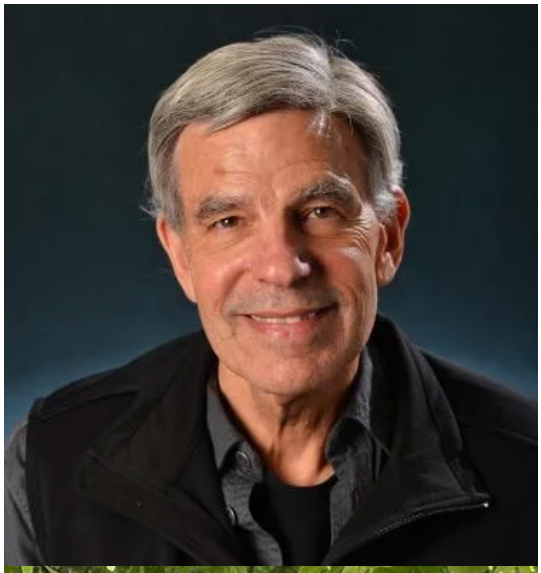
Table of Contents

Letter from the Department Chair

From Mark Ablowitz

Dear APPM,



Academically, Applied Mathematics completed another very successful year; we graduated eleven Ph.D.s, ten Master's of Science, thirteen Professional Master's of Science, eighteen Bachelor of Arts in Statistics and Data Science, and twenty four Bachelor of Science in Applied Mathematics comprising a total of seventy six graduating students.

During the year, representatives from APPM and the MATH department met with upper level administrators to further the goal of investigating, potentially revising, and improving the calculus sequences currently offered by APPM and MATH. Furthermore, APPM is proposing a new Bachelor of Science degree in Applied Mathematics to be offered by the College of Arts and Sciences; currently APPM only offers a Bachelor of Science degree in the College of Engineering. We have also been working diligently with CU architects on the designing of a new building that will house Chemistry and APPM, called CHAP for short.

We are pleased to pass along the information that Associate Professors Will Kleiber and Juan Restrepo have been supported to promotion to full professor through APPM, Arts & Sciences, and the Vice Chancellor's Advisory Committee (VCAC). We expect that the Provost and Chancellor will agree and the promotions will be finalized soon. We are also pleased that Assistant Professor Yu-Jui Huang has been supported for Promotion to Associate Professor with Tenure through the Chancellor level. It is expected that the Board of Regents will concur. All promotions will take effect at the beginning of the Fall 2024 semester.

Unfortunately, and so, so sadly, APPM unexpectedly lost its revered department Chair Keith Julien in April, 2024. This was a stunning loss of a world renown researcher, fine teacher and wonderful Chair. During the last week of his life, the CU Board of Regents approved the building of the CHAP building with a budget of $175.4 million dollars. It is expected that construction will begin in the fall of 2024. Recent cost estimates have been in excess of the proposed budget, so until construction begins, there may be changes in plans.

After the passing of Keith Julien, APPM held a number of votes. The first vote was to allow faculty on sabbatical and leave off absence to vote (passed 12 yes-2 no-0 abstention); this was followed by a preference vote on candidates for Chair which led to the selection of Mark Hoefer as the candidate to be proposed as Chair. The official vote for Chair ended with a vote of (22 yes, 2 no, 0 abstention, 2 non voting). Mark Hoefer met with the Dean of Natural Science after the vote. It is expected that he will officially be named as Chair in the near future.

- Mark Ablowitz (Interim Chair)

- Mark Hoefer (Chair Elect)

Department Faculty

Department Chair: Keith Julien, Mark Ablowitz (interm), Mark Hoefer (incoming)

Associate Department Chair: Anne Dougherty

Graduate Program Chair: Zachary Kilpatrick

PROFESSORS:

Mark Ablowitz (Distinguished Professor)
Gregory Beylkin
David Bortz
James Curry
Vanja Dukic
Mark Hoefer
Keith Julien
James Meiss
François Meyer

ASSOCIATE PROFESSORS:

Stephen Becker
Adrianna Gillman
Ian Grooms
Zachary Kilpatrick
William Kleiber
Manuel Lladser
Juan Restrepo
Nancy Rodriguez
Eric Vance

ASSISTANT PROFESSORS:

Eduardo Corona
Yu-Jui Huang

ADJUNCT PROFESSORS:

Natasha Flyer
Lev Ostrovsky

PROFESSOR EMERITUS:

Jerrold Bebernes
Jem Corcoran
Bob Easton
Bengt Fornberg
Congming Li
Tom Manteuffel
Steve McCormick
Harvey Segur

TEACHING PROFESSOR:

