Sahil Agarwal

Ph.D. Candidate
Program in Applied Mathematics
Yale University

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Education

- **Yale University** — USA
  M.Phil., Ph.D., Applied Mathematics — *2012 - Present (Expected Fall '18)*
  - Thesis Advisor : Professor John S. Wettlaufer
  - Thesis Title : Nonlinear Dynamics and Stochastic Processes with Astro– & Geophysical Applications
- **University of Oxford** — UK
  Visiting Graduate Student, Mathematical Institute — *2013 - 2014*
  - Advisor : Professor John S. Wettlaufer
- **Indian Institute of Technology Guwahati** — India
  Bachelor of Technology, Mathematics and Computing — *2008 - 2012*
  - Advisor : Professor Jiten C. Kalita

Fellowships and Awards

- **University of Cambridge** — UK
  David Crighton Fellowship — *2016*
  - Mentor : Professor Grae Worster
- **Woods Hole Oceanographic Institution** — USA
  Geophysical Fluid Dynamics Fellowship — *2016*
- **Alpine Summer School** — Italy
  Fellow — *2014*
- **University of Oxford** — UK
  Departmental Award, Mathematical Institute — *2013 - 2014*
- **Yale University** — USA
  University Fellowship — *2012 - Present*
- **Yale University** — USA
  Visiting Student in Research — *May - July, 2011*
  - Mentor : Professor John S. Wettlaufer
- **University of Oxford** — UK
  OCCAM Student Fellowship — *May - July, 2010*
  - Mentors : Professor John S. Wettlaufer & Dr. Irene Moroz

Refereed Publications

1. **S. Agarwal** and J. S. Wettlaufer, Fluctuations in Arctic Sea Ice Cover: Comparing Observations and Climate Models, *Philosophical Transactions of the Royal Society A* **376**, 2129 (2018).
2. W. Moon, **S. Agarwal**, and J. S. Wettlaufer, An intrinsic pink-noise multi-decadal global climate dynamics mode, *Physical Review Letters* **121**, 108701 (2018).

3. **S. Agarwal**, and J. S. Wettlaufer, Exoplanet Atmosphere Retrieval using Multifractal Analysis of Secondary Eclipse Spectra, submitted to *The Astrophysical Journal* (arXiv:1710.09870) (2018).

4. **S. Agarwal** and M. G. Worster, Sea-Ice Distribution and Mixed-Layer Depths in Fram Strait, submitted to *Journal of Geophysical Research:Oceans* (arXiv:1712.07599) (2017).

5. S. Weady, **S. Agarwal**, L. Wilen and J. S. Wettlaufer, Circuit Bounds on Stochastic Transport in the Lorenz Equations, *Physics Letters A* **382**, 1731 (2018).

6. **S. Agarwal** and J. S. Wettlaufer, The Statistical Properties of Sea Ice Velocity Fields, *Journal of Climate* **30**, 4873 (2017).

7. **S. Agarwal**, F. D. Sordo, and J. S. Wettlaufer, Exoplanetary Detection by Multifractal Spectral Analysis, *The Astronomical Journal* **153**, 12 (2017).

8. **S. Agarwal** and J. S. Wettlaufer, Maximal Stochastic Transport in the Lorenz Equations, *Physics Letters A* **380**, 142 (2016).

9. **S. Agarwal**, W. Moon, and J. S. Wettlaufer, Trends, Noise and Reentrant Long-Term Persistence in Arctic Sea Ice, *Proceedings of The Royal Society of London A* **468**, 2416 (2012).

10. **S. Agarwal**, W. Moon, and J. S. Wettlaufer, Decadal to Seasonal Variability of Arctic Sea Ice Albedo , *Geophysical Research Letters* **38**, L20504 (2011).

11. **S. Agarwal**, and J. S. Wettlaufer, Minimal Data Fidelity for Successful detection of Stellar Features or Companions, to be submitted.

