Northwestern | McCORMICK SCHOOL OF ENGINEERING

Engineering Sciences and Applied Mathematics

FROM THE CHAIR / Spring 2025

Dear colleagues and friends,

It is the end of another impactful academic year for Northwestern's Department of Engineering Sciences and Applied Mathematics (ESAM). We can be proud of what our department and University have accomplished despite the challenges we have faced.

As you have likely heard, a notable portion of Northwestern's federally funded research is subject to stop work orders and a number of the University's federal grants have been canceled. Graduate students, postdocs, and faculty alike are feeling the effects of these decisions.

Nevertheless, we remain undeterred in our mission to leverage mathematical modeling, analysis, and computation to support advances in engineering and the physical, biological, and social sciences and to tackle some of the biggest challenges facing the world today.

As this newsletter highlights, our faculty members continue to push the boundaries of knowledge in ways that improve lives, inspire innovation, and strengthen our community. From **Luís Amaral's** work using machine learning to predict pneumonia outcomes, to **Danny Abrams's** insights into the enduring power of in-person collaboration, our researchers are advancing solutions to

today's most pressing challenges. **Petia Vlahovska's** discoveries on membrane dynamics, **Niall Mangan's** recognition as a Sloan Research Fellow, and new digital tools developed by Amaral's lab further underscore the range and relevance of our work.

In the context of our goal to strengthen connections with our alumni, we are happy to report that ESAM graduates gave two recent talks in our weekly colloquium: Brennan Sprinkle (PhD '18) discussed the math behind new techniques he and his team developed to measure dynamic properties of suspensions, and Chris Vogl (PhD '13) shared his success in developing multi-physics methods to simulate the Earth's global atmosphere.

These stories reflect the collective strength of our department: a vibrant community committed to both discovery and education. We are delighted with the progress we've made and energized by the opportunities ahead. As we continue to chart a path forward, we remain dedicated to fostering a collaborative environment where bold ideas can take root and thrive.

Thank you for being part of our journey. As always, we are happy to share news about milestones achieved by our alumni in this newsletter. Please drop us a line.

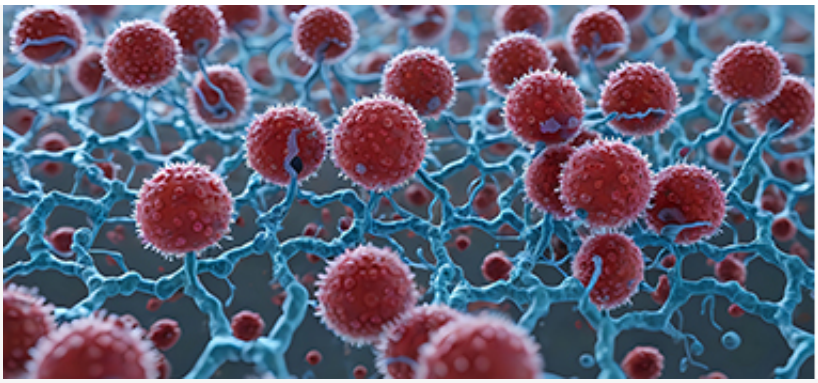
Hermann Riecke
Professor and Chair
Department of Engineering Sciences and Applied Mathematics
McCormick School of Engineering

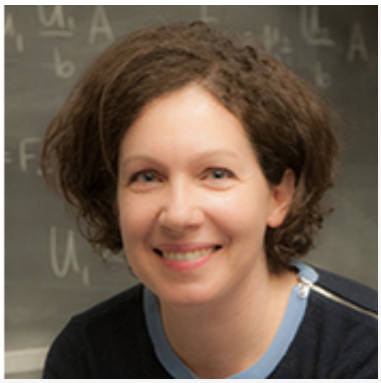
Researchers Develop Approach to Accurately Predict Pneumonia Outcomes

Using a machine-learning approach to health records, Professor **Luís Amaral** identified five pneumonia ‘states’ with predictable prognoses.

Study Reveals Why In-Person Conferences Still Matter in a Virtual World

Research from Professor **Daniel Abrams** highlights the different ways that in-person events foster community building and collaboration compared to virtual conferences, which still have value.





Membrane Viscosity Plays Key Role in Cell Dynamics and Deformation

A study led by Professor **Petia Vlahovska** showed that dissipation within the membrane controls the undulation dynamics of highly curved membranes.

Science in the Palm of Your Hand

Professor **Luís Amaral** and his lab have developed a series of apps and software programs to assist scientific research.