Silva Chang
Anne Dougherty
Adam Norris
Brian Zaharatos

ASSOCIATE TEACHING PROFESSOR:

Sujeet Bhat
Kris Pruitt
Eric Thaler
Ami Gates

ASSISTANT TEACHING PROFESSOR:

Robert Benim
Jonathan Kish
Judith Law
Daniel (Seneca) Lindsay
Matt Reichenbach

RESEARCH ASSOCIATES:

Tahra Eissa
Nick Featherstone
Jose Rafael Fuentes Baeza
Brad Hindman
Lydia Korre
Daniel Messenger
Lucas Monzon
Sean Nixon
Manjul Sharma
Tim Wessler
Houssam Yassin

Affiliated Faculty

Alireza Doostan - Aerospace Engineering
John Evans - Aerospace Engineering
Tomoko Matsuo - Aerospace Engineering
Daniel Scheeres - Aerospace Engineering

Juri Toomre - Astrophysical & Planetary Sciences

Julie Lundquist - Atmospheric and Oceanic Sciences
Jeffrey B Weiss - Atmospheric and Oceanic Sciences

Nicholas Dwork - Biomedical Informatics

John Crimaldi - Civil Engineering
Fatemah Pourahmadian - Civil Engineering

Elizabeth Bradley - Computer Science
Jed Brown - Computer Science
Xiao-Chuan Cai - Computer Science
Aaron Clauset - Computer Science
Rafael Frongillo - Computer Science
Daniel Larremore - Computer Science
Orit Peleg - Computer Science
Sriram Sankaranarayanan - Computer Science
Henry Tufo - Computer Science

Carlos Martins-Filho - Economics

Ute Herzfeld - Electrical, Computer and Energy Engineering
Emiliano Dall'Anese - Electrical, Computer and Energy Engineering
Xudong Chen - Electrical, Computer and Energy Engineering
Bri-Mathias Hodge - Electrical, Computer and Energy Engineering

Dave Fritts - GATS Inc

Ana Maria Rey - JILA

Stephan Sain - Jupiter Intelligence

Scot Elkington - Lab for Atmospheric and Space Physics

Manuel Laguna - Leeds School of Business
Nathalie Moyen - Leeds School of Business

Sean O'Rourke - Mathematics

Peter Hamlington - Mechanical Engineering
Franck Vernerey - Mechanical Engineering
Patrick Weidman - Mechanical Engineering

Aimé Fournier - Massachusetts Institute of Technology

Annick Pouquet - National Center for Atmospheric Research

Meredith Betterton - Physics
Michael Calkins - Physics
John Cary - Physics
Mihály Horányi – Physics
Scott Parker - Physics

Thomas Hauser - Research Computing

Department Staff

Ian Cunningham - Office Coordinator, Undergraduate Program Assistant

Mary Fentress - Program Manager

Laura Gooch, Erin Roberts - Masters Student Coordinator

Gabriella Kirkley - Graduate Student Coordinator

Desiree Holtz, Antonio Gilbert - Accounting Technitian

Noah Chopper - IT Manager

Josh Jeng - IT Assistant

Maedee Trank-Green - Student Assistant

Patrick McCreery - Department Writer, Newsletter Editor

Doctor of Philosophy Graduates

Sabina Adhikari
Advisor: Juan Restrepo

Thesis Title: *Synchronization of phase oscillators on hypergraphs*

Caitlin Berry
Advisor: William Kleiber

Thesis Title: *Subordinated Processes and Spectral Analysis for High Frequency Time Series*

Heather Lynn Cihak
Advisor: Zachary Kilpatrick

Thesis Title: *The impact of synaptic dynamics on working memory in neural field equations.*

Kevin Michael Doherty
Advisor: Stephen Becker

Thesis Title: *Numerical Methods for Non-Uniform Data in Machine Learning*

Evan Gorman
Advisor: Manuel Lladser

Thesis Title: *Learning Sparse Representations of Hierarchically Structured Data with Applications to Comparative Metagenomics*

Andrew Lawrence
Advisor: Bengt Fornberg

Thesis Title: *Advancements in Numerical Modeling: High-Order Methods for Fractional Initial Value Problems and Meshfree Solvers for Partial Differential Equations*

Yifeng Mao
Advisor: Mark Hoefer

Thesis Title: *Two-Phase Wave Interactions and Periodic Wavemaker Problem in Dispersive Hydrodynamics*

Rachel Robey
Advisor: Julie Lundquist, ATOC
Keith Julien, APPM

Thesis Title: *Approaches to multi-scale challenges in measurements and modeling of geophysical flows*

