# Joseph Nakao
*Curriculum Vitae*

*Last updated: December 2023*

*Swarthmore College*
*Dept. of Math. & Stat.*
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## ACADEMIC POSITIONS

**Swarthmore College** — Swarthmore, PA
Assistant Professor of Mathematics (tenure track) — *2023–Present*

## EDUCATION

**University of Delaware** — Newark, DE
Ph.D. Applied Mathematics — *2020–2023*
>   Advisor: Jingmei Qiu

**University of Delaware** — Newark, DE
M.S. Applied Mathematics — *2018–2020*

**Seattle University** — Seattle, WA
B.S. Applied Mathematics — *2014–2018*
>   Advisors: Yen-Lin Han (Mechanical Engineering) and Katie Oliveras (Mathematics)

## AREAS OF INTEREST

- Scientific computing and numerical analysis
- Tensor decompositions and data science applications
- Computational fluid dynamics and computational plasma physics
- Mathematical modeling

## PUBLICATIONS

### Journals and Conference Proceedings

J. Nakao, J.-M. Qiu, and L. Einkemmer, "Reduced Augmentation Implicit Low-rank (RAIL) integrators for advection-diffusion and Fokker-Planck models", arXiv: 2311.15143 (2023). *Submitted.*

J. Nakao, W. Taitano, and J.-M. Qiu, "A structure preserving, conservative, low-rank tensor decomposition algorithm for the 1D2V Vlasov-Fokker-Planck equation", *In preparation* (2023).

J. Chen, J. Nakao, and J.-M. Qiu, "A new forward Eulerian-Lagrangian finite volume method for nonlinear hyperbolic problems", *In preparation* (2023).

J. Nakao, "Speeding up high-order algorithms in computational fluid and kinetic dynamics: based on characteristics tracing and low-rank structures", *University of Delaware* (2023).

J. Nakao, J. Chen, and J.-M. Qiu, "An Eulerian-Lagrangian Runge-Kutta finite volume (EL-RK-FV) method for solving convection and convection-diffusion equations", *Journal of Computational Physics*, **470** (2022), pp. 111589.

J. Nakao and Y.L. Han, "Preliminary simulated results modeling a dynamic heating cancer ablation probe", *ASME International Mechanical Engineering Congress and Exposition (IMECE) – Applications of Computational Heat Transfer*, Pittsburgh, PA, November 2018.

## Articles

J. Nakao, "Recent Activities and Progress by Spectra and the LGBTQ+ Mathematics Community", *MAA FOCUS*, **43:6** (2023/2024), pp. 10-13.

R. Buckmire, A. Folsom, C. Goff, A. Hoover, J. Nakao, and K.A. Sather-Wagstaff, "On Best Practices for the Recruitment, Retention, and Flourishing of LGBTQ+ Mathematicians", *Notices of the American Mathematical Society*, **70:6** (2023), pp. 979-985.

J. Nakao, "The Pot of Gold at the End of the Rainbow – How Mathematics Departments Can Increase LGBTQ+ Inclusivity", *MAA Math Values Blog*, April 2021.

J. Nakao, "Adventures in Book Collecting", *The Atrium – University of Delaware's Quarterly Newsletter*, September 2019.

## Open Access Handbooks and Reference Guides

J. Nakao, "The Handbook of MATH221".

J. Nakao and D. Hayes, "A MATLAB Reference Guide for Undergraduate STEM Majors".

J. Nakao, "A Mathematica Reference Guide (for calculus students)".

J. Nakao, "A Gentle Introduction to LaTeX".

# PRESENTATIONS

## Keynote or Plenary Speaker

- Title TBD                                                                      (upcoming) July 2024
  *LGBTQ+ in Math Alliance Conference, The Ohio State University, Columbus, OH*
- "Navigating Graduate School as a Queer Student"                                November 2022
  *LGBTQ+ Math Day (virtual), Fields Institute for Research in Mathematical Sciences, Toronto, CAN*

## Conference or Seminar Speaker

- "Navigating College and Beyond as a Queer Student"                            November 2023
  *Fourth Annual OURFA2M2 Conference (virtual)*
- "Implicit low-rank integrators for solving time-dependent problems"           October 2023
  *SIAM NNP Section Meeting, hosted by New Jersey Institute of Technology, Newark, NJ*
- "A structure preserving, conservative, low-rank tensor scheme for solving the 1D2V Vlasov-Fokker-Planck equation"                                                                February 2023
  *SIAM Conference on Computational Science and Engineering, Amsterdam, NLD*
- "A structure preserving, conservative, low-rank tensor scheme for solving the 1D2V Vlasov-Fokker-Planck equation"                                                                November 2022
  *SIAM TX-LA Sectional Meeting, hosted by the University of Houston, Houston, TX*
- "A structure preserving, conservative, low-rank tensor scheme for solving the 1D2V Vlasov-Fokker-Planck equation"                                                                September 2022

