

Program for 2017 SIAM Southeastern Atlantic Section Conference (SIAM-SEAS)

Tallahassee, Florida

March 18-19, 2017

Saturday, March 18, 2017

7:30-12:00 **Registration**

8:20-8:30 **Opening Remarks: SSB 203**

Dean Sam Huckaba

8:30-9:30 **Plenary Speaker: SSB 203**

Greg Forest: Molecular-to-micron scale experiments and the role of mathematics in "big data to knowledge" in biology and biomedicine

Chair: Nick Moore

9:30-10:00 **Coffee Break: Student Services Building**

10:00-12:00 **Advances in Financial Mathematics: HCB 212**

Chair: Arash Fahim

10:00-10:25 Hamed Amini: Systemic Risk and Central Clearing Counterparty Design

10:30-10:55 Arash Fahim: Model risk and constrained optimal transportation

11:00-11:25 Zachary Feinstein: An extension of the Eisenberg-Noe network model with fire sales

11:30-11:55 David Mandel: Model Robustness and Sensitivity in Finance

10:00-12:00 Mathematical Modeling Applied to Biology: HCB 309

Chair: Monica Hurdal

10:00-10:25 Monica Hurdal: Conformal Brain Mapping

10:30-10:55 Ahmet Kliniç: A Mathematical Model of Cerebral Cortical Folding Development

11:00-11:25 Raymond Morie: Modeling Cortical Folding Patterns on a Growing Oblate Spherical Domain

11:30-11:55 Maria Poole: Modeling HCV Interactions with p53 in Hepatocytes: Implications for Carcinogenesis

10:00-12:00 Numerical Methods and Models for Multimaterial/Multiphase Systems: HCB 207

Chair: Mehdi Vahab and Mark Sussman

10:00-10:25 Hadi Mohammadigoushki: Flow of wormlike micelles past a falling sphere

10:30-10:55 William Dewar: A Multiphase Model of Deep Oil Spills in the Ocean

11:00-11:25 Mehdi Vahab: A coupled level set and moment of fluid method for phase change problems

10:00-12:00 Numerical Methods in Fluid Mechanics with Applications: HCB 205

Chair: Xiaofeng Yang, Qi Wang and Jia Zhao

10:00-10:25 Qingshan Chen: Convergence and error analysis of staggered finite volume methods on unstructured meshes

10:30-10:55 Thi Thao Phuong Hoang: Global-in-time domain decomposition methods for linear advection-diffusion equations

11:00-11:25 Jia Zhao: On Energy-stable Schemes for Complex-fluid Hydrodynamic Equations

11:30-11:55 Chaoxu Pei: A hierarchical block structured space-time spectral element method for incompressible flows

10:00-12:00 Optimal Control, Optimization, Inverse Problems and Numerical Simulations with Applications: HCB 210

Chair: Ana-Maria Croicu

10:00-10:25 Nihan Acar: Investigation of Optimal Antibiotic Timing in Disinfecting Bacterial Population

10:30-10:55 Alessandro Alla: Model order reduction for the control of parametrized PDEs via dynamic programming equations

11:00-11:25 Liang-Hsuan Tai: Trend and seasonal effect estimation under random time warpings

11:30-11:55 Ana-Maria Croicu: Optimal Control Applied to Anthrax Transmission in Animal Populations

10:00-12:00 Recent Advances in Experiment-Guided Mathematical Biology: HCB 208

Chair: Greg Forest and Jia Zhao

10:00-10:25 Ruian Ke: Modeling the mechanistic action and predicting the impact of an immunotherapeutic DART® molecule in HIV 'shock and kill' strategies

10:30-10:55 Caitlin Hult: Modeling nucleosomal DNA in living yeast

11:00-11:25 Melanie Jensen: Antibody-mediated immobilization of virions in mucus

11:30-11:55 Timothy Wessler: Modeling Antibody-Mucus-Pathogen Kinetics

10:00-12:00 Recent Advances on Modeling, Analysis and Computation of Nonlocal Problems: HCB 209

Chair: Lili Ju and Tadele Mengesha

10:00-10:25 Hong Wang: Fast numerical methods for nonlocal models

10:30-10:55 Yanzhi Zhang: A fast algorithm for solving the space-time fractional diffusion equation