Kristopher Tucker
Advisor: Ana Maria Rey, PHYS
Juan G. Restrepo, APPM

Thesis Title: *Analyzing Properties of Driven-Dissipative Quantum Systems from the Mean Field to Machine Learning*

Killian Reed Wood
Advisor: Emiliano Dall'Anese, ECEE

Thesis Title: *Advances in Stochastic Optimization with Decision-dependent Distributions*

Shimian 'Sam' Zhang
Advisor: Aaron Clauset, CSCI

Thesis Title: *Statistical models of scientific careers and decision-making*

Master's Degree Graduates

Master of Science

Anna Kinne Granquist

Tyler James Jensen

Zachariah Malik

Eappen Sebastian Nelluvelil

Kaloyan Parvanov

John Timothy Quinn

Camille Renaud

Frank Charles Seidl

Sean Paul Svihla

Chi 'April' Tran

Professional Master of Science

Isabel Beaulieu

Ian Bircak

Claudia Chen

Kevin Quoc Dang

Connor Flaherty

Eric Matzke Flaska

Mitchell John Krouss

Samuel Y Kwon

Bisman Singh

Samuel Stiffman

Nihar Gregory Tomy

Sam Robert Touvannas

Yujie Zhang

Graduating Class of 2024

Bachelor of Science
Applied Mathematics

Aubrie L. Capps ‡
Cambria Denae Chaney ◊•
Sophia Clark
Clayton James D'Epagnier ◊
Chris Hieu Doan
Charles Doremieux †
Henry Merrill Dyer ‡ ▸
Ryan Rabel Foley
Ella Louise Glebe
Emily Claire Kaiser †
Daniel Lisle
Molly Noelle McFaul
Aria Trew Mundy
Victoria Nawalany
Ellen Katherine Puzak •
Jenna Rae Rothe •
Katherine Frances Simon
Luke Aaron Stuckenbruck
Kevin Roger Stull
Maedée Sola Trank-Greene †
Stella O'Brien Vannier
Santiago Velasco
Walter Dickson Virany †
Gabriel Thomas Wallon ◊

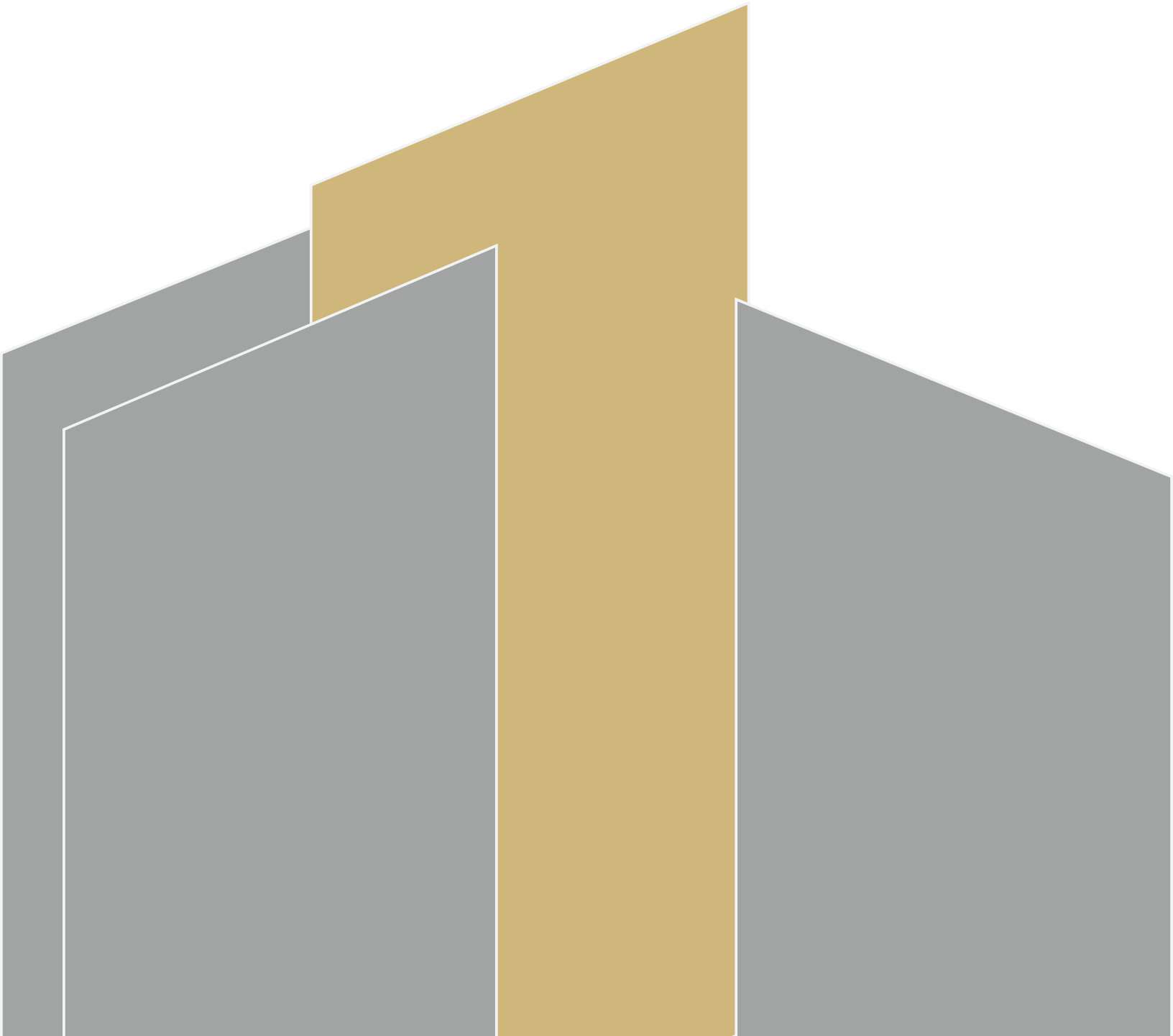
Bachelor of Arts
Statistics and Data Science

