Spring /Summer 2019
Volume 1, Issue 5

Old Dominion University

# Mathematics & Statistics Newsletter

## Chair's Message:

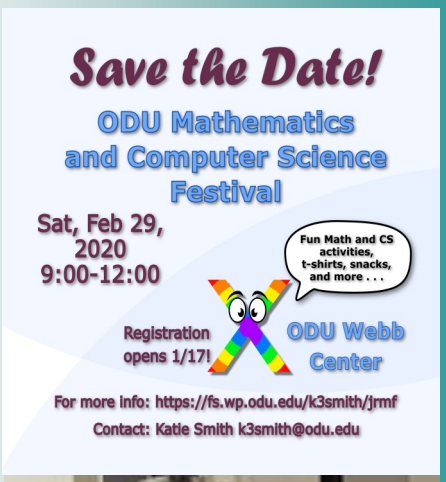
**Dr. Hideaki Kaneko**

I am happy to report to you that the department continues to thrive in the areas of research and teaching. The new BS program in Big Data Analytics (BDA) is in its second year of existence and it is gaining popularity among our students. A new ONLINE Graduate Certificate Program for Computational Data Analytics is being proposed; this entails online development of four BDA courses: Introduction to Machine Learning I & II, Optimization and Inverse Problems and Statistical Methods for Big Data Analytics. We anticipate launching this new certificate program in the academic year 2020-2021.

Several faculty members are involved in special projects aimed at improving student academic performance in College Algebra and Precalculus. Data from Fall 2018 indicate that students who are participating in the Precalculus pilot projects are performing much better academically. We are very encouraged by these results and anxious to receive the results from spring 2019.

Bob Strozak, Master Lecturer, received the COS Distinguished Teaching Award in April 2019. Undergraduate students, Angela Branch is the recipient of the Carl A. Schulz Jr Scholarship, Justin Williams received the Elzie Glenn Whitlock Endowment Scholarship and Daniel Weddle received the Wayne A Helm Scholarship. This year's Philip R. Wohl Memorial Scholarship was awarded to Mohammed Alqawba who expects to complete his PhD degree in August 2019. Top Undergraduate Students are listed on Page 3 of this newsletter. Congratulations to all!

The 2nd Annual Julia Robinson Mathematics Festival (JRMF) attracted approximately 165 students from the Tidewater region. This has been a great outreach program and I thank Katie Smith and Blair Swoope for spearheading this effort! More information on the JRMF can be found on page 2.




### Inside this issue



**Special points of interest**

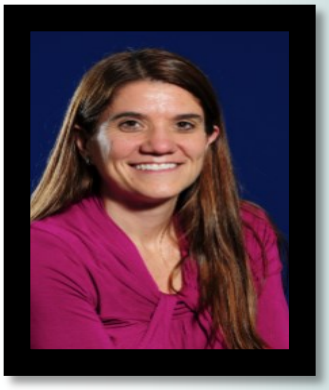
- RFB Seminars
- JRMF
- Accepted Papers
- New Faculty
- Deceased Math Professors

**Julia Robinson Mathematics Festival**

**The Second Annual Julia Robinson Mathematics Festival:** The Old Dominion University Mathematics & Statistics Department hosted the Second Annual JRMF ODU Mathematics and Computer Science Festival on Saturday, March 2, 2019. The event was also supported by the Computer Science Department and several members of the community. The event was coordinated by organizer Katie Smith and co-organizer Blair Swoope, both faculty in the Department of Mathematics & Statistics. The event was also supported by a team of nearly 50 incredible volunteers including faculty and students. The festival attracted approximately 165 students in 4th through 8th grades from the Hampton Roads area. The theme of the festival was "What's Your X?" encouraging students to relate to problem solving activities. To promote excitement and enthusiasm for STEM, the organizer created a diverse cast of X characters. The event was a success as students enjoyed problem and puzzle solving activities including Measuring Rice, The Last Chip, Tiling Torment, Candy Conundrum, Switching Light Bulbs, Computer Science, Tower of Rings, and ConHex. Each participant received a t-shirt with the characters, string backpack, snacks, and a character button. Organizers received overwhelmingly positive feedback from parents, chaperones, and participants with over 93% of respondents rating the festival positively. We are looking forward to coordinating the Third Annual JRMF ODU Mathematics and Computer Science Festival in Spring 2020.