11:00-11:25 Pablo Seleson: Anisotropic bond-based peridynamic models

11:30-11:55 Jilu Wang: Convergence analysis of time discretization for stochastic time-fractional PDEs subject to additive space-time white noise

10:00-12:00 Theoretical and Computational Issues in Geosciences and Engineering: HCB 307

Chair: Qingshan Chen, Xiaoming Wang, Ming Ye, and Nick Moore

10:00-10:25 Roger Castro: Karst Flow Model Validation at Laboratory Scale for Coupled Discrete Continuous Models

10:30-10:55 Ahmed Elshall: Numerical Daemons of Monte Carlo based Bayesian Model Evidence Estimators

11:00-11:25 Shu Gu: Recent progress in homogenization of Stokes systems

11:30-11:55 Ray Huffaker: Diagnosing and Reconstructing Real-World Hydroclimatic Dynamics from Time Sequenced Data

10:00-12:00 Contributed Session 1: HCB 310

Chair: Eitan Lees

10:00-10:15 James Moseley: The Agglomeration Model: The Fixed Problem II

10:20-10:35 Yue Chen: Monitoring depth profile of residual stress via Rayleigh-wave dispersion (Cancelled)

10:40-10:55 Michael Schneier: Reduced Basis Methods and Their Application to Ensemble Methods for the Navier Stokes Equations

11:00-11:15 Eitan Lees: The Electroneutrality Constraint in Peridynamic Modeling

11:20-11:35 Wenju Zhao: Auxiliary Equation Approach Numerical Methods for the time dependent stochastic Navier-Stokes equations with additive noise

10:00-12:00 Contributed Session 2: HCB 312

Chair: Mario Harper

10:00-10:15 Corey Harris: The Chern-Mather class of the multiview variety

10:20-10:35 Orhan Akal: Sustainable Equilibrium in a Stock Market: Agent-Based Modeling with Evolutionary Game Theory Applied to Traders

10:40-10:55 Serdar Cellat: A New Family of Shape Metrics to Improve Shape Classification

11:00-11:15 Mario Harper: Highly Parallel Motion Planning Using Monte Carlo Techniques in Applied Robotics

11:20-11:35 Sirani Perera: Self Recursive Radix-2 Fast DCT Algorithms

12:00-2:00 Lunch

2:00-3:00 Plenary Speaker: SSB 203

Annalisa Quaini: Simulation of fluid-structure interaction problems arising in hemodynamics

Chair: Bryan Quaife

3:00-3:30 Coffee Break: Student Services Building

3:30-5:30 **Advances in Financial Mathematics: HCB 212**
 Chair: Arash Fahim

3:30-3:55 Nguyet Nguyen: Hidden Markov Model for Stock Trading

4:00-4:25 Giorgi Pertaia: Fitting normal mixtures with tail constraints

4:30-4:55 Edward Qian: The Triumph of Mediocrity: A Case Study of “Naïve Beta”

5:00-5:25 Yuying Tzeng: Time Series Simulation with Randomized Quasi-Monte Carlo Methods

3:30-5:30 **Advances in Stochastic Computing and its Applications: HCB 310**
 Chair: Yanzhao Cao and Feng Bao

3:30-3:55 Feng Bao: Hierarchical Optimization for Neutron Scattering Problems

4:00-4:25 Lin Mu: DG-IMEX Stochastic Galerkin schemes for Linear Transport Equation with Random Inputs and Diffusive Scalings

4:30-4:55 Hans-Werner van Wyk: Localizing Uncertainty with Multiscale Gaussian Markov Random Field Models

5:00-5:25 Guannan Zhang: A multilevel reduced-basis method for parameterized partial differential equations

3:30-5:30 **Computational Methods in Interfacial Dynamics: HCB 313**
 Chair: Bryan Quaife and Lukas Bystricky

3:30-3:55 Lukas Bystricky: Using Boundary Integral Equations To Model Rigid Body Motion

4:00-4:25 Mansoor Haider: Fast algorithms for integral equation models of viscoelasticity in biological soft tissues

4:30-4:55 Gokberk Kabacaoglu: Stable and accurate low-resolution simulations of two-dimensional vesicle flows

