DEPARTMENT OF MATHEMATICS AND STATISTICS

New Mathematical Finance Program

by Angela Peace

The department is now offering new M.S. and Ph.D. tracks in mathematical finance, thanks to the efforts of Dr. W. Brent Lindquist and Dr. Svetlozar Rachev, who are co-directors of the new Mathematical Finance Program. Mathematical finance uses intricate mathematical models to predict markets, set prices, enhance returns, and manage risk. Through these new tracks, students learn how to apply mathematical and computational methods to develop and exploit financial opportunities for return enhancement and risk control. Throughout their courses, students use real data to analyze and predict the performance of individual stocks and commodities, as well as market indices and derivatives. The Texas Tech Mathematical Finance Programs is one of a few programs offering both M.S. and Ph.D. training.

"The Texas Tech Mathematical Finance Program is one of a few programs offering both M.S. and Ph.D. training."

The M.S. specialization in mathematical finance focuses on building a solid foundation in applied mathematics, uncovers models used in financial applications, and teaches computational tools for developing solutions.

The Ph.D. in Mathematics with a specialization in Mathematical Finance focuses on developing candidates with strong affinity for quantitative reasoning and the ability to connect advanced mathematical theories with real-world phenomena. Doctoral candidates will have an interest in the creation of complex models and financial instruments, as well as a passion for in-depth analyses suitable for seeking careers in research, either 'on the Street' or in academia. For more information visit the Mathematical Finance website.

Drs. Svetlozar Rachev and W. Brent Lindquist co-directors of the new Mathematical Finance Program.

IN THIS ISSUE

FACULTY SPOTLIGHT

Congratulations to Dr. Angela Peace, recipient of the 2021 President's Excellence in Teaching Award at TTU, as well as the 2021 Dayawansa Award for Research and Teaching.

ALUMNI SPOTLIGHT

Congratulations to Dr. Atul Dixit, recipient of the 2021 Gabor Szego prize. He received his M.S. from TTU under Drs. Alex Solynin and Roger Barnard in 2006.

2020 PUBLICATIONS

The department published more than 120 publications in 2020.

Chair's Corner

by Magdalena Toda

Our department is one of the largest departments on campus, with 46 tenured and tenure track faculty, 7 postdocs, 8 instructors, and way over 100 supported graduate students. We offer two different Bachelor's degrees, two Master's degrees (in Mathematics and in Statistics) and 5 different tracks of doctoral studies: applied mathematics, pure mathematics, statistics, mathematical finance, and mathematics education. Based on the data we collected over the past 5 years, we have conferred 120 Bachelor's degrees, 20 Master's degrees and 10 Ph.D. degrees per year, in average.
We teach about 85,000 standard credit hours a year, and we strive for excellence in teaching, research, and service.

We are here today thanks to our students, through our students, and for our students! We are grateful to the many donors and friends of the department who have provided large amounts of funding to support our students in their studies. We appreciate you all for your generosity and support!

As a donor myself, I must confess that sponsoring a scholarship is a little bit like being a parent! They teach you how to provide, how to love, and how to be happy.

We have many deserving faculty in the department, and it would take hours to honor them all, but today's spotlight goes to only one of them, namely Angela Peace. She is the recipient of the President's Excellence in Teaching Award at TTU for 2021, as well as the Dayawansa Award for Research and Teaching of 2021. I also need to mention that Angela Peace and Fangyuan Zhang just received tenure and promotion to associate professor effective 2021.

"We are here today thanks to our students, through our students, and for our students!"

We are grateful to the leadership and staff members of the College of Arts and Sciences, and especially to Director of Marketing Britton Drown who organized the recent virtual award ceremony. And many thanks go to the staff members in Mathematics and Statistics, in particular our Unit Manager, Betty Ann Thomas.

