Somayeh Mashayekhi

Assistant professor
Department of Mathematics
Kennesaw State University
1000 Chastain Road Kennesaw, GA 30144
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Professional Employment

Assistant professor, August 2019-Present
Department of Mathematics, Kennesaw State University, Kennesaw, GA

Courtesy Assistant professor, August 2019-Present
Department of Scientific Computing, Florida State University, Tallahassee, FL

Post Doctoral Research Associate, November 2016- August 2019
Department of Scientific Computing, Florida State University, Tallahassee, FL
Mentor: Peter Beerli

Post Doctoral Research Associate in Computational Science & Engineering, November 2015- November 2016
Department of Mathematics, Florida State University , Tallahassee, FL
Mentors: M. Yousuff Hussaini, William S. Oates

Education

Ph.D. of Mathematics, August 2013- August 2015
Department of Mathematics and Statistics, Mississippi State University, Mississippi, Ms

Ph.D. of Applied Mathematics, August 2009- July 2013
Department of Mathematics, Alzahra University, Tehran, Iran

M.S. of Applied Mathematics, August 2004- July 2006
Department of Mathematics, Alzahra University, Tehran, Iran

Research Interests

Approximation theory, Bayesian method and uncertainty quantification, Computational methods, Fractional calculus, Fractal media and fractional viscoelasticity, Fractional Poisson process, Optimal control, Orthogonal functions and its applications to dynamic systems, Population genetics and Coalescence theory, Spectral methods.

Research Funding

Collaborative Research: Reproductive heterogeneity in the structured coalescence framework, PI : Somayeh Mashayekhi, NSF 21-502 Infrastructure Innovation for Biological Research, $112,256, Start Date: 09/01/2021 End Date: 08/31/2024

Exploring the applications of fractional differential equations in ecotoxicological risk assessment, PI: Nicholas Green, CoPI : Somayeh Mashayekhi, OVPR Seed Grant, Kennesaw State University, $14,756, Start Date: 07/01/2021 End Date: 06/30/2022

Refereed Journal Publications

S. Mashayekhi, *Fractional forward Kolmogorov equations in population genetics*, **Communications in Nonlinear Science and Numerical Simulation**, 2023, p. 107432.

B.R. Pahari, E. Stanisauskis, S. Mashayekhi, W. Oates, *An Entropy Dynamics Approach for Deriving and Applying Fractal and Fractional Order Viscoelasticity to Elastomers* , **Journal of Applied Mechanics**, 2023, 90, p.081009.

S. Mashayekhi, S. Sedaghat, *Study the genetic variation using Eta functions*, **Computational and Applied Mathematics**, 2023, 42, p.95.

S. Sedaghat, S. Mashayekhi, *Exploiting delay differential equations solved by Eta functions as suitable mathematical tools for the investigation of thickness controlling in rolling mill*, **Chaos, Solitons Fractals**, 2022, 164, p.112666.

E. Stanisaukis, S. Mashayekhi, M. Markus, P. Steinmann, W. Oates, *Fractional and fractal order effects in soft elastomers: strain rate and temperature dependent nonlinear mechanics* , **Mechanics of Materials**, 2022, 172, 104390.

P. Beerli, H. Ashki, S. Mashayekhi, and M. Palczewski, *Population divergence time estimation using individual lineage label switching*, **G3-Genes Genomes Genetics**, 2022, DOI: 10.1093/g3journal/jkac040.

S. Mashayekhi, E. Stanisaukis, M. Hassani, W. Oates, *Excluded volume effects and fractional viscoelasticity in polymers*, **Meccanica**, 2021, DOI: 10.1007/s11012-021-01415-2.

S. Mashayekhi, S. Sedaghat, *Fractional model of stem cell population dynamics*, **Chaos, Solitons & Fractals**, 2021, p.110919.

S. Mashayekhi, L. Gr. Ixaru, *The least-squares fit of highly oscillatory functions using Eta-based functions*, **Journal of Computational and Applied Mathematics**, 2020, p.112839.

P. Beerli, S. Mashayekhi, M. Sadeghi, M. Khodaei, K. Shaw , *Population genetic inference with MIGRATE*, **Current Protocols in Bioinformatics**, 2019, 68 (1), 28 pages.

