

Charlie Godfrey

<https://godfrey-cw.github.io> | godfrey.cw@gmail.com | www.linkedin.com/in/godfrey-cw

Skills

• Python (pytorch, numpy, scipy, pandas) • Git • Bash • Linux

Education

PhD in Mathematics, The University of Washington-Seattle June 2021

- Extended results on singularities using inductive construction algorithms for semi-simplicial schemes. Built a new Fourier-type transform on differential forms with poles using duality theory. Defined generalizations of ordinary elliptic curves over finite fields and studied their deformations.
- Completed the [eScience Institute's Advanced Graduate Data Science Option](#)
 - PhD-level courses in machine learning, data visualization and statistical inference
 - Implemented machine learning methods like LASSO, kernel regression and k-means clustering in raw numpy and scipy
- Department of Mathematics Graduate Fellowship 2018-2019

Master's of Science in Mathematics, The University of Washington-Seattle June 2018

Bachelor's of Science in Mathematics and Physics, The University of Wisconsin-Madison May 2014

Experience

Postdoctoral Research Associate, [Pacific Northwest National Laboratory](#) October 2022 - Present

Research areas:

- robustness and security of machine learning algorithms and pipelines, in the domains of computer vision and multi-modal data
- geometry and statistics of hidden features of deep learning models, with applications to neural network interpretability
- updates to deep learning models requiring limited additional data (model editing and patching)

Student, [MSRI Mathematics of Machine Learning Summer Graduate School](#) July 29-August 9 2019

- Attended mini-courses and problem sessions on statistical learning, convex optimization, bandits, deep learning and reinforcement learning
- Presented an expository account of recent work on linear stochastic bandits

Program Associate, [Mathematical Sciences Research Institute](#) March-May 2019

Graduate Mentor, [Washington Experimental Math Laboratory](#) January 2019-December 2020

- Mentored undergraduate research projects on foundations of quantum mechanics and mathematical epidemiology

Publications

1. Charles Godfrey, Davis Brown (equal contribution), Tegan Emerson and Henry Kvinge. [On the Symmetries of Deep Learning Models and their Internal Representations](#). To appear in *NeurIPS 2022*.
2. Elizabeth Coda, Nico Courts, Colby Wight, Loc Truong, WoongJo Choi, Charles Godfrey, Tegan Emerson, Keerti Kappagantula and Henry Kvinge. [Fiber bundle morphisms as a framework for modeling many-to-many maps](#). In *ICLR 2022 workshop on geometrical and topological representation learning*.
3. Higher Direct Images of Ideal Sheaves, Correspondences in Log Hodge Cohomology and Globally F-Full Varieties. PhD thesis, University of Washington 2021.

Preprints

1. Takumi Murayama and Charles Godfrey. [Pure subrings of du bois singularities are du bois singularities](#) (2022).
2. [Higher direct images of ideal sheaves](#) (2022).