Magdalena Toda, Ph.D.
Professor and Department Chair
Department of Mathematics and Statistics
College of Arts and Sciences, Texas Tech University

Problems in the Life Sciences: Upcoming REU Program

by Chunmei Wang

The department is excited to host the NSF funded REU program "Mathematical, Statistical and Computational Methods for Problems in the Life Sciences" this summer. It is an eight-week intensive program that actively engages undergraduate students in research projects designed to introduce them to mathematical, statistical and computational methods that are used in the study of life science problems. Students work individually or in groups of two or three, under the supervision and guidance faculty mentors, Drs. Linda Allen, Akif Ibragimov, Leif Ellingson, Angela Peace, and Chunmei Wang. The research projects cover a wide array of life science applications on the dynamics of populations, epidemics, organisms, cells, and proteins. The objectives of the program are to engage undergraduate students, especially those from underrepresented groups and academic institutions, where research opportunities in STEM are limited, in innovative research projects, to expose them to active research environments, and to provide them with the necessary technical skills to do independent research. Through a series of educational and social activities, REU participants have opportunities to enhance their professional development and to form a network of partners among the participants and collaborators in the program. Faculty continue to mentor the REU participants after the 8-week program to guide them in writing their results for publication and to assist them as they transition into graduate school. The ultimate goal of the program is to motivate and to inspire the REU participants to continue graduate study in mathematics, statistics or a related field and to pursue academic or other research careers in STEM disciplines.

"It is an eight-week intensive program that actively engages undergraduate students in research projects"

The research projects of the REU program introduce undergraduate students to mathematical, statistical and computational methods that enable them to pursue independent research on current problems in the life sciences. Under the guidance of

experienced faculty mentors, the student research projects will lead to (1) development of new stochastic models and computational methods to address biological questions on emerging diseases or species invasion; (2) new methods in time-nonhomogeneous processes to determine times at which zoonotic transmission risk is greatest; (3) the development of numerical methods, especially the primal-dual weak Galerkin finite element methods, with applications in Nernst-Planck model arising from life sciences; (4) the development of optimization methods with the mathematical and statistical constraints inherent to the biological and chemical aspects of the structural alignment of protein binding sites; (5) new insights on the effect of community structure and nutrient cycling when aquatic food webs are subject to stoichiometric constraints. The proposed research will build on current results and contribute to new mathematical, statistical and computational methods, algorithm design, analysis, data collection and implementation to address important and complex problems in the life sciences. The results from the research projects will be disseminated through student participation in conferences and workshops, and through publications in mathematical, statistical and biological journals. In addition, code packages that are developed will be available on the program's website.

Welcoming New Colleagues

Dr. W. Brent Lindquist
Professor

As an applied mathematician, he rejoins the department after serving as dean of the College of Arts & Sciences from 2014-2020. His research focus includes numerical methods for PDEs.

Dr. Amanda Laubmeier
Assistant Professor

Her research focuses on the mathematical study of ecological systems, both through theoretical, model-based exploration and data-driven validation of the mechanisms driving system dynamics.

Dr. Ruiqi Liu
Assistant Professor

His research focuses on developing statistical procedures to solve real-world problems and understanding the foundations of statistics

Dr. Luigi Ferraro
Post Doc

His research is in commutative algebra, in particular in the use of homological tools to study commutative rings.

Dr. Alvaro Pampano
Post Doc

His research focus includes the Geometric Calculus of Variations for curves and surfaces.

Dr. Ozkan Ozturk
Post Doc

His research interests include differential/difference equations, dynamical systems on time scales, control theory, oscillation theory, stability theory, and integral equations

XVIII Red Raider Minisymposium: Modeling in a Heterogeneous World

By Angela Peace

The department will host the XVIII Red Raider Minisymposium on Modeling in a Heterogeneous World in August 2021. This event is generously supported by NSF and Horn Professor Linda Allen and organized by Angela Peace, Wenjing Zhang, Linda Allen, Ken Schmidt, and Joshua Padgett.

It will bring together experts, early-career faculty, and graduate students whose interests lie in the use of mathematical biology to investigate heterogeneous models arising in ecology and epidemiology. The meeting will not only be a good opportunity for researchers to find common ground but will also provide a chance for interested early-career faculty to gain insight into this area as they begin to make their own contributions. The interaction between mathematicians, biologists, and medical professionals will provide a unique opportunity for all involved to experience truly interdisciplinary interactions and research. Our overarching goal is to foster a collaborative effort to find common themes amongst diverse researchers, identify important open questions in this field, and to focus continued effort in the direction of studying the importance of heterogeneity in biological models.