*Sayas Numerics Day, hosted by the University of Maryland, Baltimore County, Baltimore, MD*

- "A structure preserving, conservative, low-rank tensor scheme for solving the 1D2V Vlasov-Fokker-Planck equation"                                                                                         August 2022
  *AFRL/RQRS Technical Talks, Air Force Research Laboratory, Edwards, CA*

- "A brief introduction to low-rank tensor decompositions"                                                          August 2022
  *AFRL/RQRS Technical Talks, Air Force Research Laboratory, Edwards, CA*

- "A new Eulerian-Lagrangian Finite Volume (ELFV) Method for Solving Convection-Diffusion Equations and Hyperbolic Conservation Laws"                                                                               March 2022
  *AMS Spring Central Sectional Meeting (virtual), originally hosted by Purdue University, West Lafayette, IN*

- "An Eulerian-Lagrangian Finite Volume Method for Solving Nonlinear Transport Equations"                July 2021
  *SIAM Annual Meeting (virtual), originally at Spokane, WA*

- "Solving for Exact Stationary Solutions to Shallow-Water Waves"                                           November 2017
  *Analysis Seminar, Department of Mathematics, Washington State University, Pullman, WA*

- "Modifying an Optimal Payload Sensor Model to Detect Mobile Targets"                                       August 2017
  *Summer Scholar Presentations, Air Force Research Laboratory, Albuquerque, NM*

### Departmental Seminar Speaker

- "Speeding up high-order algorithms in computational fluid and kinetic dynamics: based on characteristics tracing and low-rank structures"                                                                                    May 2023
  *Dissertation defense, University of Delaware, Newark, DE*

- "A structure preserving, conservative, low-rank tensor scheme for solving the 1D2V Vlasov-Fokker-Planck equation"                                                                                     September 2022
  *Hallenbeck Graduate Student Seminar, Department of Mathematical Sciences, University of Delaware, Newark, DE*

- "A new Eulerian-Lagrangian Finite Volume (ELFV) Method for Solving Convection-Diffusion Equations and Hyperbolic Conservation Laws"                                                                            December 2021
  *Hallenbeck Graduate Student Seminar, Department of Mathematical Sciences, University of Delaware, Newark, DE*

- "An Eulerian-Lagrangian Finite Volume (ELFV) Method for Nonlinear Conservation Laws"                April 2021
  *Hallenbeck Graduate Student Seminar, Department of Mathematical Sciences, University of Delaware, Newark, DE*

## POSTERS

- "Implicit low-rank integrators for solving time-dependent problems"                                           October 2023
  *Workshop on Sparse Tensor Computations, hosted by the University of Illinois, Chicago, IL*

- "An Eulerian-Lagrangian Runge-Kutta finite volume (ELRK-FV) method for solving convection-diffusion equations"                                                                                          February 2022
  *Winter Research Symposium, University of Delaware, Newark, DE*

- "Modifying an Optimal Payload Sensor Model to Detect Mobile Targets"                                       August 2017
  *Summer Scholar Poster Session, Air Force Research Laboratory, Albuquerque, NM*

- "Reconstructing the water-wave profile from pressure measurements in a moving body of water"           April 2017
  *AMS Sectional Meeting, Washington State University, Pullman, WA*

## OTHER RESEARCH EXPERIENCE

**Air Force Research Laboratory**                                                                      Edwards, CA
Aerospace Systems Directorate                                                           *May 2022–August 2022*

    **Mentors:** William Taitano and Alexander Alekseenko

**Project:** Building conservative, structure-preserving low rank tensor algorithms for solving the Vlasov-Fokker-Planck equation

## Air Force Research Laboratory
Edwards, CA

Aerospace Systems Directorate *May 2021–August 2021*

**Mentors:** Robert Martin and Alexander Alekseenko

**Project:** Modelling the Fokker-Planck and Vlasov-Fokker-Planck equations

## Air Force Research Laboratory
Albuquerque, NM

Space Vehicles Directorate *June 2017–August 2017*

**Mentor:** Reed Weber

**Project:** Modifying and implementing an optimal payload sensor model

Interim security clearance (secret)

# TEACHING

## Swarthmore College

- **Instructorships**

  *MATH 043 (basic differential equations)* Spring 2024

  *MATH 025 (single variable calculus 2 for natural sciences and engineering)* Fall 2023

## University of Delaware

- **Instructorships**

  *MATH 243 (calculus 3 for physical sciences and engineering with lab component)* *Download evaluations here* Winter 2023

  *MATH 243 (calculus 3 for physical sciences and engineering with lab component)* *Download evaluations here* Winter 2022

  *MATH 221 (calculus 1 for life sciences and business)* *Download evaluations here* Winter 2021

