# 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**
*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**

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)

**PUBLICATIONS**

**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 Ngele. 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.

**INVITED TALKS**

Theory Seminars at Stanford (2020), SFU (2020), Berkeley (2020), Cornell (2021), UT Austin (2021), U. Maryland (2021), Aalto University (2021), London School of Economics (2022)
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
HIM Approximation and Relaxation Workshop 2021 - plenary 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)

**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**

**Conference reviews:** FOCS 2019/2021/2022/2023, APPROX 2020, SODA 2021/2023/2024, STOC 2021/2022/2023/2024, ITCS 2022, IPCO 2022, ICALP 2023, SOSA 2024
**Journal reviews:** *SICOMP* (2021/2022), *Mathematical Programming* (2021/2022/2024), *Transactions on Algorithms* (2021), *SIDMA* (2022)
**Admissions:** Allen School Graduate program. Application reader (2018-2022), Area chair (2021).
**Popular writing:** Article on approximating TSP for The Conversation

**TEACHING EXPERIENCE**

**TA:** Algorithms (Fall 2014, Fall 2015), Theory of Computer Science (Spring 2015, 2016), Foundations of Computing II (Autumn 2018), the Polynomial Paradigm in Algorithms (Winter 2020).

**Advising:** Kasper Lindberg, Kevin Kim

**Instructor experience:** Metamath, Strange Loops, and Randomness (Fall 2015).

**INDUSTRY EXPERIENCE**

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