Nathan Klein

nklein@ias.edu

RESEARCH INTERESTS Design and analysis of algorithms for combinatorial problems.

POSITIONS

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

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

William Chan Memorial Dissertation Award
STOC 2021 Best Paper Award
NSF Graduate Research Fellowship

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 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.

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
Journal reviews: *SICOMP* (2021/2022), *Mathematical Programming* (2021/2022), *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.