

Max Daniels

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Research webpage: mdnls.cc

Education

MASSACHUSETTS INSTITUTE OF TECHNOLOGY - Cambridge, MA **September 2022 - Present**

Department of Mathematics

Candidate for Doctoral Degree in Mathematics, expected May 2025.

NORTHEASTERN UNIVERSITY - Boston, MA **September 2018 - May 2022**

Khoury College of Computer Sciences

Candidate for Bachelor of Science in Computer Science and Math Combined, minoring in Physics, May 2022

Coursework: Topics Courses: Deep Learning & Signal Processing, Randomized Algorithms
PhD Level: Probability 1, Analysis 1, Analysis 2, Algebra 1, Complexity Theory

Honors: GPA: 3.997/4.00, Dean's List (2018 - Present)
Member of Northeastern University Honors Program

Articles & Publications

M. Daniels, C. Gerbelot, F. Krzakala, L. Zdeborová, "Multi-layer State Evolution Under Random Convolutional Designs," Accepted to NeurIPS 2022. Available: <https://arxiv.org/abs/2205.13503>.

M. Daniels, T. Maunu, P. Hand, "Score-based Generative Neural Networks for Large-Scale Optimal Transport," Accepted to NeurIPS 2021. Available: <https://arxiv.org/abs/2110.03237>.

J. Park, N. Smedemark-Margulies, **M. Daniels**, R. Yu, JW. Van De Meent, P. Hand, "Generator Surgery for Compressed Sensing," 2020. Accepted to NeurIPS Deep Inverse Workshop 2020. Available: <https://arxiv.org/abs/2102.11163>.

M. Asim*, **M. Daniels***, O. Leong, A. Ahmed, and P. Hand, "Invertible generative models for inverse problems: mitigating representation error and dataset bias," 2020. Accepted to ICML 2020. Available: <http://arxiv.org/abs/1905.11672>.

M. Daniels, "Statistical Distances and Their Implications to GAN Training," 2019. Workshop Article, VISxAI Workshop at IEEE VIS 2019. Available: <http://mdnls.cc/prob-vis>. **Honorable mention, best submission to workshop.**

M. Daniels*, Catherine Huang*, Chloe Makdad*, Shubham Makharia*, "An Overview of Graph Spectral Clustering and Partial Differential Equations," 2020. Product of ICERM 2020 REU program.
Available: <https://ghost-clusters.github.io/icerm-spectral-clustering/>.

Employment

DOCTORAL STUDENT - Phillipe Rigollet's Group, MIT, Cambridge **September 2022-Present**

| PhD student working under the supervision of Phillipe Rigollet at MIT.

VISITING STUDENT - SPOC Group, EPFL, Lausanne **September 2021-Present**

| Visiting student of Lenka Zdeborová's Statistical Physics of Computation (SPOC) group at EPFL in Lausanne, Switzerland.

| Continuation of work in imaging inverse problems by analyzing physics-inspired message passing algorithms.

RESEARCH ASSISTANT - Prof. Paul Hand, NEU, Boston **January 2019-Present**

| Undergraduate research with Prof. Paul Hand at Northeastern University.

| Publish co-first author paper at ICML 2020, coauthor paper at NeurIPS 2021 Deep Inverse workshop.

Awards

FINALIST, Hertz Foundation Fellowship **2022**

- | Recognizing the nation's most promising innovators in science and technology, providing them with full funding to pursue a doctoral degree.
- | In 2022 the committee received over 650 applications, chose 45 finalists, and awarded 13 fellowships.

FINALIST, CRA Outstanding Undergraduate Researcher – Northeastern University, Boston, MA **2022**

- | Annual award recognizing undergraduates who show outstanding potential in undergraduate research.
- | In 2022 the committee chose 77 honorable mention recipients, 20 finalists, 4 runners up, and 4 awardees.

RECIPIENT (Declined), Knight-Hennessy Fellowship **2022**

- | Supports a highly engaged, multidisciplinary and multicultural community of graduate students by providing recipients with full funding to pursue a graduate degree at Stanford University.
- | In 2022 the committee selected 150 finalists and 70 recipients. Offered jointly with admission to Stanford's Statistics PhD program.

GOLDWATER SCHOLAR – Northeastern University, Boston, MA **2020**

- | One of 22 in CS to receive 2020 national Barry Goldwater award for outstanding undergraduate research.

RESEARCH AWARDS – Northeastern University, Boston, MA **2018-2019**

- | Northeastern Honors Undergraduate Research Award of \$1000.
- | Recipient of Northeastern URF office's Summit Research Award of \$3000.

Talks

LARGE SCALE OPTIMAL TRANSPORT, ENS, Paris **December 2021**

- | Paper presentation given as long talk at École Normale Supérieure, hosted by Gabriel Peyré, on the SCONES algorithm for large-scale optimal transport.
- | Associated work: "Score-based Generative Models for Large-scale Optimal Transport," <https://arxiv.org/abs/2110.03237>.

LARGE SCALE OPTIMAL TRANSPORT, CIRM, Marseille **September 2021**

- | Poster presentation at the CIRM institute in Marseille, France, on the SCONES algorithm for large-scale optimal transport.
- | Associated work: "Score-based Generative Models for Large-scale Optimal Transport," <https://arxiv.org/abs/2110.03237>.

GENERATIVE MODELING, Brown University SUMS 2020 **March 2020**

- | Research talk at the Brown University Symposium for Undergraduate Mathematics (SUMS 2020) discussing algorithms for generative modelling of probability distributions. We discuss Noise Contrastive Estimation, the Word2Vec algorithm, and GAN based generative modeling.
- | Associated work: "Statistical Distances and Their Implications to GAN Training," <http://qnkxsovc.gitlab.io/prob-vis>.

ML INTRODUCTORY WORKSHOP, Northeastern University ASME **June 2019**

- | Co-organized a three-week Machine Learning workshop for student members of Northeastern University's chapter of the American Society of Mechanical Engineers.
- | Developed curriculum and practice exercises. Instructed students during lectures.

Service & Extracurriculars

FOUNDER & CHAIRPERSON, MathEMA

2020-Present

- | Founder and Chairperson of NEU math department's Mathematics Engagement and Mentorship Association.
- | I organize meetings, maintain our global schedule each semester, host social events, and coordinate our committee's efforts to pair mentees with mentors.

COURSE ASSISTANT, Proof-Based Probability & Statistics

2020

- | TA for advanced/proof-based undergraduate course in Probability & Statistics under Prof. Paul Hand.
- | Maintain course calendar, track logistics, contribute a few cool problems, write all homework solutions, grade weekly assignments, hold office hour.

TUTOR, Algorithms & Machine Learning

2018-2019

- | Volunteer as unpaid private or university-funded tutor for B.S. Algorithms (3 times), B.S. Machine Learning (1 time), and M.S. machine learning (1 time).
- | Each time, I met 1-on-1 at least 2 hours per week for at least 1/2 semester to practice course material. Outside meetings I track progress and prepare study material.