3:30-5:30 **Numerical Methods and Models for Multimaterial/Multiphase Systems: HCB 207**
 Chair: Mehdi Vahab and Mark Sussman

3:30-3:55 Gerry Puckett: A Study of Interface Tracking and Capturing Algorithms for Computing A Fundamental Instability in the Earth's Mantle

4:00-4:25 Mikhail Khenner: Model and computation of graphene island growth

4:30-4:55 Ashish Pathak: A fully Eulerian fictitious domain method to study interaction between moving structures and two-phase fluid flows

5:00-5:25 Neda Yaghoobian: Flow over urban-like geometries with complex thermal boundary conditions

3:30-5:30 Numerical Methods in Fluid Mechanics with Applications: HCB 205

Chair: Xiaofeng Yang, Qi Wang and Jia Zhao

3:30-3:55 Bryan Quaife: Eroding bodies in a Stokesian fluid

4:00-4:25 John Cummings: Modeling and Simulation of Microstructural Evolution in Organic Photovoltaic Thin Films

4:30-4:55 Jing Tian: On the emergence of the Navier-Stokes-alpha model for channel flows

5:00-5:25 Xiaoming Wang: An energy stable decoupled scheme for the Navier-Stokes-Darcy system

3:30-5:30 Numerical Solution of PDE Using Spline Functions: HCB 309

Chair: Ming-Jun Lai

3:30-3:55 James Lanterman: Construction of Hermite interpolatory cubic Wachspress functions on rectangles

4:00-4:25 Clay Mersmann: Spline Solutions of the Maxwell Equations

4:30-4:55 Ming-Jun Lai: Max-Norm Estimate for Bivariate Spline Solutions to Second Order Elliptic Partial Differential Equations in Non-divergence Form

3:30-5:30 Optimal Control, Optimization, Inverse Problems and Numerical Simulations with Applications: HCB 210

Chair: Ana-Maria Croicu

3:30-3:55 Atanaska Dobрева: Sensitivity analysis applied to models for hair growth and disease

4:00-4:25 Yongjin Lu: Uniform stability to a non-trivial equilibrium of a nonlinear fluid structure interaction subject to viscoelastic damping

4:30-4:55 Richard Schugart: Using A Mathematical Model with Individual Patient Data to Quantify Differences Between Patients with Diabetic Foot Ulcers

3:30-5:30 Recent Advances in Experiment-Guided Mathematical Biology: HCB 208

Chair: Greg Forest and Jia Zhao

3:30-3:55 Jay Newby: Pixels to predictions: a unified framework for mechanistic modeling and image analysis of particle motion in micron scale environments

4:00-4:25 Yun Ling: Computationally Efficient Inference for Particle Tracking Data

4:30-4:55 Xinfeng Liu: Multi-scale and stochastic modeling of HER2 signaling for cancer tumor growth

5:00-5:25 Ian Seim: Uncovering signals in bronchoalveolar lavages from patients with cystic fibrosis

3:30-5:30 Recent Advances on Modeling, Analysis and Computation of Nonlocal Problems: HCB 209

Chair: Lili Ju and Tadele Mengesha

3:30-3:55 Ihsan Topaloglu: Height-constrained nonlocal interaction energies and their gradient flows

4:00-4:25 Harbir Antil: Fractional Operators with Inhomogeneous Boundary Conditions

4:30-4:55 Dennis Kriventsov: A Local-Nonlocal Transmission Problem

5:00-5:25 Pablo Stinga: How to approximate the fractional Laplacian by fractional powers of the discrete Laplacian

3:30-5:30 Theoretical and Computational Issues in Geosciences and Engineering: HCB 307

Chair: Qingshan Chen, Xiaoming Wang, Ming Ye, and Nick Moore

3:30-3:55 Karina Khazmutdinova: Natural ventilation in caves with a single opening

4:00-4:25 Reed Ogrosky: Modeling and identification of planetary-scale rainfall events in the tropical atmosphere

4:30-4:55 Adam Perez: Study of Florida's sinkhole mechanism by a physical hydrogeological model

5:00-5:25 Xiaoyu Song: Computational modeling of multi-physical processes in unsaturated porous geological materials

