Curriculum Vitae/Resume
Gabriel Kosmacher

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Education

University of Texas at Austin, Austin, TX — August 2023-Present
Degree: Computational Science, Engineering, and Mathematics PhD
Concentration: Computational and Applied Mathematics (CAM)
Advisor: George Biros

University of Illinois at Urbana-Champaign, Champaign, IL — August 2019-May 2023
Degree: Mathematics and Computer Science BSLAS; Highest Distinction
Minors: Computational Science and Engineering

Publications

Evaluating the Interplay between Trajectory Segmentation and Mode Inference Error
Gabriel Kosmacher, *K. Shankari*
Transportation Research Record (2023)
Available at https://journals.sagepub.com/doi/10.1177/03611981231208154

Packing Densities of Delzant and Semitoric Polygons
Yu Du, ***Gabriel Kosmacher****, Yichen Liu, Jeff Massman, Joseph Palmer, Timothy Thieme, Jerry Wu, Zheyu Zhang*
SIGMA 19 (2023), 081, 42 pages
Available at https://www.emis.de/journals/SIGMA/2023/081/

Presentations

Performance Portable Spectral Ewald Summation with PyKokkos (HPSF25, Chicago IL, June 2025)
A Primer on Boundary Integral Equation Methods for Elliptic PDEs (CSEM Student Forum, 2024)
I know I'm Right, But Does my Phone? (TRB 2023, NREL SULI 2022)
Seasonality and Immunity in Disease Dynamics. (UIC UMS 2022, UIUC URS 2022)
Toric and Semitoric Polygon Packing. (IGL Spring 2022, Fall 2021, Spring 2021)

Research Experience

University of Texas at Austin — *August 2023-Present*
Dr. George Biros
Working on a performance portable Spectral Ewald implementation for particle-in-cell Stokes flow.

- **Developing a novel particle-to-grid algorithm** *to be used in the* p*article2grid stage of the Spectral Ewald method that utilizes* **data locality** *and* **parallelism** *to achieve* **near-peak performance** *on modern machines.*
  - *Algorithm development in* **PyKokkos**, *a* **performance portable** *python framework. The algorithm will be released as part of a planed* **open source** *python package for the Spectral Ewald method.*
  - *Performance profiling with the* **NSIGHT Compute** *suite of tools for runs using NVIDIA's A100 GPUs on the TACC Lonestar 6 supercomputer. These results are compared with* **cache aware** *pen-and-paper performance modeling.*
  - *Invited to AMD tools workship at the University of Oregon port the algorithm onto* **HIP** *architecture and tune for performance on AMD Instinct™ series MI300A devices.*

National Renewable Energy Laboratory — *June 2022-August 2022*
Dr. K. Shankari
Worked on Evaluating The Interplay Between Trajectory Segmentation and Mode Inference Errors

- ***Introduced a framework*** *to evaluate accuracy of trip length computations and mode inference for continuous mode-segmented trajectories on groups of trips.*
  - *Developed a temporal alignment algorithm to classify temporal and spatial errors in a single metric and implemented the algorithm in python* https://github.com/kennykos/mobilitynet-analysis-scripts
  - *Applied the framework to the NREL OpenPATH pipeline using MobilityNet, a public dataset containing information from three* artificial timelines *that cover 15 different travel modes.*

  - *Evaluated travel data collected on smartphones on android and iOS operating systems that was post-processed by different machine learning algorithms.*

- ***Co-authored a manuscript*** *currently Published in the Transportation Research Record:* https://doi.org/10.1177/03611981231208154.
- ***Results presented*** *at the Transportation Research Board Annual Meeting 2023.*

University of Illinois Department of Mathematics *Jan 2022-May 2023*
Dr. Zoi Rapti
Worked on Seasonality and Immunity in Disease Dynamics

- ***Co-designed and Co-developed a dynamical model*** *with another undergraduate student and Professor Rapti to investigate Daphnia dentifera disease dynamics.*
- ***Presented results*** *at the University of Illinois Chicago Undergraduate Mathematics Symposium 2022 and the University of Illinois Urbana-Campaign Undergraduate Research Symposium 2022.*

Illinois Geometry Lab *January 2021-May 2022*
Dr. Joey Palmer
Worked on Toric and Semitoric Packing Capacities

- ***Investigated packing capacities*** *with a team of undergraduate student and Professor Palmer to exactly compute packing capacities.*
  - *Developed an algorithm to explicitly compute toric packing capacities and implemented the algorithm in python* https://github.com/kennykos/Semi-toric_Packing_Capacity.
  - *Solved the equivariant semitoric perfect packing problem.*
- ***Co-authored a manuscript*** *currently Published in Symmetry, Integrability and Geometry: Methods and Applications:* https://doi.org/10.3842/SIGMA.2023.081.
- ***Presented results*** *at University of Illinois Urbana-Campaign Illinois Geometry Lab Poster Presentation Spring 2021, Fall 2022, Spring 2022.*
- ***Received*** *2022 Illinois Geometry Lab Outstanding Research Award.*

Grants/Awards

CSEM Fellowship	*2024-2028*
Illinois Geometry Lab Outstanding Research Award	*2022*
Americorps Education Award	*2021*
Heery Scholarship Recipient	*2020-21*

Work Experience

University of Illinois Department of Computer Science *October 2022-May 2023*
CS 450 Numerical Analysis Course Assistant

- ***Graded*** *Mathematical & CS theory homework problems for an advanced undergraduate/graduate course.*

National Renewable Energy Laboratory *June 2022-August 2022*
Science Undergraduate Laboratory Internship

- *Developed continuous mode-segmented trajectory framework (see research section above).*
- *Worked with a* ***team of 3 interns*** *on statistical methods for trajectory* ***error propagation****.*
- *Participated in numerous Department of Energy* ***professional development activities and workshops****.*

University of Illinois Department of Mathematics *August 2021-May 2022*
Mathematics and Statistics Student Support Center

- *Hosted* ***drop in office hours*** *for all mathematics courses up to Calculus II.*

Community Involvement

CSEM Student Forum *August 2024-June 2025*
Co-host

- *General organization (including speaker invitation) for a weekly seminar series given by current CSEM graduate students to their peers. The aim of the forum is to expose students to each other's research, encourage collaboration, and provide opportunities to practice presentation skills.*

UT Austin Green Fund *January 2024-June 2025*
Committee Member

- *Member of a small student-faculty committee that reviews proposals and awards for the UT Austin Green Fund, a competitive grant program funded by a tuition allocation to support sustainability related projects and initiatives proposed by university students, faculty or staff.*

Chicago Pre-College Science and Engineering Program *October 2022-December 2022*
STEM Mentor

- *Assisted in the teaching of a data-science curriculum at Kenwood Academy high school in Chicago for* 11^{th} *and* 12^{th} *graders.*
- *Developed a plant biology and environmental sustainability curriculum for* 2^{nd} *graders which will be taught at the Urbana Neighborhood Connections Center.*