

Colin James Grudzien

Postdoctoral Researcher – NERSC

<https://cgrudz.github.io>

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Research interests

Data assimilation; stochastic dynamical systems; Bayesian inference and optimal control; applications in geosciences and electric grids

Professional experience

Aug. 2016 – Present	Nansen Environmental and Remote Sensing Center (NERSC) Bergen, Norway – Postdoctoral Researcher Developing dimensional reduction methodology for Bayesian data assimilation in physical systems.
Oct. 2012 – May. 2016	Mathematics and Climate Research Network (MCRN) https://mcrn.hubzero.org/ – Graduate Research Assistant Organized the Joint Data Assimilation Seminar between MCRN, NERSC and ICTS-TIFR of Bangalore, India. Employed novel technology platforms for collaboration in virtual research networks under the NSF Science Across Virtual Institutes program.
June 2015 – Aug. 2015	Los Alamos National Laboratory Los Alamos, New Mexico – Graduate Research Assistant Utilized Matlab and Javascript libraries to design reduction algorithms and visualization techniques for electric grid multiscale-networks.

Education

2011 – 2016	Applied Mathematics PhD, University of North Carolina at Chapel Hill Advisor: Christopher KRT Jones
2008 – 2011	BS Magna Cum Laude, University of Oregon Majors: Mathematics and History
2006 – 2008	Lane Community College

Publications

- 2018
 - **C. Grudzien**, M. Bocquet, A. Apte, and A. Carrassi. On the rank deficiency of the covariant Lyapunov vectors and the construction of a complete Oseledec basis in spectral degeneracy. *In Preparation*, 2018
 - **Grudzien, C.**, A. Carrassi, and M. Bocquet. Chaotic dynamics and the role of covariance inflation for reduced rank kalman filters with model error. *Nonlinear Processes in Geophysics*, 2018
- 2017
 - **C. Grudzien**, A. Carrassi, and M. Bocquet. Asymptotic forecast uncertainty and the unstable subspace in the presence of additive model error. *arXiv preprint arXiv:1707.08334, Submitted to SIAM/ASA Journal on Uncertainty Quantification*, 2017
 - **C. Grudzien**, D. Deka, M. Chertkov, and S.N. Backhaus. Structure-& physics-preserving reductions of power grid models. *arXiv preprint arXiv:1707.03672, Submitted to SIAM Multiscale Modeling and Simulation*, 2017
 - M. Bocquet, K.S. Gurumoorthy, A. Apte, A. Carrassi, **C. Grudzien**, and C.K.R.T. Jones. Degenerate Kalman filter error covariances and their convergence onto the unstable subspace. *SIAM/ASA Journal on Uncertainty Quantification*, 5(1):304–333, 2017
 - K.S. Gurumoorthy, **C. Grudzien**, A. Apte, A. Carrassi, and C.K.R.T. Jones. Rank deficiency of Kalman error covariance matrices in linear time-varying system with deterministic evolution. *SIAM Journal on Control and Optimization*, 55(2):741–759, 2017
- 2016
 - **C. Grudzien**, T.J. Bridges, and C.K.R.T. Jones. Geometric phase in the Hopf bundle and the stability of non-linear waves. *Physica D: Nonlinear Phenomena*, 334:4–18, 2016
 - **C. Grudzien**. The instability of the Hocking–Stewartson pulse and its geometric phase in the Hopf bundle. *Journal of Computational and Applied Mathematics*, 307:162–169, 2016

Awards

- University of North Carolina at Chapel Hill

2015 – 2016	Off Campus Dissertation Fellowship
2013	Future Faculty Fellowship Program
- University of Oregon

2010 – 2011	Phi Beta Kappa, Alpha of Oregon – Oregon Six Elect
2010 – 2011	Mathematics Department DeCou Prize
2010 – 2011	Donald DuShane IV, College of Arts and Science Scholarship
2009 – 2010	Mathematics Department Stevenson Prize
- Lane Community College

2007 – 2008	Social Science Shining Star Scholarship
2006 – 2007	Liberty Bank Making a Difference Scholarship

Teaching

- **Masters students**

June - Aug. 2017	Armand Vic, École Normale Supérieure de Rennes
	Supervised Erasmus Plus Research Training Internship in mathematics at NERSC.

- **Undergraduate research**

June - Aug. 2013	Parth Majmudar, University of North Carolina at Chapel Hill
	Worked with undergraduate research assistant to develop curriculum and the final research project for Math 190.

- **Workshops**

2018	Crash Course on Data Assimilation - Theoretical foundations and advanced applications with a focus on ensemble methods , Ensemble Kalman filter workshop — Bergen, Norway
	Led interactive exercises in numerical aspects of prediction and data assimilation in the presence of chaotic dynamical systems.

