Raphael A. Meyer

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Fifth Year Ph.D. Student Theoretical Computer Science

Education

New York University **Brooklyn, NY**
Ph.D. in Computer Science *2019–2024*
Advised by Prof. Christopher Musco
Deborah Rosenthal, MD Award for Best Quals Examination:
Towards Optimal Spectral Sum Estimation in the Matrix-Vector Oracle Model

Purdue University **West Lafayette, IN**
B.S. in Computer Science Honors *2015–2019*
Concentrations in Foundations of CS, Computational Science, Machine Intelligence
Minors in Math, Electrical Engineering
Completed 15 Graduate Courses

Research Interests

I research the interplay of Statistics and Computation, largely through the lens of Linear Algebra.

- ► Randomized Linear Algebra (RandNLA)
- ► Statistical & Computational Lower Bounds
- ► Foundations of Data Science
- ► Optimization & Machine Learning

Work Experience

Graduate Teaching Assistant

Algorithmic Machine Learning and Data Science **New York, NY**
New York University *Fall 2023*

Responsible Data Science **New York, NY**
New York University *Spring 2023*

Machine Learning **Brooklyn, NY**
New York University *Fall 2022*

Algorithmic Machine Learning and Data Science **Brooklyn, NY**
New York University *Fall 2020*

Introduction to Machine Learning **Brooklyn, NY**
New York University *Spring 2020*

Introduction to Algorithmic Analysis **West Lafayette, IN**
Purdue University *Fall 2018*

Undergraduate Research Assistant

Theoretical Machine Learning — **West Lafayette, IN**
Purdue University, with Prof. Jean Honorio — *2018-2019*

Information-Theoretic Cryptography — **West Lafayette, IN**
Purdue University, with Prof. Hemanta K. Maji — *2016-2018*

Internships

Software Engineering Intern — **New York, NY**
Bloomberg L.P. — *Summer 2017*

Software Engineering Intern — **New York, NY**
Bloomberg L.P. — *Summer 2016*

Honors and Awards

Deborah Rosenthal, MD Award for Best Quals Exam: New York University *2021*
Outstanding Reviewer Award: NeurIPS Conference *2021*
Student Travel Grant: ICML Conference *2019*
School of Engineering Fellowship: New York University *2019*
Finalist: CRA Outstanding Undergraduate Research Award *2018*
Student Travel Grant: ISIT Conference *2017*
Outstanding Sophomore of the Year: Purdue Computer Science *2016–2017*
Silver Medal, Giant Slalom: Ecole de Ski Français *2016*
Qualcomm Rookie Team of the Year: Boilermake Hackathon *2015*
Top Ten Hacks: Boilermake Hackathon *2015*
Certificate of Cuisine: Cordon Blue School of Gourmet Cuisine *2015*

Publications

- **Algorithm-Agnostic Low-Rank Approximation of Operator Monotone Matrix Functions**
  with David Persson and Christopher Musco *in submission.*
- **Hutchinson's Estimator is Bad at Kronecker-Trace-Estimation**
  with Haim Avron *in submission.*
- **On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation**
  with Cameron Musco and Christopher Musco at *SODA 2024.*
- **Near-Linear Sample Complexity for Lp Polynomial Regression**
  with Cameron Musco, Christopher Musco, David P. Woodruff, and Samson Zhou at *SODA 2023.*
- **Fast Regression for Structured Inputs**
  with Cameron Musco, Christopher Musco, David P. Woodruff, and Samson Zhou at *ICLR 2022.*
- **Hutch++: Optimal Stochastic Trace Estimation**
  with Cameron Musco, Christopher Musco, and David P. Woodruff at *SOSA 2021.*

- **The Statistical Cost of Robust Kernel Hyperparameter Tuning**
  with Christopher Musco at *NeurIPS 2020*.
- **Optimality Implies Kernel Sum Classifiers are Statistically Efficient**
  with Jean Honorio at *ICML 2019*.
- **Characterizing Optimal Security and Round-Complexity for Secure OR Evaluation**
  with Amisha Jhanji and Hemanta K. Maji at *ISIT 2017*.