***Julia Robinson Mathematics Festival — Coming — February 29, 2020!***

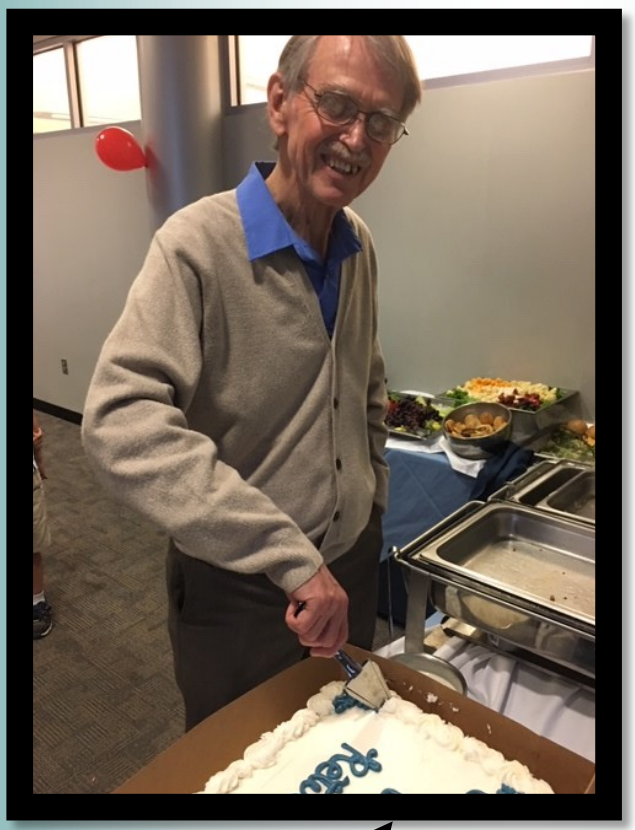

**Featured Faculty**



**Dr. Andrea Jones - Senior Lecturer**

Andrea received her BS degree in Chemical Engineering from Virginia Tech in 1996 and MS (2006) and PhD (2007) in Computational and Applied Mathematics from Old Dominion University. Since joining the department in 2007 as an adjunct faculty, she taught a variety of math courses, including Calculus III, Ordinary Differential Equations, Linear Algebra and Calculus for Business and Economics. She received the Shining Star Award in 2005 in recognition of her demonstrated evidence of helping student succeed academically, professionally, or personally inside and outside of the classroom setting. She is currently revamping Math 200 curriculum so that the course focuses more on the applications of calculus to business related problems.

**John Kroll Retirement**




Dr. Kroll obtained his PhD in Applied Mathematics from Yale University in 1973. After spending two years at Nova Oceanographic Laboratory and one year at MIT, he joined the Department of Mathematics and Statistics of Old Dominion University in 1976 as an Assistant Professor of Mathematics. Dr. Kroll currently holds the rank of Associate Professor. During the period of 43 years at Old Dominion University, John conducted research in the field of Oceanography. He spent one year 1985-86 at the Naval Postgraduate School as National Research Council Senior Associateship. From 1991 to 2000, Dr. Kroll also served as a Principal Investigator at the Center for Coastal Physical Oceanography at Old Dominion University. He has published 20 research articles in various professional journals and secured two grants from the National Science Foundation.

Dr. Kroll taught several different math courses at undergraduate as well as at graduate level, including Vector Calculus, Mathematical Modeling, Complex variables, Biomathematics, Partial Differential Equations and Perturbation Methods. Moreover, Dr. Kroll served as the Chief Departmental Advisor from 2003 to 2013.

Dr. John Kroll retirement date is May 24, 2019.