  *MATH 221 (calculus 1 for life sciences and business)* *Download evaluations here* Winter 2020

- **Teaching Assistantships**

  *MATH 243 (calculus 3 for physical sciences and engineering with lab component)* *Download evaluations here* Fall 2022

  *MATH 243 (calculus 3 for physical sciences and engineering with lab component)* *Download evaluations here* Fall 2021

  *MATH 243 (calculus 3 for physical sciences and engineering with lab component)* *Download evaluations here* Fall 2020

  *MATH 221 (calculus 1 for life sciences and business)* *Download evaluations here* Spring 2020

  *MATH 221 (calculus 1 for life sciences and business)* *Download evaluations here* Fall 2019

  *MATH 241 (calculus 1 for physical sciences and engineering)* *Download evaluations here* Spring 2019

  *MATH 221 (calculus 1 for life sciences and business)* *Download evaluations here* Fall 2018

- **Other Instruction**

  *Graduate qualifying exam review for techniques of applied mathematics (3 out of 3 students passed)* Summer 2021

  *Graduate qualifying exam review for techniques of applied mathematics (2 out of 2 students passed)* Winter 2021

## Seattle University

- **Teaching Assistantships**

  *MATH 2330 (multivariable calculus for physical sciences and engineering)* Spring 2018

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|---|---|
| *MATH 2340 (ordinary differential equations)* | Winter 2018 |
| *MATH 2340 (ordinary differential equations)* | Fall 2017 |
| *MATH 2330 (multivariable calculus for physical sciences and engineering)* | Spring 2017 |
| *MATH 2340 (ordinary differential equations)* | Winter 2017 |
| *MATH 2330 (multivariable calculus for physical sciences and engineering)* | Fall 2016 |

# PROFESSIONAL SERVICE

## The Broader Mathematics Community (Positions Held)

- *MAA FOCUS* August 2023–Present
  **Editorial Board**
  *The newsmagazine of the Mathematical Association of America (MAA) ([website link here](#)), contains information about MAA activities, news from the mathematical community, and thought-provoking articles about mathematics, mathematics education, and related areas.*

- Spectra July 2021–Present
  **Board of Directors – Membership Committee Chair**
  *Spectra ([website link here](#)) is the association for LGBTQ+ mathematicians.*

## The Broader Mathematics Community (Ad Hoc)

- Spectra Student Chapters August 2023
  *Organized and oversaw the creation of Spectra student chapters from institutions worldwide. (To begin September 2023).*

- Spectra LGBTQ+ Twitter Visibility Campaign June 2023
  *Co-organizer. Spectra highlighted a different LGBTQ+ mathematician each day of June (pride month) on Twitter.*

- Spectra LGBTQ+ Twitter Visibility Campaign June 2022
  *Co-organizer. Spectra highlighted a different LGBTQ+ mathematician each day of June (pride month) on Twitter.*

- Spectra Reception at the Joint Mathematics Meetings April 2022
  *Co-organizer.*

- AMS-Sponsored Spectra LGBTQ+ Mathematicians Posters February 2022
  *Co-organizer. This poster series highlights LGBTQ+ mathematicians.*

## University of Delaware (Positions Held)

- Mathematics Department Graduate Committee September 2021–August 2022
  **Member**
  *Responsibilities: communicating between the graduate students and faculty, ensuring every decision is inclusive of all graduate students, organizing meetings with prospective and incoming graduate students, and ensuring the voices and interests of the graduate student body were heard and accounted for at graduate committee meetings.*

- Queer and Trans Graduate Student Union (QTGSU) June 2021–June 2022
  **Executive Board Member, Founding Member**
  *Responsibilities: ensuring accessibility of all activities, assisting the treasurer, organizing community events, and upholding the values of the organization.*

- Society for Industrial and Applied Mathematics (SIAM) Student Chapter July 2019–June 2021
  **Treasurer**
  *Responsibilities: managing the student chapter finances, funding requests, and the end-of-year final report. Also helped coordinate general meetings and social events.*

- Association for Women in Mathematics (AWM) Student Chapter September 2020–June 2021

***Professional Development Chair***
*Responsibilities: organizing and coordinating professional development workshops, and helping form open discussion on articles about women in STEM.*