Julia W. Bao
Carmela Gwen Carver
Marco Edmundo Cordero
Zain R. Elsell
John Campbell Frederickson
Avery William Fulton
Marcus Alexander Garcia
Alex Greyson Hall
Bailey Marielle Hall
Ashlynn Kane McGrattan
Mary Lloyd Molingowski
Emily Anne Palese
Luke Samuel Pheneger
Andrew Itty Philips
Max Morgan Silver *
Lalita Suwattee
Santiago Velasco
Hannah Prue Whaley

† Cum Laude, ‡ Magna Cum Laude, ◊ Summa Cum Laude, • Engineering Honors
▸ A&S Honors Thesis, * Maurice Davies Award (American Statistical Association)

A Year in Review

News and Events



2023 Rudy Horne Memorial Fellowship Recipient: Ari Geisler

The Department of Applied Mathematics recently announced their 2023 recipient of the prestigious Rudy Horne Memorial Fellowship – Ari Geisler.

Ari is a first year Ph.D. student in Applied Mathematics, who graduated from Bowdoin College with a B.A. in Mathematics and Physics. Ari explained his motivation to study applied mathematics in a graduate setting: "I started my undergraduate career primarily interested in experimental biophysics. However, my sophomore year, I undertook a computational research project (as a result of COVID restrictions) and fell in love with the applied math methods. I remain interested in building mathematical models for problems in biophysics, especially protein-protein interaction models."

The Rudy Horne Memorial Fellowship, as stated by the Applied Math Department, was founded with the goal that fellowship recipients "would, through their presence in the department, contribute to the diversity of the department of Applied Mathematics and of the campus, and more generally, of the community of mathematicians."

While a difficult problem to solve, fellowships like the Rudy Horne Fellowship push for diversity and bring in passionate students who are dedicated to the best interests of the field. Bringing queer researchers in for lectures, along with organizing a plethora of other diversity-focused events, is something Ari prioritized at Bowdoin, and plans to continue while at APPM. Ari explained his goals for the department in this regard: "While at CU Boulder, I plan to address the heteronormativity and lack of queer representation in math by working with organizations such as Out in STEM and Spectra to bring queer researchers to campus for lectures … I am very honored to have received the Rudy Horne Fellowship. Starting a PhD is a daunting endeavor, especially for those with identities historically underrepresented in academia." Ari is uniquely suited for the Rudy Horne Fellowship and to help with issues regarding diversity, equity, and inclusion (DEI), having served as a Student Director of the Bowdoin Sexuality, Women, and Gender Center. Furthermore, while at Bowdoin, Ari chartered a chapter of Out in STEM (oSTEM), which, as described by Ari, "is a national organization that supports queer students in STEM personally, academically, and professionally by helping students connect with faculty mentors, prepare for grad school, find scholarships, etc."

"There is a severe lack of visible representation in mathematics for a number of marginalized identities. Until last year, I had never met an out queer professional in STEM, making it difficult to envision how my queer identity could realistically coexist with a career in math … **The Rudy Horne Fellowship is a warm reminder that I belong in the program and my perspective is valued."**

- Ari Geisler

Professor James Curry Part of 5G Hidden Operation though Securing Traffic (GHOST)

Late last year, the National Science Foundation's Convergence Accelerator program awarded $5 million to the 5G Hidden Operation though Securing Traffic (GHOST) team (shown below) at the University of Colorado at Boulder, which includes Applied Mathematics's own Professor James Curry.