**Outstanding Students:**

**Mohammed Alqawba–** The Philip R. Wohl Scholarship.

**James Kelvington:** Top Undergraduate Senior Student in Statistics.

**Isabel Ballesteros**: Top Undergrad Senior Student in Mathematics for Secondary School Teachers.

**Nicole Brailer**: Top Undergraduate Senior in Applied Mathematics Major**.**

**Elizabeth Trahadias:** Top Undergraduate Senior in Actuarial Mathematics Major

## Featured Faculty

**Dr. Yan Peng - Associate Professor**

Yan received her PhD in Computational Fluid Dynamics from the National University of Singapore in 2005. She joined the department in 2006 as Research Assistant Professor of Mathematics. She took the position of Assistant Professor in 2008 and subsequently promoted to the current rank of Associate Professor in 2014. Yan published more than 40 articles in various professional journals and proceedings. She has secured 4 external funding including a grant from the National Science Foundation entitled, "Numerical study of electrokinetic bioparticle transport through fluid-structure-electric interaction". She is a recipient of the Shining Star Award in 2010 and also the College of Science Early Career Research Award in 2013. Two PhD students completed their thesis under Yan's supervision and currently three additional tPhD students are writing theses in the area of CFD.

***What is a Math Teacher's favorite type of tree? A: a "Geome - tree"***

**Math Coordinators:**

Math 101M—Shari Davis
Math 102—Lisa Blum
Math 103M—R. Flanagan
Math 162M—E. Swoope
Math 163—R. Stowe
Math 200—Andrea Jones
Math 211/22/312—P. Bogacki & Gordon Melrose
Stat—130M—K. Rafferty

## New Faculty

**Dr. Guohui Song** – Associate Professor of Data Science: Dr. Song received his BS degree in Mathematics and Applied Mathematics from Wuhan University, Wuhan, China in 2003 and PhD in Mathematics from Syracuse University in 2009. He held a post-doc position at Illinois Institute of Technology and at Arizona State University before joining Clarkson University in 2012. We are delighted that he made decision to join us in Fall 2019. Dr. Song's research interests are Machine Learning, Optimization, Image/Signal Processing and Applied and Computational Harmonic Analysis. Probability, Statistics and Linear Algebra are his favorite undergraduate courses to teach. At the graduate level, he enjoys teaching Statistical Learning/Data Mining, Optimization and Real/Complex/Functional/Convex/Numerical Analysis courses. Dr. Song is currently completing his NSF funded projects, An Integrated Approach to Convex Optimization Algorithms. He will begin another NSF funded project starting Fall 2019.

**Dr. Sinjini Sikdar** – Assistant Professor of Data Science in Computational Statistics: Dr. Sikdar received her BS degree and MS degree in Statistics from University of Calcutta in 2010 and 2012 respectively and PhD in Biostatistics from University of Florida in 2017. During the last two years, she is conducting research under Post-doc Fellowship in the Epidemiology Branch of the National Institute of Environmental Health Sciences located in the Research Triangle, NC. Her research interested are Bioinformatics, Genetic Epidemiology, Genome-wide Association Studies, Environmental Epigenetics, Statistical Genomics and Statistical Proteomics. Dr. Sikdar has authored 8 research articles in various journals.

**Dr. Sandipan Dutta** – Assistant Professor of Statistics: Dr. Dutta received his BS degree in Statistics from University of Calcutta in 2010, MS degree in Statistics from Indian Institute of Technology Kanpur in 2012 and PhD in Biostatistics from University of Louisville in 2016. He has been serving as Post-doc Associate in the Department of Biostatistics and Bioinformatics at Duke University. His research interests are Rank based inference for clustered data, Survival analysis and multistate models regression, High dimensional regression of censored data, Resampling and Subsampling techniques, Prognostics and predictive modeling of clinical cancer data, Sample size and power calculation in clinical trials. He has authored 9 articles in various professional journals.

## SIAM Math Awareness Conference

Annual SIAM Math Awareness Conference was held on April 6th, 2019. The conference was attended by more than 55 participants. There was the total of 14 speakers, including three invited speakers. The invited speakers were:

Dr. Tyrus Berry [GMU], The Mathematics of Manifold Learning

Abstract: This talk will introduce manifold learning as an important paradigm arising in data science and machine learning. We will start by explaining the fundamental assumption, which is that our data lies on a manifold (a nonlinear low dimension subspace of the data space). We also examine the situations where such an assumption may naturally arise. We then turn to the algorithms that have been developed to represent the nonlinear structure of the manifold and I introduce the mathematics that underlies them. Finally we discuss how these questions fit into the wider context of data analysis and mathematical modeling and examine some future directions and open questions

