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 problems in <u>Numerical Linear Algebra</u> from the perspective of <u>Theoretical Computer Science</u>

▶ Randomized Linear Algebra (RandNLA)   ▶ Theoretical Computer Science
▶ Information-Theoretic Lower Bounds   ▶ Applied Mathematics

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

Fairwashing SHAP, or Interventional and Observational Shapley Values   **Presentation**
NYU Responsible AI Reading Group   *2023*

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