

Raphael A. Meyer

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Education

New York University

Ph.D. in Computer Science

Advised by Prof. Christopher Musco

Deborah Rosenthal, MD Award for Best Qualls Examination:

Towards Optimal Spectral Sum Estimation in the Matrix-Vector Oracle Model

Brooklyn, NY

2019–2024

Purdue University

B.S. in Computer Science Honors

Concentrations in Foundations of CS, Computational Science, Machine Intelligence

Minors in Math, Electrical Engineering

Completed 15 Graduate Courses

West Lafayette, IN

2015–2019

Research Interests

I research problems in Numerical Linear Algebra from the perspective of Theoretical Computer Science

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

Work Experience

Teaching Assistant.....

Responsible Data Science

New York University

New York, NY

Spring 2024

Algorithmic Machine Learning and Data Science

New York University

Brooklyn, NY

Fall 2023

Responsible Data Science

New York University

New York, NY

Spring 2023

Machine Learning

New York University

Brooklyn, NY

Fall 2022

Algorithmic Machine Learning and Data Science

New York University

Brooklyn, NY

Fall 2020

Introduction to Machine Learning

New York University

Brooklyn, NY

Spring 2020

Introduction to Algorithmic Analysis

Purdue University

West Lafayette, IN

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 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.....

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| Hutch++ and funNyström 2 | Presentation |
| <i>Mahoney Group Talk § University of California, Berkeley</i> | <i>2024</i> |
| 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.....

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|---|---------------------|
| On the Unreasonable Effectiveness of Single Vector Krylov for Low-Rank Approximation | Presentation |
| <i>SODA Conference</i> | <i>2024</i> |
| 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> |

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| Fast Regression for Structured Inputs <i>ICLR Conference</i> | Poster 2022 |
| Hutch++: Optimal Stochastic Trace Estimation <i>WALD(O) Conference</i> | Poster 2021 |
| 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

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| 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 |
| ICALP Conference: External Conference Reviewer | 2024 |
| ICML Conference: Conference Reviewer | 2024 |
| IJCAI Conference: Conference Reviewer | 2024 |

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| ICLR Conference: Conference Reviewer | <i>2024</i> |
| NeurIPS Conference: Conference Reviewer | <i>2023</i> |
| TMLR Journal: Conference Reviewer | <i>2023</i> |
| ICLR Conference: Conference Reviewer | <i>2023</i> |
| SODA Conference: External Conference Reviewer | <i>2023</i> |
| NeurIPS Conference: Conference Reviewer | <i>2022</i> |
| ICML Conference: Conference Reviewer | <i>2022</i> |
| 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> |