5:30-7:30

Poster Session and Reception: Student Services Building

Orhan Akal: Employing Convolutional Neural Network to Segment Lymph Nodes

Johnna Barnaby: A Mathematical Approach to the Immune Response Following Treatments for Prostate Cancer

Phillip Boehner: Computational framework for evolution and nucleosynthesis studies of astrophysical objects

Valerie Bullock: Dynamic neuron networks with Fitzhugh-Nagumo nodes

Evan Cresswell: Computational Model for Local Calcium Dynamics in Astrocytes

Nathan Crock: New Analysis Techniques for New Imaging Techniques

Antigoni Georgiadou: Automated Parameter Fitting in Stellar Evolution

Ayse Gor: Rank of Elliptic Curve

Matthew Hancock: Lung nodule malignancy classification using diagnostic image features

Yongje Kim: Probabilistic Sinkhole Hazard Model of East Central Florida

Ryan Learn: Sensitivity studies of mixing in astrophysical plasmas

Jorge Martinez: Shape Analysis Framework of Nucleosome Positioning

Matthew McCurdy: Small Darcy Number Asymptotics of the Coupled Navier-Stokes-Darcy System

Andrew McMillan: A Pseudo-Spectral Method Approach to the Differentially Heated Rotating Annulus

David Miller: Bugs on a Surface

Patrick Schambach: Mathematical Analysis of Tumor Growth Models Combining Chemotherapy and Immunotherapy

Kyle Shaw: Accounting for alignment and sequence quality in likelihood calculations

Chad Sockwell: Conservative Properties and Performance of Exponential Integrators for Nonlinear Conservation Laws

Immaculada Sorribes: Overcoming Chemotherapy Resistance in Glioblastoma Multiforme

Jacob Spainhour: Computational Geometry in Public Policy

Bin Xu: Simulating spring hydrograph recession and karst parameters estimation with multiple reservoirs

Sunday, March 19, 2017

8:20-8:30 Opening Remarks: SSB 203

8:30-9:30 Plenary Speaker: SSB 203

Gilbert Strang: Singular Values of Large Matrices

Chair: Max Gunzburger

9:30-10:00 Coffee Break: Student Services Building

10:00-12:00 Advances in Population Dynamics, Epidemiology, Immunology and Infectious Diseases: HCB 307

Chair: Necibe Tuncer and Maia Martcheva

10:00-10:25 Evan Milliken: Probability of Extinction in Metapopulation Models of Infectious Salmon Anemia virus

10:30-10:55 Andrew Nevai: Feral cat population dynamics

11:00-11:25 Calistus Ngonghala: Understanding poverty dynamics from an epidemiological perspective

11:30-11:55 Necibe Tuncer: Identifiability issues in multiscale immune-epidemiological models

10:00-12:00 Computational Methods in Interfacial Dynamics: HCB 313

Chair: Bryan Quaife and Lukas Bystricky

10:00-10:25 Zihua Qiu: A sliding-mesh interface approach to spectral difference method on unstructured grids for simulating vortex-induced vibrations

10:30-10:55 Jia Zhao: A Multiphasic Complex-fluid Model for Cytokinesis of Animal Cells

11:00-11:25 Yanxiang Zhao: Crawling and turning in a minimal reaction-diffusion cell motility model

10:00-12:00 Numerical Methods and Models for Multimaterial/Multiphase Systems: HCB 207

Chair: Mehdi Vahab and Mark Sussman

10:00-10:25 Kourosh Shoele: Flow-induced vibration of piezoelectric membrane energy harvester

10:30-10:55 Matthew Villemarette: Maximally Preserving Finite Difference Schemes for the Allen-Cahn Equation using Operator Splitting

11:00-11:25 Mark Sussman: A finite volume moment of fluid method for approximating solutions to the diffusion equation for systems consisting of many (>2) materials

10:00-12:00 Numerical Methods in Fluid Mechanics with Applications: HCB 205

Chair: Xiaofeng Yang, Qi Wang and Jia Zhao

10:00-10:25 Daozhi Han: Second order methods for computing phase field fluid models

10:30-10:55 Hongwei Li: Unconditionally energy stable linear schemes for a diffuse interface model with Peng-Robinson equation of state

