Nathan Klein

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RESEARCH INTERESTS Design and analysis of approximation algorithms for combinatorial problems.

POSITIONS

Boston University Assistant Professor, Computer Science 2024 - Present

Institute for Advanced Study Member, School of Mathematics 2023 - 2024

EDUCATION

University of Washington
Masters in Computer Science and Engineering 2018 - 2020
Ph.D in Computer Science and Engineering 2018 - 2023
Advisors: Anna Karlin and Shayan Oveis Gharan

Oberlin College and Conservatory 2011 - 2016
Bachelor of Arts with High Honors in Computer Science and Mathematics
Bachelor of Music in Cello Performance

AWARDS

NSF Career Award (2025)
EATCS Distinguished Dissertation Award (2024)
A.W. Tucker Prize Finalist (2024)
William Chan Memorial Dissertation Award (2024)
STOC Best Paper Award (2021)
NSF Graduate Research Fellowship (2020)

CONFERENCE PUBLICATIONS

A Randomized Rounding Approach for DAG Edge Deletion, with Sina Kalantarzadeh and Victor Reis. APPROX 2025.

Dual Charging for Half-Integral TSP, with Mehrshad Taziki. APPROX 2025.

Ghost Value Augmentation for k-ECSS and k-ECSM, with D. Ellis Hershkowitz and Rico Zenklusen. STOC 2024.

From Trees to Polynomials and Back Again: New Capacity Bounds with Applications to TSP, with Leonid Gurvits and Jonathan Leake. ICALP 2024.

A Lower Bound for the Max Entropy Algorithm for TSP, with Billy Jin and David P. Williamson. IPCO 2024.

A Better-Than-1.6-Approximation for Prize-Collecting TSP, with Jannis Blauth and Martin Nägele. IPCO 2024.

Thin Trees for Laminar Families, with Neil Olver. FOCS 2023.

A Deterministic Better-than-3/2 Approximation Algorithm for Metric TSP, with Anna R. Karlin and Shayan Oveis Gharan. IPCO 2023.

A 4/3-Approximation Algorithm for Half-Integral Cycle Cut Instances of the TSP, with Billy Jin and David P. Williamson. IPCO 2023.

Matroid Partition Property and the Secretary Problem, with Dorna Abdolazimi, Anna R. Karlin and Shayan Oveis Gharan. ITCS 2023.

A (Slightly) Improved Bound on the Integrality Gap of the Subtour LP for TSP, with Anna R. Karlin and Shayan Oveis Gharan. FOCS 2022.

An Improved Approximation Algorithm for the Minimum k-Edge Connected Multi-Subgraph Problem, with Anna R. Karlin, Shayan Oveis Gharan,

and Xinzhi Zhang. STOC 2022.

A (Slightly) Improved Approximation Algorithm for Metric TSP, with Anna R. Karlin and Shayan Oveis Gharan. STOC 2021 (best paper award).

An Improved Approximation Algorithm for TSP in the Half Integral Case, with Anna R. Karlin and Shayan Oveis Gharan. STOC 2020.

Symmetric-Key Broadcast Encryption: The Multi-Sender Case, with Cody Freitag, Jonathan Katz. ISCML 2017.

New Features for Duplicate Bug Detection, with Christopher S. Corley and Nicholas A. Kraft. MSR 2014.

JOURNAL PUBLICATIONS

Ghost Value Augmentation for k-ECSS and k-ECSM, with D. Ellis Hershkowitz and Rico Zenklusen. To appear in *SICOMP* 2025.

A Better-Than-1.6-Approximation for Prize-Collecting TSP, with Jannis Blauth and Martin Nägele. *Mathematical Programming* 2025.

A 4/3-Approximation Algorithm for Half-Integral Cycle Cut Instances of the TSP, with Billy Jin and David P. Williamson. *Mathematical Programming* 2025.

A (Slightly) Improved Approximation Algorithm for Metric TSP, with Anna R. Karlin and Shayan Oveis Gharan. *Operations Research* 2024.

TEACHING

Probability in Computing	Spring 2025
Rounding Techniques in Approximation Algorithms	Fall 2024
Metamath, Strange Loops, and Randomness	Fall 2015

ADVISING

Kasper Lindberg (undergraduate), now PhD student at ETH Zürich	2021 - 2022
Kevin Kim (undergraduate), now at Google	2021 - 2022
Zhuan Khye Koh (postdoc)	2025 - Present
Cheng-Hao Fu	Fall 2024 (temporary advisor)

INVITED TALKS

Theory talks at Stanford (2020), SFU (2020), Berkeley (2020), Cornell (2021), UT Austin (2021), U. Maryland (2021), Aalto University (2021), U. Washington (2022), London School of Economics (2022), Princeton (2023), Rutgers (2023, 2024), Institute for Advanced Study (2024), Boston University (2024), Brown University (2024), Harvard (2025), and MIT (2025)
TCS+ (2020)
APPROX 2020 - invited talk
Geometry of Polynomials Reunion at Simons (2020)
IGAFIT Algorithmic Colloquium (2020)
MIT TOC Colloquium (2020)
Highlights of Algorithms 2021 - invited talk
CanaDAM Discrete and Algorithmic Mathematics Conference (2021)
Oberwolfach Combinatorial Optimization Workshop 2021 - focus talk
Northwestern Quarterly Theory Workshop (2021)
Bonn Combinatorial Optimization Workshop: Cook's 65th Birthday (2022)
Aussois Workshop on Combinatorial Optimization (2023)
ICERM Combinatorial Optimization Workshop (2023)
Cornell ORIE colloquium (2024)
ISMP 2024 - Tucker talk and session talk
Workshop on Synergies of Combinatorics and TCS at EPFL (2024)

Oberwolfach Combinatorial Optimization Workshop (2024)

EXTERNAL FUNDING

US National Science Foundation Award #2442250. CAREER: Improved Approximation Algorithms for Graph Problems. PI, Fall 2025 - 2030. $691,413.

MEDIA COVERAGE

Computer Scientists Break Traveling Salesperson Record, *Quanta* 2020. By Erica Klarreich.

A Vast and Tiny Breakthrough, 2020. By Kenneth W. Regan.

Traveling Salesman Problem Meets Complexity Theory, 2020. By Richard J. Lipton.

Taking a Crack at the Traveling Salesperson Problem, 2020. By Matthew Carlson.

RESEARCH INTERNSHIPS

Microsoft Research Research Intern - Algorithms group Summer 2020
Studied dynamic matching with Janardhan Kulkarni and Jakub Tarnawski.

SERVICE AND OUTREACH

Program committees: FOCS 2025, APPROX 2025
Conference reviews: FOCS 2019/2021/2022/2023/2024, APPROX 2020, SODA 2021/2023/2024, STOC 2021/2022/2023/2024, ITCS 2022/2025, IPCO 2022/2025, ICALP 2023, SOSA 2024, STACS 2025
Journal reviews: *SICOMP* (2021/2022/2024), *Mathematical Programming* (2021/2022/2024), *Transactions on Algorithms* (2021), *SIDMA* (2022), *TheoretiCS* (2024), *INFORMS* (2024)
Popular writing: Article on approximating TSP for The Conversation
Educational website/games: bigprimes.org
Educational iPhone game: Connectle

INDUSTRY EXPERIENCE

The New York Times Software Engineer July 2016 - July 2018
Worked on user security and authentication.