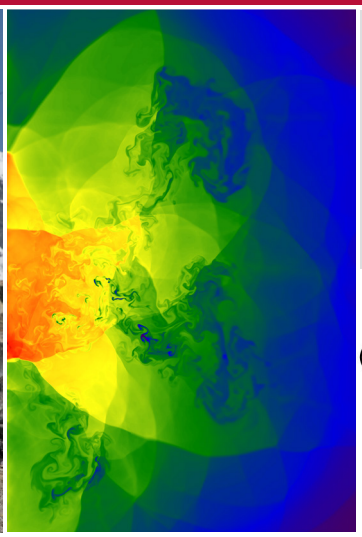
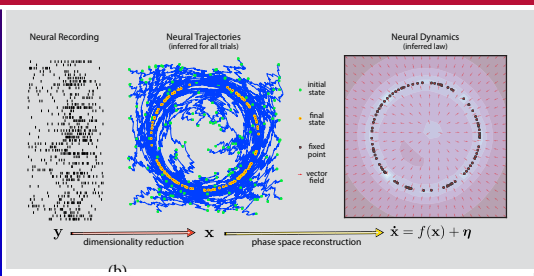
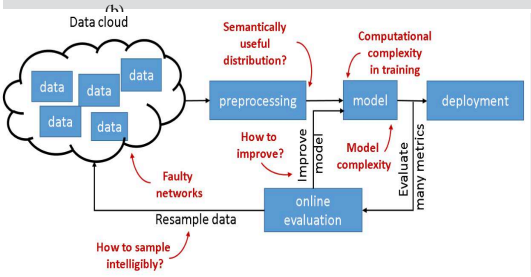
# What is **Computational Science?**

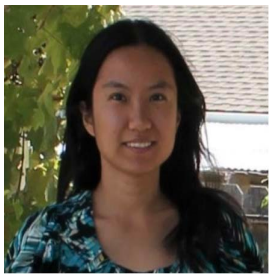
Computational science is an area of study centered on refining and applying techniques for computing and managing data. Computational Science at Stony Brook University involves many scientists from different backgrounds undertaking research in diverse fields. We have some faculty who use our resources for simulating experiments, some who use the computer clusters to analyze vast amounts of data, and some whose research focuses on how to make calculations on the clusters run faster, in parallel, and more efficiently. Read about some of our faculty here.






**IMAGES** Left: **Heather Lynch**, Center: **Alan Calder**, Top Right: **Il Memming Park**, Bottom Right: **Yifan Sun**

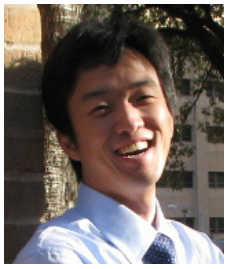


## PROFESSOR YIFAN SUN

Modern day scientific computing relies heavily on complex algorithmic tools to fit large amounts of date to abstract models. But how good are these models, and how well did we fit them>My research focuses primarily on the mathematical foundation behind optimization algorithms: knowing how fast they run (and if they can be accelerated), how much computing power/memory they need, whether they are parallelizable, and whether they can provide robust matrices to nonlinear dynamical systems to complexity theory, and uses them to develop intuition behind many popular methods heavily used in practice

## PROFESSOR HEATHER LYNCH

My lab focuses on the distribution and abundance of Antarctic wildlife. To track populations, we use a combination of old–fashioned field surveys and satellite imagery, the latter of which are analyzed using a combination of algorithms from remote sensing and computer vision. Using sophisticated statistical models, we can both understand the main forces driving recent changes in the distribution of Antarctic wildlife and create population forecasts. To streamline the integration of satellite imagery and polar science, my lab is also developing software to facilitate imagery–enabled scientific discoveries in the biological and geological sciences.



## PROFESSOR IL MEMMING PARK

How does the brain perceive the world and make decisions? My lab collaborates with experimental neuroscientists who record the signals communicated among the neurons in the brain that are collectively involved in producing meaningful behaviors. Making sense of these patterns of activity in terms of the hidden mental processing is challenging. Our lab develops machine learning tools to discover structure from complex, noisy neural recordings. Outcomes of this research can contribute to the development of diagnostic tools and neural prosthetics for cognitive and neurological dysfunctions in perception, working memory, and decision making, and can also inspire advances in artificial intelligence.

