

# ELIZABETH C. SMITH, PhD, PE

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Assistant Professor, Mechanical Engineering Technology  
William States Lee College of Engineering  
Department of Engineering Technology and Construction Management  
University of North Carolina at Charlotte

## EDUCATION

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- 2016      PhD, North Carolina State University  
Mechanical Engineering (Computational Fluid Dynamics)  
Dissertation: Application of the Meshless Local Petrov-Galerkin Method to Unsteady, Multi-Dimensional Fluid Dynamics with Interfaces
- 2005      MS, Pennsylvania State University  
Mechanical Engineering (Computational Fluid Dynamics)  
Thesis: Direct Numerical Simulation of Pulsatile Blood Flow Past an Arterial Stenosis
- 2003      BS, North Carolina State University  
Mechanical Engineering, *Cum Laude*  
Minor: Business Administration

Professional Engineer Licensed in NC (#034977)

## EXPERIENCE

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- January 2020 - Present      **University of North Carolina at Charlotte**      Charlotte, NC  
Assistant Professor, Mechanical Engineering Technology
- Taught course in the areas of thermal science, fluid mechanics, and computer applications
  - Conducted research in novel numerical methods, human physiological modeling, and augmented reality engineering simulations
  - Organized and hosted *Critical Thinking Lunch Seminars* to promote interest in graduate school and programming among upper level classman
- November 2014- January 2020      **Securboraton, Inc**      Cary, NC  
Senior Project Manager
- Management*
- Responsible for project planning, software architecture design, data model design, technical documentation, training materials, and system testing

December 2020

- Served as technical point of contact with AFRL and DTIC customers, this included in person presentations

*Software Development*

- Designed and implemented User Interfaces in both Java as well as JavaScript/HTML
- Performed backend development including interfacing with databases, multi-threading the applications, profiling and optimizing, and data model implementation
- Developed new algorithms for semantic analysis, with a patent pending

*Business Development*

- Worked as part of the business development team to identify new customers and areas of work
- Wrote proposals for these new opportunities

October 2017-  
December 2019

**e<sup>trio</sup>, LLC**

Cary, NC

*Co-Owner*

- Founded company focused on providing cost-effective, easy-to-use technologies for education, museums, research labs, and other STEM activities
- Responsible for end-to-end product cycles, requirements generation, product development, documentation, testing, and training
- Performed all software development for both released products
- Performed engineering analysis to develop and implement calibration procedures, characterize system performance, and quantify system accuracy
- Collaborated with educators on integrating technology into classrooms from elementary school through college

January 2005-  
February 2014

**Applied Research Associates, Inc**

Raleigh, NC

*BioGears Project Technical Integration Lead (Oct 2013 –Feb 2014)*

*HumanSim Product Line Manager (July 2012 – Feb 2014)*

- Created new models of human physiological processes within an existing lumped parameter model system
- Optimized and generalized existing logic for complex patient care scenarios
- Analyzed existing code and functionality, created and implemented object-oriented design, documented functionality and limitations of the methodology
- Developed project plan to convert existing Physiology Simulation Engine into modern, stable, extendable open source tool
- Managed multiple training application/serious game development projects focused on healthcare

*Lead Engineer Integrated Munitions Effects Assessment (IMEA), DTRA software development program (Jan 2010 – Dec 2011)*

*Technical Lead for Airblast, Blast Door Response, Agent Transport and Lethality (IMEA) (Jan 2008 – Jul 2012)*

- Performed engineering research, model development (FORTRAN, C++), and verification and validation
- Developed data analysis and automation tools for both model development and quality control
- Coordinated simultaneous tasks, resolved conflicts, identified overlaps, and ensured individual tasks combined to create a cohesive, comprehensive simulation capability
- Served as customer point of contact for engineering and software questions

*Validation and Verification Lead IMEA 2010*

- Assisted team with interpretation, evaluation, and documentation of data comparisons
- Authored numerous validation and verification reports
- Served as primary point of contact for external subject matter experts

*Staff Scientist/Engineer (January 2005 – January 2008)*

- Performed extensive software development in FORTRAN and C++
- Developed fast running approximation tools for probabilistic analysis
- Conducted analysis and authored validation and verification reports
- Performed high fidelity analysis using proprietary codes
- Processed and analyzed small scale experimental data
- Developed first principles models as well as response surfaces to high fidelity data via statistical analysis

*Engineering Internship Program Founder/Lead (August 2005 – May 2011)*

- 60 interns participated in the program while it was under my direction
- Handled recruiting, mentoring, and managing college junior through graduate level engineering interns
- Instructed interns in computer programming, weapons effects engineering, and professional conduct
- Served as co-advisor for student thesis research

August 2000-  
May 2001

**North Carolina State University**

Raleigh, NC

*Lab Instructor/Coordinator Computer Science Department*

- Responsible for multiple section of undergraduate FORTRAN labs
- Designed lab assignments and projects for the course
- Recruited and managed other lab instructors

