

# NATHAN LINDZEY

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## EDUCATION & ACADEMIC WORK EXPERIENCE

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### **Technion (Israel Institute of Technology)**

*Aug. 2022 - Present*

Postdoc

Department of Computer Science

*Supervisor: Yuval Filmus*

<https://theory.cs.technion.ac.il/team/>

### **Simons Institute for the Theory of Computing**

*June 2023 - Aug. 2023*

Visiting Researcher

Research Program: *Analysis and TCS: New Frontiers*

<https://simons.berkeley.edu/people/nathan-lindzey>

### **University of Colorado**

*Jan. 2019 - Aug. 2022*

Postdoctoral Research Associate

Department of Computer Science

*Supervisors: Josh Grochow & Alex Kolla*

<https://www.colorado.edu/cs-theory/>

### **Technion (Israel Institute of Technology)**

*March 2020*

Research Visitor (Host: Yuval Filmus)

Department of Computer Science

*(Interrupted by COVID-19)*

### **University of Waterloo**

*Aug. 2014 - Jan. 2019*

Ph.D. Combinatorics and Optimization

Department of Combinatorics and Optimization

*Dissertation: Matchings and Representation Theory*

*Advisors: Joseph Cheriyan & Chris Godsil*

### **Colorado State University**

*Aug. 2012 - Aug. 2014*

M.S. Mathematics

Department of Mathematics

*Thesis: Towards a General Theory of Erdős-Ko-Rado Combinatorics*

*Advisor: Tim Penttila*

### **University of Northern Colorado**

*Aug. 2012 - May 2014*

Lecturer of Computer Science

Department of Mathematical Sciences

### **Colorado State University**

*Aug. 2008 - May 2012*

M.S. Computer Science

Department of Computer Science

*Thesis: Faster Graph Algorithms via Switching Classes*

Advisor: Ross McConnell

**Southwestern University**

B.A. Computer Science, B.A. Music

Department of Mathematical Sciences, Sarofim School of Fine Arts

Aug. 2003 - Dec. 2007

## PUBLICATIONS

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(Please visit my website [www.nathanlindzey.com](http://www.nathanlindzey.com) for updates, blog posts, and links to publications.)

Yuval Filmus, Ehud Friedgut, Nathan Lindzey, Yuval Wigderson: *TBD*. (In progress)  
<https://wildonblog.wordpress.com/2023/06/08/eigenvalues-of-the-kneser-graph/>)

Shai Evra, Guy Kindler, Nathan Lindzey, Noam Lifshitz: *Global Hypercontractivity for Finite Groups of Lie Type*. (In preparation)

Esty Kelman, Nathan Lindzey, Ohad Sheinfeld: *Forbidden Intersection Theorems for Matrix Spaces*. (In preparation)

Nathan Lindzey: *On Products of Derangements*. (In progress)

Nathan Lindzey: *Disjointness Graphs*. (In progress)

Yuval Filmus, Nathan Lindzey: *A Note on “Largest independent sets of certain regular subgraphs of the derangement graph”*. (*Journal of Algebraic Combinatorics* – To Appear)

Nathan Lindzey: *Jack Derangements*. (*Submitted to Transactions of the American Mathematical Society*)

Gilad Chase, Neta Dafni, Yuval Filmus, Nathan Lindzey: *Uniqueness for 2-Intersecting Families of Permutations and Perfect Matchings*. Discrete Math Days 2022 (*Submitted to Algebraic Combinatorics*)

Yuval Filmus, Nathan Lindzey: *Simple Algebraic Proofs of Uniqueness for Erdős-Ko-Rado Theorems*. Discrete Math Days 2022 (*Submitted to Algebraic Combinatorics*)

Yuval Filmus, Nathan Lindzey: *Harmonic Polynomials on Perfect Matchings*. The 34th international conference on Formal Power Series and Algebraic Combinatorics Indian Institute of Science, Bangalore (India)

Gary Au, Nathan Lindzey, Levent Tunçel: *On Connections Between Association Schemes and Analyses of Polyhedral and Positive Semidefinite Lift-and-Project Relaxations*. (*Submitted to Discrete Mathematics*)

Neta Dafni, Yuval Filmus, Noam Lifshitz, Nathan Lindzey, Marc Vinyals: *Complexity Measures on the Symmetric Group and Beyond*. (Extended Abstract). ITCS 2021: 87:1-87:5 (*Submitted to Combinatorial Theory*)

Nathan Lindzey, Ansis Rosmanis: *A Tight Lower Bound For Non-Coherent Index Erasure*. QIC — A preliminary version of this work appeared in ITCS 2020.

