D. Michael Senter

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Interests and Objective

My primary academic interests are fluid dynamics modeling and simulations, data analysis, and machine learning. I utilize coding to solve computationally complex problems. I enjoy mentoring and teaching, and believe that a passion for math and computer science can be cultivated through active learning and emphasizing small victories.

Education

University of North Carolina at Chapel Hill — **Chapel Hill**
Doctor of Philosphy (Ph.D.) in Mathematics — *2015–2021*

University of North Carolina at Chapel Hill — **Chapel Hill**
Graduate Certificates — *2015–2021*
NIH Big Data to Knowledge (BD2K)
Bioinformatics and Computational Biology (BCB)

University of Utah — **Salt Lake City**
Bachelor of Science in Mathematics. Cumulative GPA: 3.64 — *2012–2015*

Experience

SAS Analytics — **Cary, NC**
Analytics Software Tester — *2021–Present*

SAS Analytics — **Cary, NC**
Data Science Intern — *2019–2021*
My internship within SAS Education is focused on integrating open source technologies with SAS' free academic software, developing supplemental tutorials and applied content for customers and establishing the SAS Academic **GitHub**. We are leveraging open-source offerings in **Python**, such as Pandas and Scikit, and integrating them with **SAS 9** and **SAS Viya** technology via the **SASPy** package, to which I have contributed a new method, and the **SWAT** package. We develop tutorials for various academic cloud offerings, such as **SAS OnDemand for Academics** and **SAS Viya for Learners**.

UNC Chapel Hill — **Chapel Hill, NC**
Miller Lab Group — *2015–2021*
I execute fully-coupled fluid-structure interaction simulations using the immersed boundary (IB) method with software written in **Python**, **Matlab**, and **C++** on HPC clusters running **Red Hat Enterprise Linux**. I analyze the resulting large data sets using custom **Python**, **Matlab**, and **Julia** scripts to interact with data stored in **VTK** and **HDF5** formats. Visualization of results from simulations is accomplished using **VisIt** and **Paraview** as well as with **Matplotlib**. I also developed a **Python** software package to semi-automate the creation of 2D finite difference meshes for IB software simulation from image data using image recognition and optimization techniques. I have mentored several undergraduate students and helped train other graduate students.

SAMSI — **Chapel Hill, NC**
Neuromechanics Working Group — *2015–2016*
I assisted in development and implementation of an ODE based neuromuscular model in **Matlab**.

University of Utah — **Salt Lake City, UT**
Mathematics Department REU — *2013–2015*
I developed **Matlab** scripts that implemented a novel, statistically exact covariance based algorithm for mean first passage time in complex fluids. I ported this code to a parallel version of the algorithm in **C++** that produced a more than 20x speed improvement compared to the Matlab version.

Computing Skills

Scripting Languages: Python, Matlab, Julia, R

Compiled Languages: C/C++

SAS Certified Specialist: Base Programming Using SAS 9.4

Typesetting: LaTeX, Markdown, Texmacs

Operating Systems: Linux, Windows, Mac OS

Other Skills: Git, Docker, SQL, VIM, Bash

Teaching Experience

University of North Carolina at Chapel Hill

Instructor on Record *2019–2020*

Classes taught include Introduction to Math Modeling (MATH 119), Calculus III (MATH 233), and First Course in Differential Equations Lab (MATH 383L). Devised course and exam schedule, developed all exams.

University of North Carolina at Chapel Hill

Recitation Instructor *2015–2019*

Led recitations for Calculus I and II (MATH 231 & 232). Recitation sessions required answering student questions on current class material, as well as preparing practice problems and summaries of lecture material. Out-of-class duties included grading exams as well as developing exams.

University of North Carolina at Chapel Hill

Teaching Assistant *2016, 2018*

Math Modeling in the Life Sciences (MATH 564). Duties included having weekly meetings with students going over course material.

Math Modeling Lab (BCB 718). Duties included advising students on model design and supporting student model development in Python and Matlab. Debugged student code.

Friday Center for Continuing Education

Instructor on Record *2016*

Taught inmates at the North Carolina Correctional Institution for Women. Designed and prepared course materials, developed all course exams.

Select Coursework

BCB 715 - Mathematical Modeling of Signalling Pathways: This module provides an introduction to the basic mathematical techniques used to develop and analyze models of biochemical networks. Both deterministic and stochastic models are discussed.

BCB 716 - Sequence Analysis: This module is designed to introduce students to concepts and methods in the comparative analysis of nucleic acid sequences using state of the art sequencing platforms. Course topics will include sequence alignment, genome assembly, and computational details of contemporary protocols for DNA and RNA sequencing.

BCB 720 - Statistical Modeling: Probalities, Bayesian and frequentist statistical inference. Hypothesis testing. Generalized linear models. Hierarchical/mixed models. Introduction to multidimensional analysis (PCA). This course uses **R** extensively.

MATH 661/662 - Scientific Computing: Error in computation, solutions of nonlinear equations, Fourier methods, introduction to numerical solution of ODEs. Theory and practical issues arising in computational linear algebra problems.

MATH 761/762 - Numerical ODEs/PDEs: Single, multistep methods for ODEs: stability regions, the root condition; stiff systems, backward difference formulas; two-point BVPs; stability theory; finite difference methods for linear advection diffusion equations. Elliptic equation methods (finite differences, elements, integral equations); hyperbolic conservation law methods (Lax-Fiedrich, characteristics, entropy condition, shock tracking/capturing); spectral, pseudo-spectral methods; particle methods, fast summation, fast multipole/vortex methods.

Select Talks and Workshops

SUDDEN Group: Basics of Webscraping with Python, Summer 2020 (Workshop).

SMB General Meeting 2018: "Flexible Clap and Fling".

SIAM CSE15: Undergraduate Research Symposium, March 2015

Select Poster Presentations

SMB General Meeting 2017: "MeshmerizeMe".

Utah Math Bio Alumni Conference 2017: "MeshmerizeMe".

BAMM! 2017: "Aerodynamics of parachuting in tiny insects".

Tulane Winter Workshop on Neuromechanics 2017: "Aerodynamics of parachuting in tiny insects".

FACM 2016: "A Model of Muscle Response to Neuronal Spike Activity."

University of Utah Science Day: Poster Presentation, Fall 2014

Foreign Language Skills

German: Native

Hebrew: Intermediate