Dr. Alexandra L. Hanlon [VT], Data Analytics in Nursing: A Case Study

Abstract: The main purpose of the present study is to provide an example of collaborative work to students interested in pursuing careers in applied biostatistics and/or the health data sciences. We will use and compare three data mining techniques, namely, logistic regression (LR), decision tree modeling (DT), and random forests (RF), to identify clinical phenotypes that may predict the risk of depression among young adults not on antidepressants and to predict antidepressant treatment response among those receiving antidepressant treatment. Wave IV data from over 3,000 young adults aged 24 to 32 years participating in the National Longitudinal Study of Adolescent to Adult Health (Add Health) will be used. Potential predictors considered in these analyses include demographics (education, race, birth country), health-related variables (health status, body mass index), and personality scales (neuroticism, mastery, anxiety, optimism). The three methods (LR, DT, RF) will be compared for predictive accuracy in terms of area under the curve (AUC) estimates and receiver operating characteristic (ROC) curves.

Dr. Marco Aldi [VCU], Mathematical Aspects of Quantum Complexity Theory

Abstract: In classical computing devices information is stored in strings of fundamental binary states. In quantum computing the fundamental units of information are represented by physical states of certain quantum mechanical systems. The study of computation complexity in the context of quantum computers presents numerous mathematical challenges. After a general overview of the subject, in this talk we describe some mathematical results concerning a quantum generalization of the classical satisfiability problem.

Wesley Davis served as the main organizer of the conference. Samuel Gedon, Charlie Armstrong, and Katie Rafferty also assisted in organizing. Ray Cheng was the faculty advisor. Reflecting on this year's event, Wesley comments that "we had a wonderful conference this year and we would like to thank everyone who made this event wonderful. We hope to see

## Publications and Accepted papers by the Math & Stat Faculty
## January 2018 February 2019

### John Adam:

1. Shape Resonances of the Transverse Magnetic Mode in a Spherically Stratified Medi (with U. Nuntaplook), International journal of Applied Physics and Mathematics, 8(3), (2018), 18 – 30.
2. Review of "The Beauty of Numbers in Nature" by Ian Stewart. SIAM Review 60(4), (2018), 1016 – 1020.
3. Dimensional Analysis: Physical Insight Gained Through Algebra, Virginia Mathematics Teacher, 45(1), 17 – 21, (Fall 2018 issue)

### Przemyslaw Bogacki:

1. Linear Algebra: Concepts and Applications, American Mathematical Society (March 2019)
2. University Calculus: Early Transcendentals, Fourth Edition, Pearson (2019) with J. Hass, C. Heil, M. Weir & G. Thomas

### Rao Chaganty:

1. Hierarchical Archimedean copula models for the analysis of binary familial data, Statistics in Medicine, 37, pp. 590-597, with Y. Deng, (2018).
2. A Doubly-Inflated Poisson Distribution and Regression Model, Modern Statistical Methods for Spatial and Multivariate Data, STEAM-H Series, Springer, with M. Sheth-Chandra and R. T. Sabo, (2018).

### Raymond Cheng:

1. Convergence of the best linear predictor of a weakly stationary random field, Journal of Fourier Analysis and Applications, 24 (2018).
2. Optimal Weak Parallelogram Constants for $L^p$ , Mathematical Inqualities and applications, (to appear), with J. Mashreghi and W.T. Ross.
3. Linear Functions and Zero Sets for $l^p{}_{A,}$ Transactions of the American Mathematical Society with J. Mashreghi and W.T. Ross.

### Norou Diawara:

1. Doubly-inflated Poisson model using Gaussian copula, Communications in Statistics-Theory and Methods: Vol. 47(12), pp. 2848-2858, DOI:10.1080/03610926.2017.1342831. with Sumen Sen, P. Sengupta, (2018).
2. Density estimation of spatio-temporal point patterns using Moran's statistics, International Journal of Statistics and Probability, Vol. 7 (2), pp. 80-90, https://doi.org/10.5539/ijsp.v7n2p80 with Lorio, J. and Waller, (2018).
3. The Use of Item Response Theory in Survey Methodology: Application in Seat Belt Data, American Journal of Operations Research, Vol. 8 pp.17-32 doi: 10.4236/ajor.2018.8100 with M.K. Ledbetter and B. Porter , (2018).
4. New Approaches to Model Simulated Spatio-Temporal Moran's Index," Journal of Probability.
5. Time Dependent Attribute-Level Best Worst Discrete Choice Experiments", Big Data and Information Analytics, with Working A., M. Alqawba and L. Li, (to appear in 2019).