11:00-11:25 Qi Wang: Modeling and simulation of active liquid crystal flows (Cancelled)

11:30-11:55 Xiaofeng Yang: A novel numerical approach to solve a class of nonlinear thermodynamically consistent Model (Cancelled)

10:00-12:00 Numerical Solution of PDE Using Spline Functions: HCB 309

Chair: Ming-Jun Lai

10:00-10:25 Shiyang Li: Adaptive Algorithms using Splines on Triangulations with Hanging Vertices

10:30-10:55 Lin Mu: Weak Galerkin Finite Element Methods and Numerical Applications

10:00-12:00 Recent Advances in Experiment-Guided Mathematical Biology: HCB 208

Chair: Greg Forest and Jia Zhao

10:00-10:25 Xiuxiu He: Substrate Curvature Regulates Cell Migration

10:30-10:55 Joseph McKenna: Glucose oscillations can activate an endogenous oscillator in pancreatic islets

11:00-11:25 Jian Li: Eliminating dental biofilms with the less viscous fluid

11:30-11:55 Feifei Xu: Modeling barrier properties of intestinal mucus reinforced with IgG and secretory IgA against highly motile bacteria

10:00-12:00 Recent Advances on Modeling, Analysis and Computation of Nonlocal Problems: HCB 209

Chair: Lili Ju and Tadele Mengesha

10:00-10:25 Petronela Radu: Properties and convergence analysis for state-based Laplacians

10:30-10:55 Xiaochuan Tian: On energy-based coupling strategies of nonlocal and local models

11:00-11:25 Guannan Zhang: An Efficient Probabilistic Numerical Method Based on Fourier-Cosine Series for Fractional Laplacian Equations

11:30-11:55 Lili Ju: A conservative nonlocal convection-diffusion model and asymptotically compatible finite difference discretization

10:00-12:00 Simulating and Analysis of Fire Front Behavior: HCB 210

Chair: Bryan Quaife and Kevin Speer

10:00-10:25 Jesse Canfield: Modeling wildfire with HIGRAD/FIRETEC

10:30-10:55 Scott Goodrick: Operational fire behavior prediction models in the U.S. Forest Service

11:00-11:25 David Robinson: A Simple Empirical Fire Line Model

11:30-11:55 Jeremy Sauer: Numerical Investigations into the Influence of Atmospheric, Topographic, and Fuel Aggregation Conditions on Fire Behavior

10:00-12:00 Contributed Session 3: HCB 310

Chair: Chad Sockwell

10:00-10:15 Hyunju Kim: Implicitly enriched partition of unity mapping method for numerical solutions of fourth order partial differential equations containing singularities

10:20-10:35 Maliheh Tameh: Fractional shifted Legendre tau method for linear and nonlinear variable order FPDEs : Klein-Gordon Equations

10:40-10:55 Chad Sockwell: A novel normal inclusion modeling strateg for vortex pinning in two-band, high-temperature superconductors

11:00-11:15 James Cheung: Boundary Condition Approximation for Lagrange Finite Elements by Polynomial Extension

11:20-11:35 Hua Huang: Indirect combustion noise generation in a supersonic nozzle

11:40-11:55 Tyler Bolles: Linear Water Waves Over Variable Depth and Singular Flow Around Corners

10:00-12:00 Contributed Session 4: HCB 312

Chair: Kelvin Rozier

10:00-10:15 Kelvin Rozier: Modeling the Physiological Effects of β 2-adrenoceptors in Mouse Ventricular Myocytes

10:20-10:35 Sergiusz Wesolowski: Functional Data Analysis Framework for Next Generation Sequencing Experiments

10:40-10:55 Sepideh Ebadi: Bacterial Persistence, Mathematical Model, Experimental Validation and Parameter Estimation

11:00-11:15 Angie Davenport: A Seasonal Matrix Model for Growth of *Lycium carolinianum* in Coastal Marshes

11:20-11:35 Chayu Yang: Impact of awareness programs on cholera dynamics: Two modeling approaches

11:40-11:55 Mahsa Mirzargar: On Evaluation of Ensemble Forecasts Calibration Using the Concept of Data Depth (Cancelled)