Akshay Ramachandran

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INTERESTS Geodesic/ Riemannian Optimization, Matrix Analysis, Quantum Information Theory, Geometric Invariant Theory, High Dimensional Statistics

EDUCATION

University of Waterloo, Waterloo, Ontario, Canada
Ph.D., Computer Science — Aug 2016-Oct 2021
Advisor: Lap Chi Lau
Thesis: *Geodesic convex analysis of group scaling for the Paulsen problem and tensor normal model*

UC Berkeley, Berkeley, CA, USA
B.S., Electrical Engineering and Computer Science — Aug 2012-May 2016

EXPERIENCE

CWI / UvA Post-doc in Networks and Optimization + QuSoft — October 2021-
Amsterdam, Netherlands
with Daniel Dadush and Michael Walter

Microsoft Research Research Intern — June-August 2016
Bangalore, Karnataka, India
with Navin Goyal

Juniper Networks Software Engineering Intern — June-August 2014
Sunnyvale, CA, USA

AWARDS

Mathematics Doctoral Prize (second place) for PhD Thesis — CAD 1,000
Awarded to top 3 graduated doctoral students in Faculty of Mathematics

Cheriton Distinguished Dissertation Award for PhD Thesis — CAD 1,000
For excellence in Computer Science doctoral research (1 per year)

Cheriton Scholarship (2016-2018, 2019-2020) — CAD 10,000 per year
Awarded to ≈ 60 students based on academic excellence

Ontario Trillium (2016-2020) — CAD 40,000 per year
Nominated by Faculty based on academic merit

Eta Kappa Nu EECS Honor Society at UC Berkeley (2013)

PUBLICATIONS

The Paulsen Problem Revisited: Optimal Bounds via Smoothed Analysis and Scaling
with Lap Chi Lau
In Preparation.

Hidden convexity, optimization, and algorithms on rotation matrices
with Kevin Shu and Alex Wang
In submission to Mathematics of Operations Research.

Scaling problems, algorithms and applications to computer science, functional analysis and statistics
with Rafael Oliveira
Book Chapter in Proceedings of CBM 2021.

Near optimal sample complexity for dense matrix and tensor normal models
with Cole Franks, Rafael Oliveira, Michael Walter.

In submission to Annals of Statistics.

Spectral Analysis of Operator Scaling
with Tsz Chiu Kwok, Lap Chi Lau
SIAM Journal on Computing, Volume 50 (2021).
Preliminiary version in FOCS 2019.

The Paulsen Problem, Continuous Operator Scaling, and Smoothed Analysis
with Tsz Chiu Kwok, Lap Chi Lau, Yin Tat Lee.
STOC 2018.

Sandpile Prediction on Trees in near linear time
with A. Schild
SODA 2017.

TEACHING

Instructional Assistant for Continuous Optimization at Mastermath Netherlands
Fall 2022

Instructional Assistant for CS341 (Algorithms) at UWaterloo
Spring 2019, Fall 2019, Winter 2020

Teaching Assistant for CS70 (Discrete Math and Probability) at UC Berkeley
Summer 2015, Fall 2015, Spring 2016

REFERENCES

Advisor: Professor Lap Chi Lau, University of Waterloo, (lapchi@uwaterloo.ca)

Professor Daniel Dadush, Centrum Wiskunde & Informatica, (dadush@cwi.nl)

Professor Michael Walter, Ruhr University Bochum, (michael.walter@rub.de)

Professor Rafael Oliveira, University of Waterloo, (rafael@uwaterloo.ca)

TALKS

1. Speaker in **AAC Seminar**, June 2023 (Bochum, Germany)
Title: *Eigenvalue Inequalities and the Subspaces that Induce them*

2. Invited Participant in **AIM SQuaREs Workshop**, Mar 2023 (San Jose, CA, USA)
Topic: Operator scaling meets non-commutative optimal transport

3. Speaker in **QuSoft Junior Meeting**, Mar 2023 (Amsterdam, Netherlands)
Title: *Jordan's Lemma and the CS Decomposition in Quantum Algorithms*

4. Invited Speaker at **UWaterloo A&C Seminar**, Oct 2022 (Waterloo, Canada)
Title: *The Brascamp-Lieb Polytope: Rank of Matrix Spaces and Combinatorial Optimization*

5. Invited Speaker at **Simons Workshop**, Nov 2021 (UC Berkeley, CA, USA)
Topic: Symmetry in Optimization
Title: *Near optimal sample complexity for matrix and tensor normal models*

6. Invited Speaker with Rafael Oliveira at **Coloquio Brasileiro de Matematica**, June 2021 (Online)
Topic: Advanced Course in Scaling problems, algorithms, and applications

7. Participant in **BIRS Workshop**, Online Oct 2020
Topic: Combinatorial and Geometric Discrepancy

8. Speaker in **CWI Reading Group**, Spring-Fall 2020 (Online)
Topic: Geodesic Convex Optimization
Talk Title: *Continuous scaling by gradient flow*

9. Invited Speaker at **FOCS 2019** (Baltimore, MD, USA)
Title: *Spectral analysis of matrix and operator scaling*

10. Speaker in **UWaterloo CO Reading group** (Canada), Fall 2019
Topic: Submodular Function Maximization
Talk Title: *Submodular Maximization over Multiple Matroids via Generalized Exchange Properties* by Jon Lee, Maxim Sviridenko, Jan Vondrak

11. Speaker in **UWaterloo CO Reading group**, (Canada), Spring 2019
Topic: Stable Matching
Talk Title: *A Fixed-Point Approach to Stable Matchings* by Tamas Fleiner

12. Invited speaker at **FOCS 2018 Workshop** (Paris, France)
Topic: Scaling Algorithms and Applications
Title: *The Paulsen Problem, Continuous Operator Scaling, and Smoothed Analysis*

13. Speaker in **UWaterloo CO Reading group** (Canada), Fall 2018
Topic: Clustering
Talk Title: *Local Search for Capacitated Facility Location*

14. Speaker in **UWaterloo CO Reading group** (Canada), Spring 2018
Topic: Multiplicative Weight Update
Talk Title: *Entropy, Information and Other Interpretations*

15. Speaker in **UWaterloo CO Reading group** (Canada), Winter 2018
Topic: Stable Polynomials
Talk Title: *Multivariate Stable Polynomials: Theory and Applications* by D. Wagner

16. Speaker in **UWaterloo CO Reading group** (Canada), Spring 2017
Topic: Travelling Salesman
Talk Title: *An O(log n/ log log n)-approximation Algorithm for the Asymmetric Traveling Salesman Problem* by Arash Asadpour, Michel Goemans, Aleksander Madry, Shayan Oveis Gharan, and Amin Saberi

17. Speaker in **UC Berkeley Topics Course** (USA), Fall 2015
Topic: Geometry of Polynomials
Talk Title: *Ramanujan graphs from the matching polynomial*

OTHER

Citizenship: USA
Hobbies: Basketball (playing and watching), Guitar.
Languages: English (native), Tamil (proficient), Marathi (proficient).