Peter Dukes, Nathan Lindzey, Ferdinand Ihringer: *On the Algebraic Combinatorics of Injections and its Applications to Injection Codes*. IEEE Trans. Inf. Theory 66(11): 6898-6907 (2020) — A preliminary version of this work appeared in FPSAC 2020

Nathan Lindzey: *Intersecting Families of Perfect Matchings*. (*Submitted to Combinatorial Theory*)

Nathan Lindzey: *Stability for 1-Intersecting Families of Perfect Matchings*. European Journal of Combinatorics 86:103091, 12, (2020)

Radu Curticapean, Nathan Lindzey, Jesper Nederlof: *A Tight Lower Bound for Counting Hamiltonian Cycles via Matrix Rank*. SODA 2018: 1080-1099, HALG 2018 (*Submitted to Combinatorica*)

Nathan Lindzey: *Erdős-Ko-Rado for Perfect Matchings*. European Journal of Combinatorics 65: 130-142 (2017)

P.A. Golovach, P. Heggernes, N. Lindzey, R. M. McConnell, V.F. dos Santos, J. Spinrad, J.L. Szwarcfiter: *On Recognizing Threshold Tolerance Graphs and their Complements*. Discrete Applied Mathematics 216: 171-180 (2017) — A preliminary version of this work appeared in WG 2014

Nathan Lindzey, Ross M. McConnell: *Linear-Time Algorithms for Finding Tucker Submatrices and Lekkerkerker-Boland Subgraphs*. WG 2013, SIAM Journal on Discrete Mathematics 2016 — *A preliminary version of this work appeared in WG 2013*

Benson L. Joeris, Nathan Lindzey, Ross M. McConnell, Nissa Osheim: *Simple DFS on the Complement of a Graph and on Partially Complemented Digraphs*. Information Processing Letters. 117: 35-39 (2017)

Nathan Lindzey: *Speeding up Graph Algorithms via Switching Classes*. IWOCa 2014: 238-249

## INVITED TALKS

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(Please visit my website [www.nathanlindzey.com](http://www.nathanlindzey.com) for links to talks, blog posts, and more details.)

### **Simons Institute Workshop: *Beyond the Hypercube* (2023)**

Gave a recorded talk entitled *Representation Theory in TCS and Extremal Combinatorics*.

<https://m.youtube.com/watch?v=x1I-o48vIrs>

### **Bar-Ilan Combinatorics Seminar (2023)**

Gave a talk over the paper *Jack Derangements*.

### **HUJI Combinatorics Seminar (2023)**

Gave a talk over the paper *Jack Derangements*.

### **Technion Combinatorics Seminar (2023)**

Gave a talk over the paper *Jack Derangements*.

### **Technion Coding Theory Seminar (2022)**

Gave a live talk over the theory of Association Schemes and applications to Coding Theory.

### **AMS 2022 Fall Western Sectional Meeting**

*Special Session on Algebraic Combinatorics and Applications in Harmonic Analysis*

Gave a live talk entitled *Eigenvalues of the Derangement Graphs*.

### **University of Waterloo Algebraic Graph Theory Seminar (2022)**

Gave a zoom talk over the paper *Jack Derangements*.

### **Rocky Mountain Algebraic Combinatorics Seminar (2021)**

Gave a live talk over the paper *Jack Derangements*.

### **University of Waterloo Algebraic Graph Theory Seminar (2022)**

Gave a zoom talk over the paper *Simple Algebraic Proofs of Uniqueness for Erdős-Ko-Rado Theorems*.

### **Rocky Mountain Algebraic Combinatorics Seminar (2021)**

Gave a live talk over the paper *Simple Algebraic Proofs of Uniqueness for Erdős-Ko-Rado Theorems*.

### **Codes and Expansions (CodEx) Seminar (2021)**

Spoke remotely about discrete harmonic analysis on perfect matchings.

### **University of Delaware Discrete Mathematics Seminar (2021)**

Gave a zoom talk titled *Rank, Hooks, and Hamiltonian Cycles*.

### **Open Problems in Algebraic Combinatorics Workshop (2021)**

Gave a zoom talk titled *Algebraic Aspects of  $t$ -Intersecting Families*.

### **University of Waterloo Algebraic Graph Theory Seminar (2020)**

Gave a zoom talk on the paper *Complexity measure of the Symmetric Group and Beyond*.