12. **S. Agarwal**, and J. S. Wettlaufer, Starry White Noise and the Search for Exoplanets, to be submitted.

Conference Presentations

- **Exoplanetary Detection By Multifractal Spectral Analysis**
  70th New England Complex Fluids Meeting, Yale University, 2017
- **Multifractal Analysis of Expoplanetary Spectra**
  AGU Fall Meeting, San Francisco, 2016
- **The Statistical Properties of Sea Ice Velocity Fields**
  AGU Fall Meeting, San Francisco, 2016
- **Maximal stochastic transport in the Lorenz equations**
  66th New England Complex Fluids Meeting, Yale University, 2016
- **Stochastic Upper Bounds in the Lorenz Equations and Applications to Geophysical Data**
  AGU Fall Meeting, San Francisco, 2015
- **Spatio–temporal Variability of Arctic Sea Ice from Days to Decades**
  AGU Fall Meeting, San Francisco, 2014
- **Stochastic Erosion of Fractal Structure in Nonlinear Dynamical Systems**
  AGU Fall Meeting, San Francisco, 2014
- **Trends, Noise and Reentrant Long-Term Persistence in Arctic Sea Ice**
  EGU, Vienna, 2014
- **Trends, Noise and Reentrant Long-Term Persistence in Arctic Sea Ice**
  AGU Fall Meeting, San Francisco, 2012

Teaching Experience

- **Introduction to Earth and Environmental Physics (G&G/PHYS 342)**
  Guest Lecturer, Yale University *Fall 2017*

- **Spectral Graph Theory (AMTH 561)**
  Teaching Fellow, Yale University *Fall 2015*
- **Linear Algebra with Applications (MATH 222)**
  Teaching Fellow, Yale University *Spring 2015*
- **Waves and Compressible Flow (B6b)**
  Teaching Assistant, University of Oxford *Hillary 2014*
- **Techniques in Applied Mathematics (B5a)**
  Teaching Assistant, University of Oxford *Michaelmas 2013*
- **Design and Analysis of Algorithms (CPSC 365b)**
  Teaching Fellow, Yale University *Spring 2013*

In the News

- Synopsis: Climate Noise Has Shades of Pink, *APS Physics* (September 2018).
- Think pink for a better view of climate change, *Yale News* (September 2018).
- Hitchhiker's Guide to Life in the Universe: Uncovering a data – driven method to find exoplanets amidst the noise, *Yale Scientific Magazine* (Volume **90**, Issue 2, April 2017).
- The role of data in locating exoplanets, *Yale Daily Newspaper* (January 2017).
- Searching a sea of 'noise' to find exoplanets – using only data as a guide, *Yale News* (December 2016).
- Applying Math to Shrinking Arctic Ice and the Search for Planets, *Yale Graduate School News* (September 2016).

Skills and Research Interests

- **Machine Learning Applied To Big Data**
  - Built large scale distributed systems using Map-Reduce and Parallel Computing for efficient analysis of astronomical data.
  - Developed Logistic Regression and Support Vector Machine based algorithms to assist in detection of exoplanets, by using noise as a source of information.
  - Developing a Convolutional Neural Network to detect exoplanets.
- **Statistical analysis & Stochastic modeling of non-linear phenomena**
  - Exoplanet detection and atmosphere retrieval, stellar variability, Arctic sea-ice dynamics, Global temperature variability.
- Interplay between noise and chaos
- Extensive experience in writing code in: C, C++, MATLAB, Python, R.
- Deep Learning, a 5-course specialization by deeplearning.ai on Coursera. Specialization Certificate earned on March 27, 2018
  — Neural Networks and Deep Learning; — Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization; — Structuring Machine Learning Projects; — Convolutional Neural Networks; — Sequence Models
- Machine Learning by Stanford University on Coursera. Certificate earned – December, 2017.

Professional Activity

- Referee for : *Physics Letters A*, *Journal of Climate*