Talks & Presentations

Invited Talks

Optimal Trace Estimation and Sub-optimal Kronecker-Trace Estimation — **Presentation**
Theory Lunch § University of Chicago — *2023*

On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation — **Presentation**
Perspectives on Matrix Computations § BIRS — *2023*

On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation — **Presentation**
Theory Seminar § Purdue University — *2022*

Near-Linear Sample Complexity for Lp Polynomial Regression — **Presentation**
CDS Student Seminar § New York University — *2022*

Hutch++ and More: Towards Optimal Spectral Sum Estimation — **Presentation**
Computational Lower Bounds in Linear Algebra § SIAM AN22 — *2021*

Lessons from Trace Estimation Lower Bounds — **Presentation**
Computational Lower Bounds in Linear Algebra § SIAM AN21 — *2021*

Hutch++: Optimal Stochastic Trace Estimation — **Presentation**
Theory Seminar § Johns Hopkins University — *2021*

Conference Presentations

On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation — **Presentation**
Conference on Fast Direct Solvers — *2023*

Hutchinson's Estimator is Bad at Kronecker-Trace-Estimation — **Presentation**
SIAM-NNP Conference — *2023*

On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation — **Presentation**
GAMM ANLA Conference — *2023*

Near-Linear Sample Complexity for Lp Polynomial Regression — **Presentation**
SODA Conference — *2023*

Fast Regression for Structured Inputs — **Poster**
ICLR Conference — *2022*

Hutch++: Optimal Stochastic Trace Estimation — **Poster**
WALD(O) Conference — *2021*

Hutch++: Optimal Stochastic Trace Estimation **Presentation**
SOSA Conference *2021*

The Statistical Cost of Robust Kernel Hyperparameter Tuning **Poster**
NeurIPS Conference *2020*

Statistical Efficiency of Optimal Kernel Sum Classifiers **Presentation, Poster**
ICML Conference *2019*

Statistical Efficiency of Optimal Kernel Sum Classifiers **Poster**
Midwest Theory Day *2019*

Optimal Secure OR Evaluation **Presentation**
ISIT Conference *2017*

Reading Groups

The Equivalences of Matrix-Vector Complexity in Quantum Computing **Presentation**
NYU/UMass Quantum Linear Algebra Reading Group *2023*

Hutch++: Optimal Stochastic Trace Estimation **Presentation**
NYU VIDA Reading Group *2022*

Introduction to Leverage Scores **Presentation**
NYU Tandon Theory Reading Group *2021*

Strategies for Episodic Tabular & Linear MDPs **Presentation**
NYU Tandon Reinforcement Learning Reading Group *2021*

Lagrangian Duality **Presentation**
NYU Tandon Theory Reading Group *2021*

Introduction to Differential Entropy **Presentation**
NYU CDS Reading Group on Information Theory *2020*

Lower Bounds for the Oracle Complexity of Convex Optimization **Presentation**
NYU Tandon AMLDS Reading Group *2019*

Service

Organizer: SIAM-NNP Symposium on *Matrix-Vector Complexity in Linear Algebra* (link) *2023*

Organizer: NYU Tandon TCS "Pandemic Presentations" Day (link) *2022*

Organizer: NYU Tandon TCS Reading Group *2021*

ICLR Conference: Conference Reviewer *2024*

NeurIPS Conference: Conference Reviewer *2023*

TMLR Journal: Conference Reviewer *2023*

ICLR Conference: Conference Reviewer *2023*

SODA Conference: External Conference Reviewer *2023*

NeurIPS Conference: Conference Reviewer *2022*

ICML Conference: Conference Reviewer *2022*

STOC Conference: External Conference Reviewer *2022*

ICLR Conference: Conference Reviewer *2022*

NeurIPS Conference: Conference Reviewer *2021*

ISIT Conference: External Conference Reviewer *2017*

Programming Languages

Julia, Python, C++, C, LaTeX, Racket: *Proficient*

Wrote Production-Worthy Code in Multiple Software Engineering Internships