Philip Greengard

CONTACT INFORMATION

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EDUCATION

Yale University

Ph.D. Applied Mathematics, January 2019

- Dissertation: *On Generalized Prolate Spheroidal Functions*
- Advisor: Vladimir Rokhlin

Courant Institute, New York University

M.S. Mathematics, May 2015

Bates College

B.A. in Mathematics, *Magna Cum Laude*, May 2010

PUBLICATIONS AND PREPRINTS

P. Greengard and A. Gelman. BISG: When inferring race or ethnicity, does it matter that people often live near their relatives? *arXiv* (2023). *Submitted, PNAS.*

H. Guo, P. Greengard, H. Wang, A. Gelman, E. Xing, and Y. Kim. Federated learning as variational inference: A scalable expectation propagation approach. *ICLR*, 2023.

P. Wang, R. Panda, L. T. Hennigen, P. Greengard, L. Karlinsky, R. Feris, D. D. Cox, Z. Wang, Y. Kim. Learning to grow pretrained models for efficient transformer training. *ICLR*, 2023.

A. Barnett, P. Greengard, and M. Rachh. Uniform approximation of common Gaussian process kernels using equispaced Fourier grids *arXiv* (2023). *Submitted, Applied and Computational Harmonic Analysis.*

P. Greengard, M. Rachh, and A. H. Barnett. Equispaced Fourier representations for efficient Gaussian process regression from a billion data points. *arXiv*, (2022). *Submitted, SIAM Uncertainty Quantification.*

P. Greengard, J. G. Hoskins, N. F. Marshall, A. Singer. On a linearization of quadratic Wasserstein distance. *arXiv* (2022). *Submitted, Information and Inference.*

P. Greengard. Efficient Fourier representations of families of Gaussian processes. *arXiv* (2021). *Submitted, SIAM Journal of Scientific Computing.*

P. Greengard, J. Hoskins, C. Margossian, A. Gelman and A. Vehtari. Fast methods for posterior inference of two-group normal-normal models. *Bayesian Analysis* (2021).

P. Greengard and M. O'Neil. Efficient reduced-rank methods for Gaussian processes with eigenfunction expansions. *Statistics and Computing* (2022).

P. Greengard, A. Gelman, and A. Vehtari. A Fast Regression via SVD and Marginalization. *Computational Statistics* (2021).

C. Tosh, P. Greengard, B. Goodrich, A. Gelman, and D. Hsu. The piranha problem: Large effects swimming in a small pond. *arXiv* (2020).

P. Greengard, Y. Liu, S. Steinerberger, A. Tsyvinski. Factor Clustering with t-SNE. *SSRN* (2020).

P Greengard and K. Serkh. On generalized prolate spheroidal functions. *arXiv* (2018).

P. Greengard and K. Serkh. Zernike polynomials: Evaluation, quadrature, and interpolation. *arXiv* (2018).

P. Greengard and V. Rokhlin. An algorithm for the evaluation of the incomplete gamma function. *Advances in Computational Mathematics* (2019) 45: 23.

Software

- `raking_bisg`, an implementation of the subpopulation prediction method of "BISG: When inferring race or ethnicity, does it matter that people often live near their relatives?"
- `gp-shootout`, a MATLAB package for efficient Fourier Gaussian processes and a comparison of several state-of-the-art methods.
- `fastNoNo`, an R/Fortran package for fast normal-normal Bayesian modeling.
- `kl_exps`, Eigenfunction expansions for Gaussian processes. Python.
- Moving-object identification in videos. Facebook AI Research. C++ and Python.
- Generalized prolate spheroidal functions: evaluation, quadrature, interpolation. Fortran.
- Zernike polynomials: evaluation, quadrature and interpolation. Fortran.
- Fast and accurate evaluation of incomplete gamma function. Fortran.

Grants

Co-PI, National Science Foundation (NSF), "Scalable Bayesian regression: Analytical and numerical tools for efficient Bayesian analysis in the large data regime", 2023 - 2026 (with Andrew Gelman).

Talks

- *Equispaced Fourier representations for Gaussian processes.* Columbia University Department of Statistics and Zuckerman Mind Brain Behavior Institute and Center for Theoretical Neuroscience. 2023.

- *Equispaced Fourier representations for Gaussian processes.* CUNY Graduate Center Harmonic Analysis and PDE Seminar. 2023.

- *Equispaced Fourier representations for efficient Gaussian process regression from a billion data points.* Joint Mathematics Meetings. 2023.

- *Equispaced Fourier representations for efficient Gaussian process regression from a billion data points.* SIAM Mathematics of Data Science Conference. 2022.

- *Efficient Gaussian process regression via eigenfunction and Fourier expansions.* Princeton University, IDeAS Seminar, Program in Applied and Computational Mathematics. 2021.

- *Efficient Gaussian process regression via eigenfunction and Fourier expansions.* Flatiron Institute, Center for Computational Mathematics Colloquium, 2021.

- *Efficient Gaussian process regression via basis function approximations.* Columbia University, Applied Physics and Applied Mathematics Seminar. 2021.

- *Efficient Statistical Inference for Normal-Normal Models.* Flatiron Institute, Computational Bayesian Statistics Journal Club. 2021.

- *DNA-Encoded Libraries and High-Dimensional Data.* Covid-19 Symposium at Columbia University. 2020.

- *On Generalized Prolate Spheroidal Functions.* Yale Applied Mathematics Seminar. 2018.

Work Experience

- **Columbia University**, 2020-present, Postdoctoral Research Scholar. Research computational and statistical methodology in data science and machine learning.

- **ART Advisors**, 2019-2020, Quantitative Researcher. Developed systematic trading strategies in global equity markets using statistical and mathematical techniques.

- **Facebook AI Research**, Summer 2018, Research Intern. Created computationally efficient and robust algorithms for extracting cropped images from moving objects in videos.

- **Bain Capital**, 2011-2013, Analyst. Developed quantitative portfolio management tools for fundamental portfolio managers.

- **Morgan Stanley**, 2010 - 2011. Provided analysis and trade recommendations to portfolio managers on municipal bonds.

Teaching

Applied Mathematics, Yale University

- Teaching Fellow, Numerical Solutions to ODEs and PDEs, Fall 2017 and 2018
- Teaching Fellow, Introduction to Numerical Methods, Spring 2017