### Fang Hu

1. On the use of a Prandtl-Glauert-Lorentz transformation for acoustic scattering by rigid bodies with a uniform flow , Journal of Sound and Vibration, Vol. 443, 198-211, with M. E. Pizzo, and D. M. Nark (2019).
2. Numerical Investigation on Acoustic Energy Flux Distribution in a Lined Duct, AIAA paper 2018-3778, with C. Chen, X. Li, (2018).
3. Simulation of Sound Absorption by Scattering Bodies Treated with Acoustic Liners Using a Time-Domain Boundary Element Method, AIAA paper 2018-2356, with M.E. Pizzo and D. M. Nark, (2018).

## Publications and Accepted Papers Cont':

### Sookyung Joo:

**1.** Switching mechanism in the B1 phase of bent-core liquid crystals, SIAM J. Math. Anal., 50 no. 5, (2018) 4889-4913, with C.J. Garcia Cervera, T. Giorgi and X. Lu,

### Glenn Lasseigne:

1. An Extensible Mathematical Model of Glucose Metabolism. Part I: The Basic Glucose-Insulin-Glucagon Model, Basal Conditions and Basic Dynamics, Letters in Biomathematics (TLIB), DOI 10.1080/23737867.2018.1429332 http:/ dx.doi.org/10.1080/23737867.2018.1429332 with Caleb Adams (2018).

### Li-Shi Luo:

1. Improve the eciency of the Cartesian tensor based fast multipole method for Coulomb inter action using the traces. Journal of Computational Physics 371:122-136 (2018), with H. Huang, R. Li, J. Chen, and H. Zhang.
2. An exponential time-integrator scheme for steady and unsteady inviscid flows, Journal of Computational Physics 365:206-225 (2018), with S.J. Li, J.Z. Wang, and L.L. Ju.

### Kayoung Park:

**1.** GLM-based statistical control r-charts for dispersed count data with multicollinearity between input variables, Quality and Reliability Engineering International, https://doi.org/10.1002/qre.2310, with Kim, J., and Jung, D. (2018).

### Yan Peng:

1. An MRT extension to the multigrid lattice Boltzmann method, Communications in Compu-

### Ke Shi:

1. A priori and computable a posteriori error estimates for an HDG method for the coercive Maxwell equations, Computational Methods in Applied Mechanics. And Engineerings. no. 333, 1 (2018), pp: 287-310, with H. Chen, W. Qiu.
2. An HDG method for linear elasticity with strong symmetric stresses, Mathematics of Com putation, 87 (2018), pp: 69-93, with Qiu, J. Shen.
3. An Introduction of the theory of M-decomposition, to appear in SEMA SIMAI Springer Series. B. with Cockburn and G. Fu.
4. Upscaled HDG methods for Brinkman equations with high-contrast heterogeneous coeffi cient, to appear in Journal of Scientific Computation, with G. Li.

### Katherine Smith:

1. Supporting Student Veterans Along the Engineering Degree Pathway, 2018 Fleet Mainte nance & Modernization Symposium. Virginia Beach, VA, September 17-20, 2018, with Tamhane, A., Smith, K., Dean, A., Shen, Y.
2. Incorporating Diegetic Elements to Increase Engagement in Games for Engineering Educa tion, 2018 ASEE Annual Conference & Exposition, with Zhu, Z., Shen Y., Lin, C., Ren and Dean A.
3. Design of A Virtual Laboratory for Automation Control, 2018 ASEE Annual Conference & Exposition, with Zhu, Z., Shen Y., Lin, C., Ren, K., Dean A.
4. Tracking Blade Tip Vortices for Numerical Flow Simulations of Hovering Rotorcraft, Pro ceedings of the 2018 AIAA Science and Technology Forum and Exposition. Kissimmee, FL.