Mangan Named Sloan Research Fellow

The honor for Professor **Niall Mangan** highlights the creativity, innovation, and research accomplishments of early-career researchers.

Fairhall Delivers Edward L. Reiss Memorial Lectures

This year's annual lectures in memory of Edward L. Reiss were given by Adrienne Fairhall, a renowned computational neuroscientist from the University of Washington.

In her first talk, "In Search of Internal Mental Models," she elucidated characteristic differences in the way humans and non-human primates make choices when the rewards for the choices are changed unpredictably, which reflects different underlying strategies.

In her second lecture, "Decoding Neurons to Behavior in a Model Organism," she presented a biophysical and biomechanical model of the body and muscles of Hydra that makes it possible to transform measured neural activity into movement.

Recordings of both talks are available on the ESAM website, along with those of other events.

Congratulations to Our 2024-25 Graduates

Below is a list of students who graduated from the applied mathematics department over the past year.

PhD

- Tao Li: "Physically Inspired Approaches to Data Analysis: Multi-scale Considerations of Gene Expressions," advised by Madhav Mani
- Shuyang Wang: "Analysis of Mirror Descent, Scalable Prompt Engineering in Large Language Models, and Robust Reinforcement Learning," advised by Diego Klabjan

MS
Yiran Li, Gaoxiang Lu, Robert Norwood, Zheng Pei, Eric Sorensen, Neven Vaduthala (also BS), Chaoyu Wang, Hongming Wu, Ting Wu, Zhuyan Zhang

BS
Salada Abdullahi, Max Bengtsson, Noah Depp, Oscar Depp, Will Donohoe, Jake DeRiseis, Wayne Feng, Rosa Gerner, Grace Hooper, Steven Kitchell, Rohan Krishnamurthi, Ellen Liao, Cayetana Llano, Nhat Nam Nguyen, Nikolai Ortiz, Andrew Potts, Stefan Radjenovic

Noah and Oscar Depp were both awarded the annual Outstanding Graduating Senior Award in Applied Mathematics.

Alumni News

Northwestern ESAM congratulates department alums who have started new positions in the past year.

PhD

- Joe Hibdon (PhD ’11): Rotating Associate Director for Convening Programs, NSF-Simons National Institute for Theory and Mathematics in Biology
- Biyi Fang (PhD ’21): Principal Machine Learning Engineer, Roblox
- Joshua Levy (PhD ’21): Project Scientist, Scripps Research
- Thomas Lynn (PhD ’22): Computational Engineer, The Johns Hopkins University Applied Physics Laboratory
- April Zhi Zhou (PhD ’23): Senior Scientist, Amgen

MS

- Jia Yu (MS ’17): Data Analyst, Aurora
- Han Zhu (MS ’17): Algorithm Engineer, TikTok
- Bing Hu (MS ’18): Actuarial Associate, Lemonade
- Boyi Liu (MS ’18): Senior Research Scientist, Snowflake
- Jordan Shochatovitz (MS ’19): Analytics Consultant, Wells Fargo
- Zhen Yao (MS ’19): Theoretical Computer Researcher, Huawei
- Erin Neil (MS ’21): Financial Analyst, Portland General Electric

BS

- Pat Atwood (’14): Director, Gore Creek Asset Management
- William Lassman (’14): Wildlife Meterologist, Xcel Energy
- Reid Jackson (’15): Social Protection Information Management Officer, World Food Programme, Haiti
- Andrew Rowberg (’15): Staff Scientist, Lawrence Livermore National Laboratory
- Austin Dickey (’16): Senior Software Engineer, Posit PBC
- James Graham (’16): Teacher of Physics, St Edward’s School, Oxford
- Justin Trousdale (’17): Principal, KKR
- Noah Gamble (’18): Obtained a PhD in biophysics from the University of Chicago
- Ethan Rucinski (’18): Senior Manager, United Airlines
- Tony She (’18): Associate Actuary, Atlanta Life Insurance Company
- Samuel Rubin (’20): Senior Consultant, Deloitte
- Jonathan Cao (’22): Data Scientist, Vanguard
- Samuel Chian (’22): Quantitative Researcher, Trexquant Investment LP
- Anton de Lesseps (’22): Applied Scientist, Ramp
- Alexandre Kaiser (’22): ML/AI Research Engineer, Turl Street Group
- Lily McClain (’22): Sales and Operations Manager, Hana Makgeolli

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