August 2019 - August 2022

- Numerical Methods for Engineers (Fall 2019, Spring 2020, Fall 2020, Fall 2021)
- Scientific Computing (Spring 2020)
- Data Structures (Fall 2020, Fall 2021)
- Finite Element Methods (Spring 2021, Spring 2022)
- Advanced Engineering Mathematics (Summer 2022)

### University of Houston

*Teaching Fellow*

August 2009 - August 2013

- Calculus II (Fall 2009, Spring 2010, Fall 2011, Fall 2012)
- Calculus I (Spring 2010, Summer 2010, Spring 2012)

### Ohio University

*Teaching Assistant*

August 2007 - June 2009

- College Algebra (Fall 2007, Winter 2008, Spring 2008, Winter 2009)
- Precalculus (Fall 2008, Spring 2009)

## COMPUTING EXPERIENCE

---

- **C++**: 11 years
- **Python**: 3 years
- **MATLAB**: 15 years
- **CFD Tools** (FreeFem++, ParaView, Cubit): 8 years
- **APIs** (Trilinos, PETSc): 8 years

## TECHNICAL STRENGTHS

---

<b>Scientific Areas</b>	High Performance Computing, Software Engineering Finite Element Methods, Computational Fluid Dynamics
<b>Computer Languages</b>	C/C++, Python
<b>Protocols &amp; APIs</b>	Kokkos, XML, Trilinos, PETSc, Eigen
<b>Tools</b>	Git, Vim, KDevelop, CLion, Pycharm
<b>Other Software</b>	Paraview, MATLAB/Octave

## SERVICE

---

- Member of Committee on Research, School of Math & Stat Sciences, Clemson University, 2020-2022.
- Member of Ad-hoc Committee on Inclusive Excellence and Climate, School of Math & Stat Sciences, Clemson University, 2019-2022.
- Student Representative, Dept. of Chemistry, University of Swaziland, 2005-2006.

## CONFERENCES & WORKSHOPS

---

- *Colloquium, Department of Mathematics*, University of Eswatini, Virtual, Kwaluseni, Eswatini, (invited) (January 13, 2022)
- *An Evening with the Professor Seminar*, African Institute for Mathematical Sciences, Virtual, Cape Town, South Africa, (invited) (December 9, 2021)
- *ICOSAHOM 2021, International Conference on Spectral and High Order Methods*, Virtual, Vienna Austria, (July 12 - 16, 2021)
- *Applied Mathematics Seminar*, Texas Tech University, Virtual (invited) (April 30, 2021)
- *AMS Fall Central Sectional Meeting*, Virtual, (invited) (September, 12, 2020)
- *Rising Star Symposium*, Clemson University, Clemson, SC (invited) (September, 9, 2020)
- *The 5th Annual Meeting of SIAM Central States Section*, Iowa State University, Ames, IA (invited) (October, 2019)
- *FEF 2019, IACM 20th International Conference on Fluid Flow Problems*, Chicago, IL, (invited) (March, 2019)
- *Joint Mathematics Meetings*, Jan 16 – 19, 2019, Baltimore, MD.
- *BAIL 2018, The International Conference on Boundary and Interior Layers*, June 18 – 22, Glasgow, United Kingdom.
- *ECCM-ECFD 2018*, June 11 – 15, 2018, Glasgow, United Kingdom.
- *Oberseminar Applied Mathematics III*, April 05, 2018, Technische Universität Dortmund, Dortmund, Germany.
- *MultiMat 2017*, September 18 - 22, 2017, Santa Fe, NM.
- *2017 SIAM Annual Meeting*, July 10 - 14, 2017, Pittsburg, PA
- *Recent Advances and Challenges in Discontinuous Galerkin Methods and Related Approaches*, June 29 - July 01, 2017, Institute for Mathematics and its Applications, Minneapolis, MN.
- *IACM 19th International Conference on Finite Elements in Flow Problems - FEF 2017*, April 2017, Rome, Italy.
- *2017 SIAM Conference on Computational Science and Engineering*, February 2017, Atlanta, GA.
- *MultiMat 2015*, September 2015, Würzburg, Germany.
- *DAAD Conference on Modeling Change - Changing the world*, June 2015, Universität Würzburg, Würzburg, Germany.
- *The 13th European Finite Element Fair*, June 2015, Prague, Czech Republic
- *Higher Order Numerical Methods for Evolutionary PDEs: Applied Mathematics Meets Astrophysical Applications*, May 2015, Banff International Research Station, Alberta, Canada
- *Oberseminars in Applied Mathematics III*, February 2015, Technische Universität Dortmund, Dortmund, Germany.
- *DG and moving mesh seminar in Angewandte Analysis*, November 2014, Universität Würzburg, Würzburg, Germany.
- *Oberseminars in Angewandte Analysis*, October 2014, Universität Würzburg, Würzburg, Germany.
- *2013 Workshop for Young Researchers in Mathematical Biology (WYRNB)*, Fall 2013, Mathematical Bioscience Institute, Ohio State University, Columbus OH.
- *Special Scientific Computing Seminar*, Spring 2013, University of Houston, Houston TX.
- *UH SIAM Graduate Student Paper Presentation Event*, Spring 2013, University of Houston, Houston TX.

- *International Workshop “Advances in Nonlinear Science”*, Spring 2013, University of Pittsburgh, Pittsburgh PA.
- *Finite Element Circus*: Fall 2012, University of Pittsburgh, Pittsburgh PA.
- *MathWorks and Rice University Research Computing Parallel Computing Workshop*, Fall 2012 , Rice University, Houston, Texas.
- *Finite Element Rodeo*, Spring 2012, Rice University, Houston Texas.
- *IMA Special Workshop on Career Options for Under-represented Groups in Mathematical Sciences*, Spring 2010, Institute for Mathematics and its Applications, Minneapolis, MN.
- *Workshop on Interdisciplinary Mathematics*, Spring 2010, Penn State University, State College, PA.

## SCHOLARSHIPS AND AWARDS

---

- 1<sup>st</sup> prize for SIAM (University of Houston) chapter student presentations, Spring 2013.
- Teaching Fellowship, University of Houston, Mathematics Department, 2009-2014.
- Research Assistantship, University of Houston, Mathematics Department, 2011-2014.
- Teaching Assistantship, Ohio University, Mathematics Department, 2007-2009.
- Vice Chancellor’s Prize, University of Swaziland, 2007.
- Dean’s Prize, Faculty of Science, University of Swaziland, 2007.
- Swaziland Government Scholarship, University of Swaziland, 2003-2007.

## MEMBERSHIP

---

- Society for Industrial and Applied Mathematics
- American Mathematical Society
- National Association of Mathematicians

## LANGUAGES

---

English