Dallas Foster, CV

Contact Information

Massachusetts Institute of Technology (801)828-5740
Department of Aeronautics and Astronautics

Research Interests

Uncertainty Quantification (UQ), Climate and Earth System Research, Scientific Computing, Machine Learning, Data Assimilation.

Education

Department of Mathematics, Oregon State University 2016-2021
Ph.D. in Mathematics
Focus: Data Assimilation, UQ in Dynamical Systems

Department of Mathematics, University of Utah 2012-2016
B.S. in Mathematics
B.S. in Political Science

Appointments

Postdoctoral Research Assistant 2021-Present
Massachusetts Institute of Technology, Cambridge, MA
Uncertainty Quantification techniques for large scale data-driven problems.
Reference: Youssef Marzouk ymarz@mit.edu

Graduate Research Assistant 2016-2021
Oregon State University , Corvallis, OR
Data Assimilation techniques for nonlinear advection-diffusion equations with stochastic wave velocity.
Reference: Juan M. Restrepo juan.restrepo@ornl.gov

SIParCS Intern 2020 - 2021
National Center for Atmospheric Research, Boulder, CO
Analysis of the ocean boundary layer depth using probabilistic machine learning.
Reference: David John Gagne dgagne@ucar.edu

Graduate Research Assistant 2018-2019
Los Alamos National Laboratory, Los Alamos, NM
Bayesian inference in data-driven analysis of annual to decadal sea surface temperature anomaly statistics.
Reference: Nathan Urban nurban@bnl.gov

Undergraduate Research Assistant 2014-2016
University of Utah, Salt Lake City, UT
Data-driven inverse models modeling Arctic sea ice.
Reference: Kenneth M. Golden golden@math.utah.edu

Publications

D. Foster, J.M. Restrepo, Dynamic Likelihood Filter: A Data Assimilation Scheme that Exploits Hyperbolicity in Wave Problems to Propagate Observations, In preparation, 2020.

D. Foster, David John Gagne II, Daniel B. Whitt, Probabilistic Machine Learning Estimation of Ocean Mixed Layer Depth from Dense Satellite and Sparse In-Situ Observations, Submitted to *Journal of Advances in Modeling Earth Systems*, 2020.

D. Foster, Brian Frost-LaPlante, Collin Victor, J.M. Restrepo, Gradient sensing via cell communication, Accepted to *Physical Review E*, 2021.

D. Foster, D. Comeau, and N. M. Urban, A Bayesian Approach to Regional Decadal Predictability: Sparse Parameter Estimation in High-Dimensional Linear Inverse Models of High-Latitude Sea Surface Temperature Variability, *J. Climate*, 33, 6065-6081.

C. Strong, **D. Foster**, E. Cherkaev, I. Eisenman, K.M. Golden, On the definition and analysis of marginal ice zone width, *Journal of Atmospheric and Oceanic Technology*, Vol. 34, 2017.

Invited Presentations

Dynamic Likelihood Filter: A Data Assimilation Scheme that Exploits Hyperbolicity in Wave Problems to Propagate Observations, **D. Foster**, J.M. Restrepo. 2021 Spring Meeting of the American Physical Society. Oral Presentation, March 2021.

Dynamic Likelihood Filter: A Data Assimilation Scheme that Exploits Hyperbolicity in Wave Problems to Propagate Observations, **D. Foster**, J.M. Restrepo. 2020 Fall Meeting of the American Geophysical Union. Oral Presentation, December 2020.

Probabilistic Machine Learning Estimation of Ocean Mixed Layer Depth from Dense Satellite and Sparse In-Situ Observations, **D. Foster**, D.B. Whitt, David John Gagne II, 101st American Meteorological Society Annual Meeting, January 2021.

A Bayesian approach to regional decadal predictability: Sparse parameter estimation in high-dimensional linear inverse models of high-latitude sea surface temperature variability, **D. Foster**, N. Urban, D. Comeau. 2019 Fall Meeting of the American Geophysical Union. Poster Presentation, December 2020.

Bayesian Inference in Linear Inverse Problems with Applications to Sea Surface Temperature Anomalies, **D. Foster**, N. Urban, D. Comeau. 2019 Oregon State Graduate Appreciation. Poster Presentation, March 2019.

Decadal Predictability of Global Sea Surface Temperature Anomalies, **D. Foster**, N. Urban, D. Comeau. 2018 Oregon State Applied Math and Computation Seminar, October 2018.

Relevant Skills

Uncertainty Quantification	Monte Carlo Methods: (Adaptive) MCMC, HMC, LMC, Bayesian Statistics, Stochastic (PDE) Modeling, Gaussian Processes Polynomial Chaos, Stochastic Galerkin and Collocation Methods.
Machine Learning	Dense, Convolutional, Recurrent, Adversarial, and Generative NNs Bayesian NNs, Probabilistic Graphical Models, Weight Uncertainty
Programming Languages	7 Years Experience with Python, MATLAB, Mathematica, R, Julia 4 Years Experience with C, C++, Fortran, FEniCS (Finite Element) 3 Years Experience with OpenMP, MPI, OpenCL, TensorFlow Misc. Software: Stan, Git, Docker, scikit-learn, Atom, Visual Studio

Honors and Awards

Presidential Scholarship, University of Utah	2012-2016
Provost Distinguished Scholarship, Oregon State University	2016-2017
ARCS (Achievement Rewards for College Scientists) Foundation Scholar	2016-2019
SIAM Student Chapter Certificate of Recognition 2020	2020

Professional Affiliations

American Physical Society (APS)
Member 2019-Present

American Geophysical Union (AGU)
Member 2019-Present
Candidate: Secretary for Nonlinear Geophysics 2020

Society for Industrial and Applied Mathematics (SIAM)
Member 2011-Present

Oregon State University Chapter of SIAM
Treasurer 2016-2018
- Organized payments to speakers and vendors.
- Prepared end-of-year financial reports.

President 2018-2020
- Organized Speaker visits.
- Created and implemented Python language training.
- Recieved SIAM Student Chapter Certificate of Recognition

Teaching Experience

Graduate Teaching Assistant
- Differential, Integral Calculus
- Vector Calculus
- Differential Equations
- Linear Algebra
- Discrete Mathematics

Instructor
- Integral Calculus