TEACHING

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ETGR 1100L	Engineering Technology Computer Applications Laboratory	Spring 2020
ETME 1111	CAD Modeling I	Summer 2020

ETME 3143	Thermodynamics	Spring 2020
ETME 4244	Applied Heat Transfer	Fall 2020
ETME 4244L	Thermal Fluids Laboratory	Spring 2020
ENER 4140/CMET 5140	Energy Management / Building Energy Management	Spring 2021

## PUBLICATIONS AND PRESENTATIONS

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**Elizabeth Smith**, “Viability of OpenFOAM as the Numerical Engine for Augmented Reality Sandbox”. ( Pending: abstract submitted 12/17: ASME: Fluids Engineering Division Summer Meeting)

Rodward L Hewlin Jr., **Beth Smith**, Tara Cavalline, and Ali Karimoddini “Aerodynamic Performance Evaluation of a Skydio Drone via CFD as a Platform for Bridge Inspection: Phase 1 Study.” .( Pending: abstract submitted 12/17: ASME: Fluids Engineering Division Summer Meeting)

Edward Kofi Mahama, Ali Karimoddini, Tara Cavalline, Rodward L. Hewlin, **Beth Smith**. “UAS-Enabled Bridge Inspection: Challenges and Possible Solution.” NCDOT Virtual Research & Innovation Summit 2020, October 13-14, 2020 (Presentation)

Rodney Metoyer and **Beth Smith P.E.** “Modeling the Time-Dependent Intrapericardial Pressure-Volume Relationship with Effusion”. 7<sup>th</sup> World Congress of Biomechanics (2014)

**Beth Smith** and Bryan Susi. “Application of the Meshless Local Petrov-Galerkin (MLPG) Method to a Multi-Physics Problem with Coupled Boundary Conditions”, 11<sup>th</sup> US National Congress on Computational Mechanics, Minneapolis, Minnesota, July 25-28, 2011 (Presentation)

**Beth Smith** and Bryan Susi. “Application of the Meshless Local Petrov-Galerkin (MLPG) Method to Rayleigh-Taylor Instability”. 17th American Physical Society (APS) Topical Conference on Shock Compression of Condensed Matter, Chicago, Illinois, June 26- July 1 2011.(Presentation and Paper)

Bob Britt, Bryan Conklin, Scott Frank, Alan Ohrt, and **Beth Smith**. “Modeling Improvements in the Airblast Diffraction and Clearing Models in BlastX”. Saviac 2008. Presentation and Paper.

**Beth Smith**. “Uncertainty Analysis in IMEA\_UTAS. Presentation at DTRA R&D Underground Facilities Conference”, April 2008.

## HONORS AND AWARDS

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ARA Distinguished Young Engineer/Scientist (Sector Level), 2010

ARA Distinguished Member of the Technical Staff, 2010

ARA Technical Achievement Award (IMEA/UTAS Project Team) 2010)

Precision Strick Association: William J. Perry Award (Massive Ordnance Penetrator (MOP Team), 2012

## GRADUTE STUDENT COMMITTEES

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**Blake Bush**, MS Civil Engineering, North Carolina State University  
“Analytical Evaluation of Concrete Penetration Modeling Techniques”  
Graduation 2010, Industry Member

**Bryan Susi**, MS Mechanical Engineering, North Carolina State University  
“A Methodology for Translating Detonation Wave Effects between One and Two Dimensions”  
Graduation 2008, Industry Member

## PATENTS

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**Risk Quantification and Estimation (RIQUEST)** US 62/279,045, Filed January 15, 2016 (Provisional)

## RESEARCH

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Co-PI, “Developing a Safe and Cost-effective Physics-based Flight Control Methodology for a UAV-enabled Bridge Inspection.” NCDOT (\$89,073) (PI – Dr. Tara Cavalline). August 2019 to November 2020. (Project Lead PI Dr. Ali Karimodini, North Carolina Agricultural and Technical State University, \$259,861).

### Pending

ARL BAA W911NF-17-S-0003 CCE-HS-3: Creation of Virtual Populations and Statistical Analysis of Patient Simulation Outcomes” (White Paper – Submitted September 16, 2020)

## PROFESSIONAL DEVELOPMENT AND WORKSHOPS

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ASEE Workshop: Replacing Implicit Bias: Recognize, Reconsider, and Respond  
December 16, 2020

UNCC Center for Learning and Teaching: Academic Integrity and Cheating,  
September 17, 2020

UNCC Center for Learning and Teaching: Using Poll Everywhere in Online and  
Hybrid Courses September 3, 2020

UNC System Digital Learning Initiative: Designing Effective Online Courses, July 20-  
31, 2020

BioGears Conference 2020 (Virtual) March 17-18, 2020

Center for the Improvement of Mentored Experiences in Research (CIMER) Mentors  
Training for Graduate Faculty, UNC Charlotte, March 2, 2020

## PROFESSIONAL SOCIETIES

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*Pi Tau Sigma*, President at NC State, (2002-2003)