## PROFESSOR Josh Zhang

My research focuses on the relationship between social movements and organizational behavior. My current projects combine advanced statistical, social network, and computational methods with big data to study how primary and secondary stakeholder activists influence corporate political activities. My work intensively uses machine learning methods to analyze large–scale administrative records, social media texts, satellite images, and online videos.

## WHY CHOOSE STONY BROOK?

Stony Brook is home to an exceptionally diverse student body of more than 25,700 high-achieving students from nearly all 50 states and more than 150 countries. Stony Brook offers more than 100 master's programs and more than 40 doctoral programs.

Ranked as one of the top 100 universities in the nation and in the top 40 national public universities by *U.S. News & World Report*, Stony Brook is repeatedly recognized for its engagement in cutting-edge research and novel approaches to inquiry and understanding. We have been one of only 94 institutions in the country to be designated a "Very High Research University" by the Carnegie Foundation.

With graduate program offerings in nearly 50 fields, The Graduate School is here and ready to provide you with the environment and resources you need to excel.

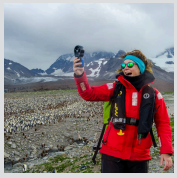
## WHAT IS IACS?

The Institute for Advanced Computational Science (IACS) is comprised of faculty and students from a broad range of disciplines pursuing discovery and learning at the intersections of their fields of study, which have in common the use of computers to simulate the world around us or to analyze data large or small. We are funded by a $20M endowment and are led by a community of inclusive, forward-thinking and world-renowned researchers working in a highly collaborative environment with access to powerful computer resources. The pervasive entrepreneurial, think-tank culture of support and encouragement at IACS enables our students and postdocs to make connections that elevate their careers and activate their curiosity. IACS students graduate with essential skills and foundational knowledge in programming; data-science and modern computers; and applied mathematics; and the ability to communicate effectively in their relevant disciplines.

## ALUMNI

IACS student **Alena Aksenova** graduated in 2020 with a PhD from Linguistics. She now is a Linguist at Google LLC in a team that works on speech recognition and generation technologies.

IACS student **Mohammad Mahdi Javanmard** graduated in 2020 with a Ph.D. from Computer Science. He is now working as a research scientist at Facebook, working on improving performance and efficiency of the Facebook apps.



IACS student **Catherine Foley** graduated in 2019 with a PhD from Ecology and Evolution. She now works as a Postdoctoral Research Scholar at the Hawai'i Institute of Marine Biology at the University of Hawai'i Manoa, focusing on the use of emerging remote sensing technologies for marine conservation.

IACS student **Casey Youngflesh** graduated in 2018 with a PhD from Ecology and Evolution and he now works as a Postdoctoral Research Associate at the Department of Ecology and Evolutionary Biology at the University of Connecticut focusing on research in quantitative ecology.

For more information about IACS, please visit www.iacs.stonybrook.edu

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**Barbara Chapman**
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**Rezaul Alam Chowdhury**
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**Marivi Fernandez-Serra**
Physics & Astronomy
**Jeffrey Heinz**
Linguistics
**Xiangmin Jiao**
Applied Mathematics & Statistics
**Marat Khairoutdinov**
School of Marine and Atmospheric Sciences
**Predrag Krstic**
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**Benjamin Levine**
Chemistry
**Heather Lynch**
Ecology & Evolution
**Owen Rambow**
Linguisitcs
**Matthew Reuter**
Applied Mathematics & Statistics
**Yifan Sun**
Computer Science
**Jason Trelewicz**
Materials Science & Engineering
**Yongjun Zhang**
Sociology

## AFFILIATED DEPARTMENTS

**Applied Math & Statistics**
**Biomedical Informatics**
**Chemistry**
**Civil Engineering**
**Computer Science**
**Ecology & Computer Engineering**
**Linguistics**
**Materials Science & Chemical Engineering**
**Mechanical Engineering**
**Music**
**Neurobiology & Behavior**
**Physics & Astronomy**
**School of Journalism**
**School of Marine & Atmospheric Sciences**
**Sociology**

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