

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) ▶ Foundations of Data Science
- ▶ Statistical & Computational Lower Bounds ▶ Optimization & Machine Learning

Work Experience

Graduate Teaching Assistant.....

Algorithmic Machine Learning and Data Science <i>New York University</i>	New York, NY <i>Fall 2023</i>
Responsible Data Science <i>New York University</i>	New York, NY <i>Spring 2023</i>
Machine Learning <i>New York University</i>	Brooklyn, NY <i>Fall 2022</i>
Algorithmic Machine Learning and Data Science <i>New York University</i>	Brooklyn, NY <i>Fall 2020</i>
Introduction to Machine Learning <i>New York University</i>	Brooklyn, NY <i>Spring 2020</i>
Introduction to Algorithmic Analysis <i>Purdue University</i>	West Lafayette, IN <i>Fall 2018</i>

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 Qualls 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 L_p 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
<i>Theory Lunch § University of Chicago</i>	<i>2023</i>
On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation	Presentation
<i>Perspectives on Matrix Computations § BIRS</i>	<i>2023</i>
On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation	Presentation
<i>Theory Seminar § Purdue University</i>	<i>2022</i>
Near-Linear Sample Complexity for Lp Polynomial Regression	Presentation
<i>CDS Student Seminar § New York University</i>	<i>2022</i>
Hutch++ and More: Towards Optimal Spectral Sum Estimation	Presentation
<i>Computational Lower Bounds in Linear Algebra § SIAM AN22</i>	<i>2021</i>
Lessons from Trace Estimation Lower Bounds	Presentation
<i>Computational Lower Bounds in Linear Algebra § SIAM AN21</i>	<i>2021</i>
Hutch++: Optimal Stochastic Trace Estimation	Presentation
<i>Theory Seminar § Johns Hopkins University</i>	<i>2021</i>

Conference Presentations.....

On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation	Presentation
<i>Conference on Fast Direct Solvers</i>	<i>2023</i>
Hutchinson's Estimator is Bad at Kronecker-Trace-Estimation	Presentation
<i>SIAM-NNP Conference</i>	<i>2023</i>
On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation	Presentation
<i>GAMM ANLA Conference</i>	<i>2023</i>
Near-Linear Sample Complexity for Lp Polynomial Regression	Presentation
<i>SODA Conference</i>	<i>2023</i>
Fast Regression for Structured Inputs	Poster
<i>ICLR Conference</i>	<i>2022</i>
Hutch++: Optimal Stochastic Trace Estimation	Poster
<i>WALD(O) Conference</i>	<i>2021</i>

Hutch++: Optimal Stochastic Trace Estimation <i>SOSA Conference</i>	Presentation 2021
The Statistical Cost of Robust Kernel Hyperparameter Tuning <i>NeurIPS Conference</i>	Poster 2020
Statistical Efficiency of Optimal Kernel Sum Classifiers <i>ICML Conference</i>	Presentation, Poster 2019
Statistical Efficiency of Optimal Kernel Sum Classifiers <i>Midwest Theory Day</i>	Poster 2019
Optimal Secure OR Evaluation <i>ISIT Conference</i>	Presentation 2017

Reading Groups.....

Fairwashing SHAP, or Interventional and Observational Shapley Values <i>NYU Responsible AI Reading Group</i>	Presentation 2023
The Equivalences of Matrix-Vector Complexity in Quantum Computing <i>NYU/UMass Quantum Linear Algebra Reading Group</i>	Presentation 2023
Hutch++: Optimal Stochastic Trace Estimation <i>NYU VIDA Reading Group</i>	Presentation 2022
Introduction to Leverage Scores <i>NYU Tandon Theory Reading Group</i>	Presentation 2021
Strategies for Episodic Tabular & Linear MDPs <i>NYU Tandon Reinforcement Learning Reading Group</i>	Presentation 2021
Lagrangian Duality <i>NYU Tandon Theory Reading Group</i>	Presentation 2021
Introduction to Differential Entropy <i>NYU CDS Reading Group on Information Theory</i>	Presentation 2020
Lower Bounds for the Oracle Complexity of Convex Optimization <i>NYU Tandon AMLDS Reading Group</i>	Presentation 2019

Service

Organizer: SIAM-NNP Symposium on <i>Matrix-Vector Complexity in Linear Algebra</i> (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	<i>2022</i>
ICLR Conference: Conference Reviewer	<i>2022</i>
NeurIPS Conference: Conference Reviewer	<i>2021</i>
ISIT Conference: External Conference Reviewer	<i>2017</i>

Programming Languages

Julia, Python, C++, C, LaTeX, Racket:	<i>Proficient</i>
Wrote Production-Worthy Code in Multiple Software Engineering Internships	