Welcome to APAM

An Overview of the Applied Math Program

Prof. Marc Spiegelman

Who we are: APAM Applied Math group

Qiang Du

Michael Weinstein

Amir Sagiv

Marc Spiegelman

Adam Sobel

Lorenzo Polvani

Lu Zhang

Kui Ren

Chris Wiggins

Kyle Mandli

Michael Tippett

Drew Youngren
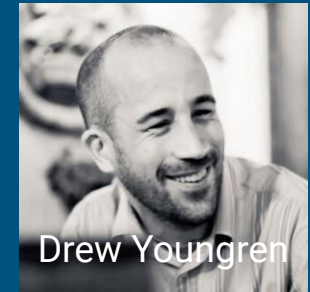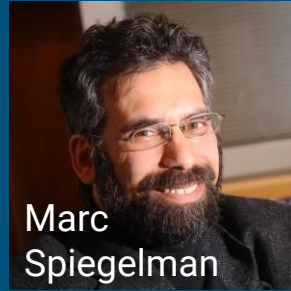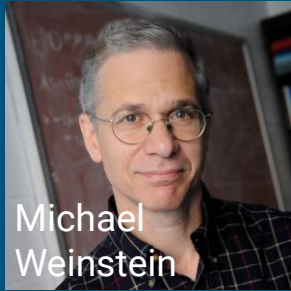
- 9 (regular faculty) + 2 (term faculty) + 1 (lecturer)
- Plus affiliated faculty@Columbia: IEOR, DEES/Lamont, NASA/GISS, Math, CS, EE,
- Recent Ph.D students have worked with faculty@ CS, CEEM, IEOR, BME, DEES/Lamont/Climate School

What we do: Applied Math

- **AM research spans a broad spectrum of mathematics from pure to applied in analysis, numerical analysis, machine learning, computational math, inverse theory, uncertainty quantification, fluid dynamics...**

- **Applied to a dizzying array of interdisciplinary fields including novel materials, lasers, medical imaging, cancer research, climate, natural hazards, planetary dynamics...and more...**

What we do: Core Research Areas

- **Applied Analysis and Partial Differential Equations**
- **Mathematics and Algorithms for Learning and Data Science**
- **Mathematics of Inverse Problems and Imaging**
- **Mathematics for Physics- and Data-enabled Material Discovery**
- **Computational/Theoretical Climate and Solid Earth Science Research**

All of this work is supported by a diverse set of public and private funding agencies

- NSF(DMS, DMR, OAC, CISE, GRFP, EAR, ATM), NOAA, AFOSR, ARO, ONR, DARPA, Simons and Sloan Foundations...

Applied Math: Faculty excellence in research and mentoring

Awards and honors:

- Adam Sobel (Louis J. Battan Award from American Meteorological Society, AMS Fellow);
- Lorenzo Polvani (Fellow of the AMS and AGU);
- Kui Ren (Calderon Prize in inverse problems, 2017);
- Michael Weinstein (SIAM Kuskal Prize, Fellow of SIAM and AMS);
- Qiang Du (Fellow of SIAM, AMS and AAAS ...) ···

Initiatives/Leadership:

- Sobel, Tippett: Columbia Initiative on Extreme Weather & Climate/Columbia World Projects Climate Risk/Adaptation
- Du, Mandli, Spiegelman: SEAS Initiative on Computational Science & Engineering.
- Du: co-Chair, Center for Comp Sys and Data-driven Science.
- Weinstein: Simons Math+X investigator, NSF-IMA special year on math & optics.
- Ren: organizer of NSF-ICERM special program on inverse problems/Lead PI- NSF-RTG grant
- Wiggins: chief data scientist at New York Times, founding member of Columbia DSI···
- Spiegelman: NSF Computational Infrastructure for Geodynamics

Excellent Students:

Current Students in AM program

- 24 Ph.D. (+ 65 Masters + 113 Undergraduates)
- 3 current NSF Graduate fellows (+ multiple prior NSF, DOE CSGF)

Outstanding Alumni: Carnegie Mellon,UT Austin, UCSD, UCLA, UCSC, StonyBrook, Courant, Drexel, U. Utah, NASA, Oak Ridge national Laboratory, LDEO, Financial, Tech, Risk Firms.

Research/Mentoring Opportunities

- **NSF-RTG** **(Research Training Grant) $**1.9million for 5 years. PI: Ren (APAM); Co-PI: Weinstein/Du (APAM), De Silva/Corwin (MATH), with other participating APAM/DSI/STAT faculty members; to create a "cutting-edge research and training program in modern applied mathematics" emphasizing "physics- and data-based modeling, analysis and computation"
- **Joint advising within APAM**
  - Braxton Osting (faculty at Utah) supervised by Weinstein & Keyes;
  - Gideon Simpson (faculty at Drexel), supervised by Weinstein & Spiegelman;
  - Philip Dinenis (APAM, current), supervised by Mandli & Bienstock;
  - Wen Ding (APAM, current), supervised by Du & Ren.
- **Collaborative/interdisciplinary advising between departments**
  - Wiggins:System biology/DSI
  - Sobel/Polvani/Spiegelman/Tippett: DEES/Lamont/Climate School
  - Weinstein: MATH.
  - Du/Mandli/Ren/Tippet: DSI
- **Data Science Institute(DSI):** Major SEAS/Columbia initiative, Applied Math Ph.D. can elect a specialization in Data Science (consult Qiang Du, for details)