

Terrence Alsup

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https://terrencealsup.github.io

Research Interests

Bayesian inverse problems, scientific machine learning (SciML), Monte Carlo methods, uncertainty quantification, numerical and scientific computing

Education

- Sep. 2017 – **Ph.D. Mathematics**, *Courant Institute, New York University*, New York, NY
Jan. 2023 ○ Advisor: Benjamin Peherstorfer
○ Dissertation (defended Dec. 2022):
Trading off deterministic approximations and sampling in multifidelity Bayesian inference
○ Henry MacCracken Fellowship
- Jan. 2017 – **M.S. Mathematics**, *Georgia Institute of Technology*, Atlanta, GA
Aug. 2017 ○ STEM Fellowship
- Aug. 2013 – **B.S. Applied Mathematics**, *Georgia Institute of Technology*, Atlanta, GA
Dec. 2016 ○ Highest honors

Work Experience

- Feb. 2022 – **Finastra**, *Senior Data Scientist*, Innovation Lab
Present ○ Predictive modeling for customer churn and product recommendation
○ Automatic payments processing using optical character recognition
○ Deployed text-to-speech model for internal use across Finastra's sales teams
- Jun. 2021 – **Sandia National Laboratories**, *Computer Science Research Institute intern*
Sep. 2021 ○ Bayesian machine learning group with Tommie Catanach focusing on applications of Bayesian optimal experimental design to sensor configuration for seismic monitoring
○ Developed a method for estimating the error in expected information gain estimates

Honors & Awards

- 2022 Vista Hackathon Winner
The Grid: Federated Learning for the Credit Invisible
- 2020, 2022 SIAM student travel award
- 2021 BGCE Student Paper Prize Finalist

Publications, Preprints, & Technical Reports

- [1] **T. Alsup**, T. Hartland, B. Peherstorfer, and N. Petra. Further analysis of multilevel Stein variational gradient descent with an application to the Bayesian inference of glacier ice models. *Advances in Computational Mathematics*, 2024.
- [2] A. Maurais, **T. Alsup**, B. Peherstorfer, and Y. Marzouk. Multifidelity covariance estimation via regression on the manifold of symmetric positive definite matrices. *arXiv:2307.12438*, 2023.
- [3] A. Maurais, **T. Alsup**, B. Peherstorfer, and Y. Marzouk. Multi-fidelity covariance

estimation in the log-euclidean geometry. In *International Conference on Machine Learning (ICML)*, 2023.

- [4] **T. Alsup** and B. Peherstorfer. Context-aware surrogate modeling for balancing approximation and sampling costs in multi-fidelity importance sampling and Bayesian inverse problems. *SIAM/ASA Journal on Uncertainty Quantification*, 2022.
- [5] **T. Alsup**, L. Venturi, and B. Peherstorfer. Multilevel Stein variational gradient descent with applications to Bayesian inverse problems. In *Mathematical and Scientific Machine Learning (MSML) 2021*, 2021.
- [6] **T. Alsup** and T. Catanach. Expected information gain estimates and Bayesian optimal experimental design. In J.D. Smith and E. Galvan, editors, *Computer Science Research Institute Summer Proceedings 2021*, pages 269–282, 2021. Technical Report: SAND2022-0653R.

Teaching Experience

- 2020–2021 Mathematical Statistics, NYU, Teaching Assistant (3 semesters)
- 2019–2020 Introduction to Machine Learning, NYU, Class Assistant (2 semesters)
- 2018 Stochastic Calculus, NYU, Teaching Assistant (1 semester)
- 2014–2015 Differential Equations, Georgia Tech, Teaching Assistant (2 semesters)

Conference Presentations

- Sep. 2022 SIAM MDS22, *Multilevel Preconditioning for Stein Variational Gradient Descent with Applications to Bayesian Inverse Problems*.
- Apr. 2022 SIAM UQ22, *Multilevel Stein Variational Gradient Descent with Applications to Bayesian Inverse Problems*.
- Mar. 2022 IMSI, The Mathematics of Soft Matter, *Trading-off deterministic preconditioning and sampling in Bayesian inference*.
- Aug. 2021 MSML21, *Multilevel Stein Variational Gradient Descent with Applications to Bayesian Inverse Problems*.
- Mar. 2021 SIAM CSE21, *Trading-off Deterministic Preconditioning and Sampling in Bayesian Inference*.
- Mar. 2021 SIAM CSE21, *Learning Context-Aware Surrogate Models for Multifidelity Importance Sampling and Bayesian Inverse Problems*.
- Apr. 2020 ICERM, Computational Statistics and Data-Driven Modeling, *Learning context-aware surrogate models for multifidelity importance sampling and Bayesian inverse problems*.
- Feb. 2020 ICERM, Mathematics of Reduced Order Models, *Learning context-aware surrogate models for multifidelity importance sampling and Bayesian inverse problems*.

Other Projects & Articles

- 2022 Optimal Transport and its Applications to Fairness, *Published on DZone*
- 2020 Learning Large Graphical Models via Convex Optimization
- 2019 Parallel Kinetic Monte Carlo, *with Anya Katsevich*
- 2019 Multi-fidelity Cross-Entropy Estimation of Rare Events, *with Frederick Law*
- 2018 A Survey of Normalizing Flows for Deep Unsupervised Learning

2016 Image Forgery Detection in Alipay, with Ant Financial as a part of RIPS-HK 2016
(report manager)

Computing skills

Languages: Python (Numpy, Scipy, Pandas), Matlab, C, SQL, Java

HPC: OpenMP, MPI (mpi4py), Slurm, CUDA, Singularity

Cloud: Azure, Spark, Databricks

Software: Git, svn, Gnuplot, L^AT_EX

Languages

English, *Native*

French, *Intermediate*