S. Mashayekhi, M.Y. Hussaini, W. Oates, *A physical interpretation of fractional viscoelasticity based on the fractal structure of media: Theory and experimental validation*, **Journal of the Mechanics and Physics of Solids**, 2019, 128:137-150.

S. Mashayekhi, P. Beerli, *The fractional coalescent*, **Proceedings of the National Academy of Sciences of the United States of America**, 2019, 116: 6244-6249.

S. Mashayekhi, P. Miles, M. Yousuff Hussaini and W. Oates, *Fractional viscoelasticity in fractal Media: Theory, Experimental Validation, and Uncertainty Analysis*, **Journal of the Mechanics and Physics of Solids**, 2018, 111:134-156.

V.S. Krishnasamy, S. Mashayekhi, M.Razzaghi, *Solving fractional differential equations numerically using*

fractional integral operational matrices, **IEEE/CAA Journal of Automatica Sinica**, 2017, 4:98–106.

S. Mashayekhi, M.Razzaghi, *An approximate method for solving fractional optimal control problems by hybrid function*, **Journal of Vibration and Control**, 2016, DOI: 10.1177/1077546316665956.

S. Mashayekhi, M.Razzaghi, *Numerical solution of distributed order fractional differential equations by hybrid functions*, **Journal of Computational Physics**, 2016, 315: 169-181.

S. Mashayekhi, M.Razzaghi, *Numerical solution of the fractional Bagley-Torvik equation*, **Mathematical Methods in the Applied Sciences**, 2016, 39: 353-365.

V. Calvert, S. Mashayekhi, M.Razzaghi, *Solution of Lane-Emden type equations using Rational Bernoulli functions*, **Mathematical Methods in the Applied Sciences**, 2016, 39: 1268-1284.

S. Mashayekhi, M. Razzaghi, and M. Wattanataweekul, *Analysis of multi-delay and piecewise constant delay systems by hybrid functions approximation*, **Differential Equations and Dynamical Systems**, 2016, 24: 1-20.

S. Mashayekhi, M.Razzaghi, *Numerical solution of nonlinear fractional integro-differential equations by hybrid functions*, **Engineering Analysis with Boundary Elements**, 2015, 56: 81-89.

S. Mashayekhi, Y. Ordokhani, and M. Razzaghi, *Hybrid functions approach for optimal control of systems described by integro-differential equations*, **Applied Mathematical Modelling**, 2013, 37: 3355-3368.

S. Mashayekhi, Y. Ordokhani, and M. Razzaghi, *A hybrid functions approach for the Duffing equation*, **Physica Scripta**, 2013, p. 025002.

S. Mashayekhi, Y. Ordokhani, and M. Razzaghi, *Hybrid functions approach for nonlinear constrained optimal control problems*, **Communications in Nonlinear Science and Numerical Simulation**, 2012, 17: 1831-1843.

Refereed Proceedings

W. Oates, E. Stanisaukis, B. Pahari, and S. Mashayekhi *Entropy Dynamics Approach to Fractional Mechanics with Experimental Validation on Auxetic Foams and Dielectric Elastomers*, **Proc. Behavior and Mechanics of Multifunctional Materials XV**, Online Only, 22-27 March, 2021.

E. Stanisaukis, H. Solheim, S. Mashayekhi, P. Miles, and W. Oates, *Modeling, experimental characterization, and uncertainty quantification of auxetic foams: hyperelastic and fractional viscoelastic mechanics*, **Proc. Behavior and Mechanics of Multifunctional Materials IX**, Online Only, 27 April - 8 May, 2020.

W. Oates, P. Miles, W. Gao, J. Clark, S. Mashayekhi, and M.Y. Hussaini, *Rate dependent constitutive behavior of dielectric elastomers and applications in legged robotics*, **Proc. SPIE Smart Structures and Materials+ Nondestructive Evaluation and Health Monitoring** , Portland, Oregan, March 26-29, 2017.

Book Publications

M. Shafiebeyk Mohammadi, S. Mashayekhi, H. Pourbashash, Differential and Integral (in Farsi), 2011, Noavaran Sharif Publication (416 pages).