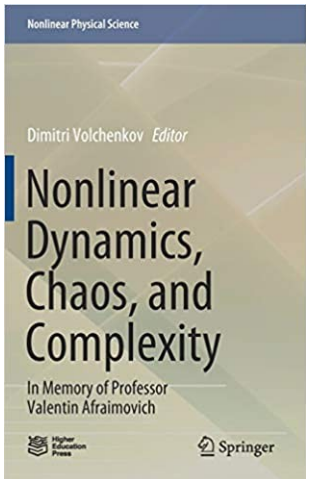
"... a collaborative effort to find common themes amongst diverse researchers, identify important open questions in this field, and to focus continued effort in the direction of studying the importance of heterogeneity in biological models."

The minisymposium will consist of Invited Plenary speakers, including Mark Lewis (University of Alberta), Alun Lloyd (North Carolina State University), Spencer Hall (Indiana University), Joel Brown (University of Illinois), as well as early career speakers and a poster session. Through the generous support of the NSF, funding is available for early-career faculty, postdoctoral researchers, undergraduate and graduate students to participate and to present posters.

Book Announcement: Nonlinear Dynamics, Chaos, and Complexity

By Dr. Dimitri Volchenkov

Dr. Dimitri Volchenkov is editor of "Nonlinear Dynamics, Chaos, and Complexity" a Springer book from the Series "Nonlinear Physical Science". This book demonstrates how mathematical methods and techniques can be used in synergy and create a new way of looking at complex systems. It becomes clear nowadays that the standard (graph-based) network approach, in which observable events and transportation hubs are represented by nodes and relations between them are represented by edges, fails to describe the important properties of complex systems, capture the dependence between their scales, and anticipate their future developments. Therefore, authors in this book discuss the new generalized theories capable to describe a complex nexus of dependences in multi-level complex systems and to effectively engineer their important functions. The collection of works devoted to the memory of Professor Valentin Afraimovich introduces new concepts, methods, and applications in nonlinear dynamical systems covering physical problems and mathematical modelling relevant to molecular biology, genetics, neurosciences, artificial intelligence as well as classic problems in physics, machine learning, brain and urban dynamics. The book can be read by mathematicians, physicists, complex systems scientists, IT specialists, civil engineers, data scientists, urban planners, and even musicians (with some mathematical background).



18th Emmy Noether High School Mathematics Day

By Angela Peace

The 18th Emmy Noether High School Mathematics day is going virtual on May 12, 2021. The department first began hosting this mathematical outreach event in 2003 through the efforts of Dr. Mara Neusel and the continued dedication of the department, along with efforts led by Dr. Magdalena Toda, has kept it an important event for the Lubbock community. This summer, students and teachers from local high schools and junior high schools will join us virtually as we promote women mathematicians and foster young interests in mathematics. This year's virtual panel is dedicated to all academic fields, in particular arts and sciences. Panelists include: Dr. R. Higgins, Dr. A. Laubmeier, Dr. A. Peace, Dr. A. Wong and Dr. J. Cañas from TTU, along with Dr. B. Shipman from UTA.

Graduate Degree Recipients

May 2020

Ph.D. Lale Asik

M.A. Math Victoria Dines-Shore
Seth Johnson

M.S. Math Michael Clines
Chathuri Sandamalli
Isanka Garli Hevage

M.A. Math Rohana Vithanage
Shadi Heenatigala
Yuan Hu
Rhanuma Islam
Lily Young

M.S. Stat Adeepa Gunarathne
Dananjani Madiwala
Abootaleb Shirvani

August 2020

Ph.D. Shamon Ann Almeida
Ahmed Belhad
Dilini Fonseka
Md Rafiul Islam
Miuran Dencil Jayaweera
Kaniz Nipa
Yuan Qiu
Nadeesha Vidanage

M.S. Math Md Wasim Akram
Sergio Baez-Lugo
Yusup Geldiyev

M.S. Stat Tung Nguyen
Shan Xue

December 2020

Ph.D. Jayarathne, Diyunugalage Gajith Neranjaka

M.S. Math Saba Nafees
Bobbie L. Nettle

M.S. Stat Dulanjalee D. Devage Dona
Dewamullage Chathuri N. Perera
Hettiarachchige Sithma S. Pinto Jayawardena
Lingjuan Qi
Kusal C. Rathnayake
Dong Xu

Math&Stats notes

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The success of the Department is largely possible due to the generous support of many donors. *Thank you!* For more information about giving to Mathematics and Statistics visit http://www.math.ttu.edu/Other/giving.shtml.

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