## University of Delaware (Ad Hoc)

- Graduate Student Mentor-Mentee Program                                              August 2022–June 2023
  *Co-organized the peer mentoring program sponsored by the AWM student chapter. Graduate student mentors are paired up with an incoming first year student to help guide them through the first year of graduate school.*
- Graduate Student Mentor-Mentee Program                                           September 2020–July 2023
  *Mentored three first-year graduate students (one per year), helping them adjust to graduate school. Provided monthly check-ins, and offering advice on coursework, balancing life and graduate school, and qualifying exams.*
- New Qualifying Exam System                                                                          April 2022
  *As a member of the graduate committee, I helped draft a new qualifying exam system that went on to be passed by the faculty vote.*
- QTGSU Accessibility Committee                                                              June 2021–June 2022
  *Co-drafted access guides and documents, as well as ensured all events were accessible.*
- QTGSU Bylaws Committee                                                               June 2021 –September 2021
  *Co-drafted the bylaws and organizational structure for QTGSU.*
- UD SIAM Seminar Series                                                                 September 2020–June 2021
  *Instigated and organized the UD SIAM Seminar Series inviting PhD students and post-docs from other universities to present their research.*

## Other

- Memberships
  *Society for Industrial and Applied Mathematicians (SIAM), Association for Women in Mathematics (AWM), American Mathematical Society (AMS), The Association for LGBTQ+ Mathematicians (Spectra), Out in STEM (oSTEM)*
- Incoming Student Handbook                                                                             May 2018
  *Instigated and created a student handbook for the Seattle University Mathematics Department's future incoming students. The intention was to give a student point-of-view of life at Seattle University as a mathematics major.*

# AWARDS

- Graduate Student Excellence in Scholarly Community Engagement Award, University of Delaware    December 2022
  *"This excellence award serves the following major purposes: 1. To highlight the University's commitment to engaged scholarship in teaching, engaged research/creative activities, and engaged service; 2. To reward Graduate Student excellence in mutually beneficial, scholarly engaged teaching, research/creative activities and service; and 3. To thereby promote excellence in community engagement among other Graduate Students." ($1000 award)*
- Winter Research Symposium Best Poster Award, University of Delaware                         February 2022
  *Voted best poster at the annual Winter Research Symposium hosted by the University of Delaware Department of Mathematical Sciences. ($500 award)*
- Baxter-Sloyer Graduate Teaching Award, University of Delaware                                     May 2021
  *"Given to a graduate student teaching assistant, in mathematical sciences, who has demonstrated superior effectiveness in teaching, and in the performance of their responsibilities." ($300 award)*
- Seth Trotter Book Collecting Contest, University of Delaware                                     June 2019
  *Placed first in the book collecting contest put on by the Friends of the University of Delaware Library, and entered into the National Student Book Collecting Contest. Won with my reference library of (now) roughly 400 mathematical and engineering texts. ($1000 award)*

- Wynne Alexander Guy Award, Seattle University — June 2018

  *"Given in grateful acknowledgment of a graduating mathematics major whose extraordinary contribution to the department always went above and beyond what was expected. Named to honor beloved teacher Mrs. Guy, who performed extraordinary service to the Mathematics department and Seattle University for 30 years."*

# PANELS, WORKSHOPS, AND MINISYMPOSIA

## Panels

- Panelist at the Virtual Joint Mathematics Meetings — April 2022

  *Spectra Workshop: Identifying Best Practices Fostering Inclusion and Retention of LGBTQ Mathematicians. Topics of discussion: supporting transgender mathematicians in the work place (Keri Sather-Wagstaff), LGBTQ+ mathematicians balancing work choices with family (Ron Buckmire), best practices for recruitment of LGBTQ+ faculty (Amanda Folsom), and supporting LGBTQ+ graduate students (Joseph Nakao).*

- Panelist at Society for Industrial and Applied Mathematics (SIAM) Annual Meeting — July 2021

  *Minisymposium: Presentations by LGBTQ Mathematicians. Responsible for leading discussion about LGBTQ inclusivity in the applied mathematics community, as well as Spectra's current projects.*

- People of Color Caucus — October 2017

  *Invited by Dr. Rose Ernst (formerly) of the Political Science Department at Seattle University to facilitate a people of color caucus. Topics of discussion included: racism in academia, and living as a person of color in college.*

## Workshops and Minisymposia Organized

- SIAM LA23: Low-rank tensor methods for high-dimensional problems — May 2024 (upcoming)

  *Co-organizer.*

- JMM24: Spectra Special Session — January 2024 (upcoming)

  *Co-organizer.*

- SIAM NNP23: Low-rank methods and their applications in large data and high-dimensional problems — October 2023 (upcoming)

  *Co-organizer.*

- SIAM AN22: LGBT Minisymposia — July 2022

  *Co-organizer.*

- Mathematica Workshop — March 2021

  *Led a Mathematica workshop tailored for undergraduate students in the calculus sequence. Organized by the UD AWM Student Chapter.*

- LaTeX Workshop — October 2020

  *Led an introductory LaTeX workshop geared towards graduate students in both the mathematics and other departments. Organized by the UD AWM Student Chapter.*

# COMPUTER SKILLS

**Proficient:** MATLAB, Mathematica, LaTeX, Word, Excel, Powerpoint
**Some experience:** Fortran 90, Python, Julia