The purpose of GHOST is to eliminate the possibility of external organizations using cellular network data to find cell phone user data, such as physical position, with on-device software. Anonymizing user data is critical for civilian and military usage to keep users safe from unwanted tracking and data mining.

Keith Gremban, the principal investigator of the project, notes that GHOST is "obviously important for soldiers but it's so much more than that. A lot of companies and nonprofits operate in regions of the world that are less than stable. There have been a rash of kidnappings of corporate executives in some countries."

NSF's funding of GHOST is published on the College of Engineering and Applied Sciences newspage, which contains more information about the GHOST project and the team behind the product.

Professor David Bortz Awarded the National Institutes of Health's Maximizing Investigators' Research Award

In October of 2023, Applied Mathematics's own Professor David Bortz received the National Institutes of Health (NIH) Maximizing Investigators' Research Award (MIRA), which includes $1.88 million of support. MIRA, according to NIH, was established to better distribute NIGMS funding by "providing investigators with greater stability and flexibility, thereby enhancing scientific productivity and the chances for important breakthroughs."

With this funding, Professor Bortz will use data-driven discovery methods, which use data to discover overarching model equations via machine learning, to tackle two biomedical projects. One project is to understand how cells communicate collective motion during wound healing. The second project is to use disease data to hypothesize disease infection rates, which helps predict necessary localized hospitalization resource distribution.

This achievement is published in the Colorado Arts and Sciences Magazine, which has more detail about the award itself and the projects Professor Bortz will use this award for.

Dr. Sabina Adhikari Wins 2024 Dynamics Days Best Poster Award

In January, Applied Mathematics PhD student Sabina Adhikari won an award for the best poster at the 2024 Dynamics Days conference at UC Davis. Sabina's poster is titled "Oscillatory and chaotic synchronization behavior in coupled oscillator systems with higher order interactions, community structure, and phase lags".

The Dynamics Days webpage explains that the conference is an international and interdisciplinary effort "that focuses on chaos and nonlinear dynamics. We invite contributions related to tools and techniques of investigating dynamical systems models, and related applications. Topics may include, but are not limited to, mathematical theory, specific applications, and relevant experiments."

SIAM Student Paper Prize Recipient: Dr. Heather Lynn Cihak

Spring Applied Mathematics Ph.D. graduate Dr. Heather Lynn Cihak recently received the Society for Industrial and Applied Mathematics (SIAM) Student Paper Prize. This prestigious award is given to authors of the best papers published in SIAM journals and includes a monetary prize, a certificate, and a special paper session at the SIAM Annual Meeting. According to SIAM, the award is presented annually to "the student author(s) of the most outstanding paper(s) accepted by SIAM journals within the three years preceding the nomination deadline. The award is based solely on the merit and content of the student's contribution to the submitted paper."

Dr. Cihak was nominated by Applied Mathematics Associate Professor Kilpatrick for their paper "Multiscale Motion and Deformation of Bumps in Stochastic Neural Fields with Dynamic Connectivity" (Multiscale Modeling & Simulation, 2024). Dr. Cihak was one of three recipients of the award and will be honored at the 2024 SIAM Annual Meeting in Spokane, Washington, from July 8-12, with a special session for the prize winners on July 12.

The Applied Mathematics Department congratulates Dr. Cihak on this monumental achievement and is excited to see what the future holds for the new APPM doctoral graduate.

DARPA Innovation Fellow: Dr. Evan Gorman

Dr. Evan Gorman (pictured on the left with Associate Professor Manuel Lladser), a recent Applied Mathematics Ph.D. graduate, has been awarded a Defence Advanced Research Projects Agency (DARPA) Innovation Fellowship in Arlington, VA. The position, which begins in July, is a two-year fellowship that is aimed towards supporting early career scientists. DARPA notes that the Innovation Fellows “develop and manage” high-impact, high-risk portfolios to analyze technologies for the Department of Defense. The purpose of the fellowship is to “search for innovation across a broad range of scientific fields and technologies. Fellows are asked to probe existing paradigms, question technological barriers, and push the state of the art in science and technology.” DARPA-funded research via universities, industry leaders, and nonprofits work closely with the fellows in an effort to evaluate the investability of high-risk, high-reward projects. The Innovation Fellowship webpage from DARPA further discusses the fellowship and recipients.

Applied Mathematics congratulates Dr. Gorman on this exciting, ambitious new chapter after his successful thesis defense in the last year.

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