Presentation

S. Mashayekhi, Application of Fractional Calculus in Population Genetics, SIAM Conference on Mathematics of Data Science, San Diego (USA), September 2022

S. Mashayekhi, Fractional Coalescent, Mathematical and Computational Evolutionary Biology, Switzerland, June 26-30, 2022

E. Stanisaukis, S. Mashayekhi, W. Oates, Nonlinear Hyperelasticity and Fractional Viscoelasticity of Auxetic Foams and Dielectric Elastomers, SIAM conference on Computational Science and Engineering, Online, March 2021

W. Oates, E. Stanisaukis, B. Pahari, S. Mashayekhi, Entropy Dynamics Approach to Fractional Mechanics with Experimental Validation on Auxetic Foams and Dielectric Elastomers, Behavior and Mechanics of Multifunctional Materials XV, 22-27 March 2021

E. Stanisaukis, H. Solheim, S. Mashayekhi, P. Miles, W. Oates, Modeling, experimental characterization, and uncertainty quantification of auxetic foams: hyperelastic and fractional viscoelastic mechanics, Behavior and Mechanics of Multifunctional Materials IX, 27 April - 8 May 2020

S. Mashayekhi, The fractional coalescent, The Florida State University Department of Biological Science, Tallahassee (USA), April 2019

S. Mashayekhi, A physical interpretation of fractional viscoelasticity based on the fractal structure of media : Theory and experimental validation, SIAM conference on Computational Science and Engineering, Spokane (USA), February 2019

S. Mashayekhi and P. Beerli, A new coalescent theory based on a non-Markovian Poisson process. Evolution 2018, Montpellier (France), August 2018

S. Mashayekhi, Mittag-Leffler Distribution in Population Genetics, MANNA 2017, Santa Fe (USA), December 2017 (Poster)

S. Mashayekhi, Fractional Viscoelasticity in Elastomeric Materials, MANNA 2017, Santa Fe (USA), December 2017 (Poster)

S. Mashayekhi, Numerical solution of fractional partial differential equations via hybrid functions, SIAM conference on Computational Science and Engineering, Atlanta (USA), March 2017

S. Mashayekhi, Bernoulli polynomials as a trial function in spectral methods, SIAM conference on the 13th International Symposium on Orthogonal Polynomials(USA), June 2015

S. Mashayekhi, Solving of fractional order differential equations by using hybrid function, 2015 Joint Mathematics Meetings (USA), January 2015

S. Mashayekhi, A new method for solving nonlinear fractional integro-differential equations, The 10th Mississippi State Conference on Differential Equations and Computational Simulations, Mississippi State University (USA), October 2014

S. Mashayekhi, Hybrid functions approach for solving HIV pathogenesis models, 2014 MBI workshop for young researchers in mathematical biology, Mathematical Biosciences Institute, The Ohio State University (USA), August 2014 (Poster)

S. Mashayekhi, Hybrid function for solving nonlinear constrained optimal control problems, SIAM conference on optimization, San Diego, California (USA), May 2014

Submitted Proposal

Reproductive heterogeneity in the structured coalescence framework, PI: Somayeh Mashayekhi, NSF 21-502 Infrastructure Innovation for Biological Research, $112,256, Start Date: 09/01/2021 End Date: 08/31/2024.

Exploring the applications of fractional differential equations in ecotoxicological risk assessment, PI: Nicholas Green, CoPI: Somayeh Mashayekhi, OVPR Seed Grant, Kennesaw State University, $14,756, Start Date: 07/01/2021 End Date: 06/30/2022.

An entropy dynamics approach to discovering multifractal constitutive relationships in structural and functional materials Co-PI, PI: W. Oates, ARO, Army Research Office (2021, Not funded).

Fractal structure and fractional property relations in multifunctional polymers, PI, linked proposal with FSU with PI: W. Oates, NSF to the Mechanics of Materials and Structures cluster (2020, Not funded).

From Molecules to Ecosystems, Co-PI with P. Jackson, R. Rajagopalan, R. Rajagopalan, H. Sutton, NSF RUI to the Population and Community Ecology cluster (2020, Not funded).

Exploring the applications of fractional differential equations in ecotoxicological risk assessment, Co-PI with Nicholas Green, NSF, Mathematical Biology Program (2020, Not funded).

