

# Deanna Colonna Easley

## *Curriculum vitae*

10641 Gramercy Place  
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Columbia, MD, 21044

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<https://mason.gmu.edu/~deasley2/>

### EDUCATION

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PH.D. IN MATHEMATICS, May 2022, George Mason University, Dissertation: *Higher Order Kalman Filtering for Nonlinear Systems*, Advisor: Dr. Tyrus Berry

M.S. IN MATHEMATICS, May 2017, George Mason University

B.S. (SUMMA CUM LAUDE) IN MATHEMATICS, Minor in Italian, May 2015, George Mason University

### RESEARCH INTERESTS

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NUMERICAL ANALYSIS: approximation of tensor eigenvalues and eigenvectors, tensor decomposition and numerical integration/cubature

DYNAMICAL SYSTEMS: data assimilation, inverse problems, prediction/control, and uncertainty quantification.

### PUBLICATIONS

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- Deanna C. Easley. *Higher Order Kalman Filtering for Nonlinear Systems*. PhD thesis, George Mason University, 2022.
- Deanna Easley and Tyrus Berry, *A Higher Order Unscented Transform*. SIAM/ASA Journal on Uncertainty Quantification (JUQ), 9(3):1094–1131, 2021.

We develop an approach for estimating the expected values of nonlinear functions applied to multivariate random variables with arbitrary distributions. In order to overcome a long standing issue of improving upon and generalizing the unscented transform by creating a new quadrature that matches not only the mean and covariance but also any given skewness and kurtosis tensors (and potentially arbitrarily many moments), we introduce the higher order unscented transform (HOUT). The nodes of the HOUT are formed using the tensor CP decompositions of the moments, and we present a practical algorithm for computing a non-minimal CP decomposition of tensors and the first rigorous proof of convergence in linear time. The unscented transform is used in many areas of uncertainty quantification such as filtering, smoothing, and parameter estimation, and our generalization can help improve all these methods.

### TALKS AND CONFERENCES

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- October 6, 2021: Sensor Science Division Seminar, National Institute of Standards and Technology (NIST). *Learning Hidden States from Noisy Observations*.
- August 27, 2021: Dynamics Days Europe 2021. *Generalizing the Unscented Ensemble Transform to Higher Moments*.
- August 25, 2020: Dynamics Days Digital 2020. *Generalizing the Unscented Ensemble Transform to Higher Moments*.
- August 14, 2020: SIAM Conference on Mathematics of Planet Earth (MPE20). *Generalizing the Unscented Ensemble Transform to Higher Moments*.
- November 22, 2019: Student Research Talks, George Mason University. *Generalizing the Unscented Ensemble Transform to Higher Moments*.
- February 26, 2019: Mathematics and Climate Seminar, George Mason University. *Lorenz Equations*.

## SOFTWARE PACKAGES DEVELOPED

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- Higher Order Unscented Transform (HOUT)

This Matlab code computes the weights and nodes of the Higher Order Unscented Transform and is available at <https://dceasley.github.io/code/HOUT.zip>

## ORGANIZATIONS

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*Association for Women In Mathematics (GMU Chapter)*

PRESIDENT April 2020 - April 2022

TREASURER March 2018 - April 2020

VICE PRESIDENT April 2017 - March 2018

## TEACHING AND RESEARCH EXPERIENCE

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MAY 26, 2022 – FEB 7, 2023	<i>Postdoctoral Associate</i> University of Maryland, College Park Researched sea ice data assimilation based on the Joint Effort for Data Assimilation Integration (JEDI) framework and tested methods for assimilating satellite sea ice thickness and sea ice age observations.
OCT 7, 2021 – MAR 31, 2022	<i>Guest Researcher</i> NIST, Gaithersburg Researched Nitrogen Vacancy (NV) Diamond-Based Quantum Metrology with Dr. Zeeshan Ahmed and Dr. Tyrus Berry
AUG 25, 2018 – MAR 24, 2022	<i>Research Assistant</i> George Mason University, Fairfax Researched higher order methods in data assimilation with Dr. Tyrus Berry
MAY 25, 2019 – JUN 24, 2019	<i>Course Instructor</i> George Mason University, Fairfax Taught Precalculus.
MAY 25, 2018 – JUN 24, 2018	<i>Course Instructor</i> George Mason University, Fairfax Taught Precalculus.
JAN 10, 2018 – MAY 24, 2018	<i>Teaching Assistant</i> George Mason University, Fairfax Taught three recitations of Analytic Geometry and Calculus III for Instructor Nacir Hmidouch and one recitation of Elementary Differential Equations for Adjunct Prof. Chistopher Paldino.
AUG 25, 2017 – JAN 9, 2018	<i>Teaching Assistant</i> George Mason University, Fairfax Taught three recitations of Analytic Geometry and Calculus III for Dr. Thomas Wanner and three recitations of Analytic Geometry and Calculus I for Dr. Flavia Colonna.
JAN 10, 2017 – MAY 24, 2017	<i>Teaching Assistant</i> George Mason University, Fairfax Taught three recitations of Analytic Geometry and Calculus III for Asst. Prof. Kumnit Nong.
JAN 22, 2017 – MAY 27, 2017	<i>Grader</i> George Mason University, Fairfax Graded Linear Algebra exams for Dr. Neil Epstein.
AUG 25, 2016 – JAN 9, 2017	<i>Teaching Assistant</i> George Mason University, Fairfax Taught two recitations of Analytic Geometry and Calculus III for Dr. Igor Griva and one recitation of Analytic Geometry and Calculus III Honors for Dr. Robert L. Sachs.

MAR 20, 2016 – MAY 28, 2016	<i>Grader</i> George Mason University, Fairfax Graded Introductory Calculus with Business Applications quizzes and tests for Prof. Karen Crossin
AUG 31, 2015 – DEC 26, 2015	<i>Grader</i> George Mason University, Fairfax Graded Linear Algebra homework for Dr. Jeng-Eng Lin.

## SOFTWARE SKILLS

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EXPERT	MATLAB
GOOD LEVEL	LaTeX, HTML, Word, PowerPoint
INTERMEDIATE	Python
BASIC LEVEL	Java, Excel

## AWARDS

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- 2021 **Clarke Family Award for Excellence in Algebra, Analysis, and Topology**  
This award was established in 2015 by Robert W. Clarke to provide scholarships to encourage and recognize graduate student excellence in the study of mathematics and carries a monetary prize of \$1,000.
- 2015 **William Weaver Prize in Italian Studies**  
This award was established in the name of the late pre-eminent translator of Italian literature into English and recognizes the academic achievements of students of Italian. It is a monetary prize in the amount of \$1,000.
- 2015 **Excellence in Advanced Italian**  
This award recognizes one's progress and efforts at study of Italian language and culture at the advanced level for the 2014-2015 academic year.
- 2014 **Excellence in Advanced Italian**  
This award recognizes one's progress and efforts at study of Italian language and culture at the advanced level for the 2013-2014 academic year.

## HONORS

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- SPRING 2015 **Phi Beta Kappa Society**  
FALL 2012 **Delta Alpha Pi International Honor Society**  
2011-2015 **Dean's List**

## COMMUNICATION SKILLS

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ENGLISH	Native speaker
ITALIAN	Good
FRENCH	Fair

## INTERESTS

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- I enjoy making origami that display mathematical concepts and in fact, I have been regularly running origami workshops as a community building session for math majors while a part of AWM.
- I have a deep appreciation of geology, particularly with regard to the human and animal evolution as well as the study of climate, which is an important application of my research.
- I have a strong passion for drawing, and get inspiration from ancient and medieval history, and myth.