### Lucia Tabacu:

1. Weak convergence of the linear rank statistics under strong mixing conditions, Statistics & Probability Letters, Vol. 132, (2018), 28-34.

### Xiang Xu:

1. An elementary proof of eigenvalue preservation for the co-rotational Beris-Edwards system, Journal of Nonlinear Science, to appear in 2019, with Contreras, A. and Zhang, W. J
2. Dynamics and flow effects in the Beris-Edwards system modeling nematic liquid crystals, Arcives Rational Mechanics and Analysis, (2018), online first, DOI: 10.1007/s00205-018-1297-2, with Wu, H. and Zarnescu, A.

## Publications and Accepted Papers Cont':

### Yuesheng Xu:

1. A higher-order polynomial method for SPECT reconstruction, IEEE Transactions on Medcal Imaging, published online, 2018, with Y. Jiang and S. Li.
2. Infimal convolution-based regularization for SPECT reconstruction, Medical Physics, 45 (12)(2018), 5397-5410, with Jihan Zhang, Si Li, A. Krol, C.R. Schmidtlein, D. Feiglin, E. Lipson.
3. Computing integrals involved the Gaussian function with a small standard deviation, Journal of Scientic Computing, published online, 2018., with Y. Ma.
4 Sparse support vector machines in reproducing kernel Banach spaces, Contemporary Compu tational Mathematics-A Celebration of the 80th Birthday of Ian Sloan, Springer 869-887, 2018, with Zheng Li and Qi Ye.
5. Generalized Mercer Kernels and Reproducing Kernel Banach Spaces, Volume 258 - Memoirs of the American Mathematical Society, Feb. 2019, 122 pages, with Qi Ye.

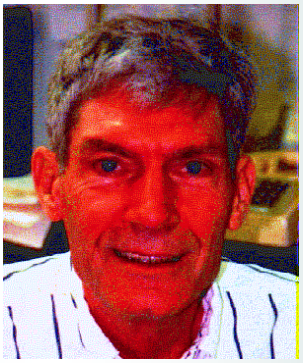
### Nail Yamaleev:

1. Entropy stable spectral collocation schemes for the 3-D Navier-Stokes equations on dynamic unstructured grids, arXiv: 1812.10185 [math.NA], 2018, also submitted to J. Computational Physics, with D. C. Del Rey Fernandez, J. Lou, M. H. Carpenter, (2018).

### Ruhai Zhou:

1. Instabilities of active suspensions of liquid crystals", Radiation Effects and Defects in Solids, (to appear 2019), with A. Williams.

## Passing away of two Math Professors:



Ms. Sue Doviak, Senior Lecturer Emeritus, who retired in 2017, passed away this year. She joined the Dept. of Mathematics & Statistics in 1988 and was promoted to Senior Lecturer in 2009. Sue has been active in various work with many campus groups to provide remedial instructional in mathematics.

Mr. Mark Lesley, Associate Professor Emeritus, who retired in 1997, passed away this year. Prof. Lesley received his BS ('58) and MS ('60) degree from American University of Beirut. He joined the Department of Mathematics and Statistics of ODU in 1964 as Assistant Professor of Mathematics. He was promoted to the rank of Associate Professor in 1977. He served as Assistant Chairman from 1975 to 1997. He was a passionate teacher who influenced many students to choose a career in mathematics.

**Richard F. Barry Seminars**
**Spring 2019**

**Jan. 31, 2019**—Michael Schweinberger, Rice Univ,
**March 31, 2019**—Raymond Cheng, ODU
**April 11, 2019**– Tiziana Giorgi, New Mexico State Univ.
**April 25, 2019**—Victor Ambrus, West Univ. of Timisoara
**May 16, 2019**– Xin Yan Lu Lakehead University.

Anyone who has suggestions for the fall and Spring seminar speakers, contact Yan Peng at ypeng@odu.edu.

**Officers**

Hideaki Kaneko – Chair
Yuesheng Xu – Associate Chair of Research
Gordon Melrose – Assistant Chair of Instruction
Ruhai Zhou – Graduate Program Director
Rao Chaganty—Statistics Program Director
Bob Strozak – Chief Departmental Advisor
Przemek Bogacki – Director of Online Instruction
Yan Peng – Coordinator of the Richard F. Barry Colloquium Series

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