Estimation of heterogeneity within and among populations, Co-PI with Peter Beerli, NSF, Mathematical Biology Program (2019, Not funded).

Honors and Awards

- Postdoctoral Traveling award for SIAM Conference on Computational Science and Engineering, February 2019
- The outstanding graduated student award in Mississippi State University, May 2015
- Teaching assistantship in Mississippi State University, August 2013- August 2015
- Traveling fellowship award for SIAM conference on the 13th International Symposium on Orthogonal Polynomials, Special Functions and Applications, at the National Institute of Standards and Technology, Gaithersburg, Maryland, June 2015
- Traveling fellowship award for 2015 Joint Mathematics Meetings, January 2015
- Traveling fellowship award for Prospects in Applied Mathematics, The University of Chicago, October 2014

- Traveling fellowship award for 2014 MBI workshop for young researchers in mathematical biology, Mathematical Biosciences Institute, The Ohio State University, August 2014
- Traveling fellowship award for SIAM conference on optimization, San Diego, California, May 2014
- First rank for Ph.D. admission exam, Alzahra university, Iran, August 2009

Google Scholar (retrieved: August 15, 2023)
https://scholar.google.com/citations?user=Y60NyTEAAAAJ&hl=en
Total citations: 818, since 2018: 684; h-index:17; i10-index: 17

Undergraduate/ High school Student Research

- *Spring 2022: Undergraduate Student Research,* Fatemeh Ghasemi, Jayden Ayash
- *Summer 2022: Undergraduate Student Research,* Fatemeh Ghasemi, Logan Miller
- *Fall 2022: Undergraduate Student Research,* Fatemeh Ghasemi, Diana Jimenez
- *Fall 2022: High school student Research,* Rithu Hegde

Teaching Experience

Kennesaw State University, USA

- *Fall 2023:* Calculus II (A large section)
- *Spring 2023:* ODE (One section)
- *Fall 2022:* Calculus II (A large section), Undergrad Research (Two sections)
- *Spring 2022:* ODE (One section), Undergrad Research (One section)
- *Fall 2021:* Calculus II (A large section), ODE (One section)
- *Spring 2021:* Calculus II (One section)
- *Fall 2020:* Calculus I (Two sections)
- *Spring 2020:* Calculus I (Two sections)
- *Fall 2019:* Calculus I (One section)

Instructor: Mississippi State University, USA
August 2014 - May 2015
Course: Business calculus

Instructor: Alzahra university, Payame Noor University and Science and Culture university, Iran
September 2003 - May 2013

Courses: Complex variables, Numerical analysis, Ordinary differential equations, Engineering mathematics, Computer programming, Introductory probability, Probability and statistics for scientists and engineers, Advanced calculus, Precalculus algebra, College algebra

Service

- *Organizer*
  - Mini symposium on "Fractional Order Operators and their Applications in Engineering" at the SIAM Conference on Computational Since and Engineering in Fort Worth, Texas, U.S., March 1-5, 2021.
  - Mini symposium on "Fractional Order Operators and their Applications in Material Science" at the SIAM conference on Computational Science and Engineering, Bilbao, Spain, May 18-22, 2020 (Postponed).
  - Mini symposium on "Application of Fractional Calculus in Material Science and Engineering" at the SIAM conference on Computational Science and Engineering, Washington, USA, Feb. 25-March 01, 2019.
- *Editor*
  - Special issues of *Mathematics (Impact Factor 2.258)* on Computational, Experimental, and Theoretical Aspects of Fractional Order Operators
  - Special issues of *Fractal and Fractional (Impact Factor 3.313)* on Fractal Media and Fractional Viscoelasticity
- *Committee member*
  - Ad-Hoc Committee on the master's degree Program, Department of Mathematics, Kennesaw State University (August 2020- Present).
  - Developing a Calculus for the Life Sciences, Kennesaw State University (March 2021- August 2021).
  - Department Curriculum Committee (August 2021- August 2023).
  - Department Awards Committee (August 2021- August 2023).
  - Hiring new Faculty Committee (October 2022- March 2023).
  - Upper division Calculus Strand Committee (August 2022-Present)
- *Reviewer*
  - American Mathematical Society
  - Journal' Reviewer