### **Rocky Mountain Algebraic Combinatorics Seminar (2020)**

Gave a zoom talk on the paper *On the Algebraic Combinatorics of Injections*.

### **University of Texas Quantum Computing Seminar (2020)**

Gave a live talk on the paper *A Tight Lower Bound for Non-Coherent Index Erasure*.

### **International Linear Algebra Society (2019)**

Gave a talk on some open questions and research directions in Erdős-Ko-Rado Combinatorics.

### **CU Boulder Algebraic Lie Theory Seminar (2019)**

Spoke about some joint work in progress on a Hecke algebra associated with matchings of  $K_n$ .

**CU Boulder CS Theory Seminar (2018)**

Gave a talk on *the Algebraic Combinatorics of Perfect Matchings*, i.e., some results in my PhD thesis.

**University of Waterloo Algorithms and Complexity Seminar (2017)**

Spoke about the paper *A Tight Lower Bound for Counting Hamiltonian Cycles via Matrix Rank*.

**Canadian Mathematical Society Summer Meeting (2016)**

Gave a talk on some results that appeared in the paper *Intersecting Families of Perfect Matchings*.

**University of Waterloo Algorithms and Complexity Seminar (2014)**

Gave a talk on the paper *Faster Graph Algorithms via Switching Classes*.

**Rocky Mountain Algebraic Combinatorics Seminar (2014)**

Spoke about some results in the paper *Recognizing Threshold Tolerance Graphs and their Complements*.

**Rocky Mountain Algebraic Combinatorics Summer School Seminar (2013)**

Spoke about a class of Cayley graphs of  $S_n$  that generalizes the derangement graph of  $S_n$ .

**CSU Computer Science “BMAC” Seminar (2012)**

Gave a talk on the paper *Faster Graph Algorithms via Switching Classes*.

## TEACHING

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**University of Colorado**

*Jan. 2019 - May 2022*

Instructor in the Postbaccalaureate Program

Department of Computer Science

*Courses taught: Design and Analysis of Operating Systems*

**University of Waterloo**

*Aug. 2014 - Dec. 2018*

Graduate Teaching Assistant

Department of Combinatorics and Optimization

*Courses assisted: Calculus, Introduction to Optimization, Network Flows, Discrete Math for Engineers, Honors Combinatorics, Combinatorics, Graph Theory, Coding Theory*

**University of Northern Colorado**

*Aug. 2012 - May 2014*

Lecturer of Computer Science

Department of Mathematical Sciences

*Courses taught: Introduction to Computer Science, Introduction to Programming, Structured Programming, Object-Oriented Programming, Algorithms and Data Structures, Business Computing, Operating Systems, Directed Studies*

## PROFESSIONAL DUTIES

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- I have reviewed for WG '12, ICALP '18, FOCS '19, ITCS '20, SODA '24, Algorithmica, European Journal of Combinatorics, Discrete Applied Mathematics, Journal of Algebraic Combinatorics, Discrete Mathematics, Linear Algebra and its Applications, Quantum.
- I have organized the following learning seminars:
  - Algebra (University of Waterloo, Spring 2018)
  - Quantum Computing (University of Colorado, Summer 2019)
  - Additive Combinatorics (University of Colorado, Summer 2020)
- In Summer 2020 I volunteered for the *Prove it! Math Academy*: <https://proveitmath.org/>.
- I co-organized the Erdős-Ko-Rado panel of the *Open Problems in Algebraic Combinatorics Workshop*: <http://www.math.uwaterloo.ca/~cgodsil/quagmire/may21workshop/>

- I mentor prisoners at *The Prison Math Project*: <https://www.prisonmathproject.org/>

## AWARDS & GRANTS

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- Ontario Trillium Scholarship (2014 - 2018)

## REFERENCES

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- Joseph Cherian (Ph.D Supervisor): [jcherian@uwaterloo.ca](mailto:jcherian@uwaterloo.ca)
- Chris Godsil (Ph.D Supervisor): [cgodsil@uwaterloo.ca](mailto:cgodsil@uwaterloo.ca)
- Yuval Filmus (Postdoc Supervisor): [yuvalfi@cs.technion.ac.il](mailto:yuvalfi@cs.technion.ac.il)
- Josh Grochow (Postdoc Supervisor): [joshua.grochow@colorado.edu](mailto:joshua.grochow@colorado.edu)
- Ehud Friedgut: [ehud.friedgut@gmail.com](mailto:ehud.friedgut@gmail.com)