- **Lecturer**

University of North Carolina at Chapel Hill

2013	Math 190, Topics in Mathematics: A Climate of Uncertainty
	Designed original curriculum and led course under the first year seminar program. Lesson plans and resources archived at: https://aclimateofuncertainty.web.unc.edu
2012	Math 232, Calculus II

Course reviews:

<https://cgrudz.github.io/teaching/>

- **Teaching assistant**

University of North Carolina at Chapel Hill

2015	Math 657, Dynamical Systems with Applications in Climate
2013	Masc 783, Mathematical Modeling: Climate Modeling
2013	Math 67, Topics: The Mathematics of Climate Change
2012	Math 541, Advanced Calculus
2011	Math 383, Ordinary Differential Equations
2011	Math 381, Discrete Mathematics
2011	Mathematics Help Center – Tutor

- **Educator training**

University of North Carolina at Chapel Hill

2013	Future Faculty Fellowship Program
2011	Math 920, Graduate TA Teaching Seminar

- **Tutor and grader**

University of Oregon

2010 – 2011	Grader: Math 307, Introduction to Proof
2010 – 2011	Tutor: Math 213, Fundamentals of Elementary Mathematics

Research visits

Aug. – Dec. 2018	CEREA, Joint laboratory of École des Ponts Paris Tech and EdF R& D — Paris, France Principal Investigator: Marc Bocquet
Nov. – Dec. 2017	CNLS, Los Alamos National Laboratory – Los Alamos, New Mexico Principal Investigator: Michael Chertkov
Oct. – Nov. 2016	CNLS, Los Alamos National Laboratory – Los Alamos, New Mexico Principal Investigator: Michael Chertkov
Nov. 2015 – Dec. 2015	International Centre for Theoretical Science, TIFR – Bangalore, India Principal Investigator: Amit Apte
Oct. 2015 – Nov. 2015	Nansen Environmental and Remote Sensing Center – Bergen, Norway Principal Investigator: Alberto Carrassi
Dec. 2014 – Jan. 2015	International Centre for Theoretical Science, TIFR – Bangalore, India Principal Investigator: Amit Apte
Dec. 2013 – Jan. 2014	International Centre for Theoretical Science, TIFR – Bangalore, India Principal Investigator: Amit Apte

Selected talks

March 2018	SIAM Southeastern Atlantic Sectional Conference, University of North Carolina at Chapel Hill – Chapel Hill, NC
Feb. 2018	Department of Mathematics, Applied Mathematics Seminar, Oregon State University – Corvallis, Oregon
Oct. 2017	Numerical Modeling, Predictability and Data Assimilation in Weather, Ocean and Climate, Bologna, Italy
Sept. 2017	SIAM Conference on Mathematical and Computational Issues in the Geosciences, Erlangen, Germany
May 2017	Twelfth International Ensemble Kalman Filter Workshop, Bergen, Norway
April 2017	European Geophysical Union General Assembly, Vienna, Austria
Nov. 2015	Department of Meteorology Data Assimilation Research Centre Seminar, University of Reading – Reading, England
May 2015	SIAM Conference on Applications of Dynamical Systems, Salt Lake City, Utah
April 2015	SIAM Central States Section First Annual Meeting, Rolla, Missouri
March 2014	IIMAS Coloquio de Matemáticas Aplicadas, Universidad Nacional Autónoma de México – México City, México

Workshops and trainings

March 2017	Emerging Applications of Data Assimilation in the Geosciences, Lorentz Center – Leiden, Netherlands
Sept. 2016	Distributed Control and Decision Making Over Networks, Institute for Mathematics and its Applications – Minneapolis, Minnesota
March 2015	Data4Decisions Conference and Exposition, Raleigh, North Carolina
Dec. 2014	Climate Variability: From Models to Decisions, Lorentz Center – Leiden, Netherlands
April 2014	Careers and Opportunities in Industry for Mathematical Scientists, Institute for Mathematics and its Applications – Minneapolis, Minnesota
Feb. 2014	Algebraic Topology in Dynamics, Differential Equations and Experimental Data, Institute for Mathematics and its Applications – Minneapolis, Minnesota
May 2013	Community Earth System Model (CESM) Tutorial, National Center for Atmospheric Research – Boulder, Colorado

Service

2017 – 2018	Quarterly Journal of the Royal Meteorological Society – Referee
2018	Sensors - Open Access Journal – Referee
2016 – 2017	Forskningsdagene (Research Days) – Science Fair Volunteer Bergen, Norway
2015 – 2016	Math and Climate Research Network – Hubadministrator Led trainings, curated meta-data and created resources for using the MCRN Hub. Video tutorials are available at https://mcrn.hubzero.org/resources/606
2012 – 2013	UNC-CH Graduate Mathematics Association – Seminar Coordinator
2012 – 2013	UNC-CH Graduate and Professional Student Federation – Senator
2003 – 2011	City of Eugene Libraries, Parks and Recreation – Lifeguard Eugene, Oregon

Languages

English	Native
Spanish	Limited Working Proficiency
Python, Matlab & LaTeX	Proficient
Bash, Javascript, HTML & CSS	Novice

Code base

Electric grid model reduction repository:

https://github.com/cgrudz/electric_grid_model_reduction