# Joyce A. Chew


**Contact Information**

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**Research Interests**

Numerical linear algebra, optimization, stochastic iterative methods

**Education**

**University of California, Los Angeles**, Los Angeles, California USA

Ph.D., Applied Mathematics **Expected June 2025**
Cumulative GPA: 4.00
Qualifying Exams:

- Numerical Analysis (Spring 2021)
- Optimization/Numerical Linear Algebra (Spring 2021)

Graduate Courses:

- Advanced Numerical Analysis
- Optimization and Calculus of Variations
- Numerical Linear Algebra

**Calvin University**, Grand Rapids, Michigan USA

B.S., Mathematics (Honors) **May 2020**
Cumulative GPA: 4.00

- Honors Thesis: Applications of algebra in bifurcation theory
- Minor in Computer Science

B.A., Chemistry **May 2020**
Cumulative GPA: 4.00

**Honors and Awards**

National Science Foundation Graduate Research Fellowship, 2020

National Center for Women and Information Technology Collegiate Award Finalist, 2019

Goldwater Scholarship Honorable Mention, 2018

Calvin Student Research Fellowship, 2016

**Publications**

Kazmierczak, N.P.; **Chew, J.A.**; Michmerhuizen, A.R.; Kim, S.E.; Drees, Z.D.; Rylaarsdam, A.; Thong, T.; Van Laar, L.; Vander Griend, D.A. Sensitivity Limits for Determining 1:1 Binding Constants from Spectrophotometric Titrations via Global Analysis. Journal of Chemometrics, 2019, 33:e3119.

**Papers in preparation**

**Chew, J.A.**; Borum, A. Tension-induced instabilities of twisted springs.

Kazmierczak, N.P.; **Chew, J.A.**; Vander Griend, D.A. Estimation of Equilibrium Stoichiometry Parameters in Hard-Modeling of Spectrophotometric Titrations.

Kazmierczak, N.P.; **Chew, J.A.**; Vander Griend, D.A. Bootstrap methods for quantifying the uncertainty of binding constants in the hard modeling of spectrophotometric titration data.

## Presentations

**Chew, J.A.** Slinkies, Gorges, and Ice Cream: What I Did on My Summer Vacation. Calvin University Mathematics and Statistics Colloquium, Grand Rapids, MI (oral presentation, September 26, 2019).

**Chew, J.A.** Tension induced instabilities of twisted springs. Cornell University Undergraduate Research Forum, Ithaca, NY (oral presentation, July 25, 2019).

**Chew, J.A.**; Kazmierczak, N.P.; Vander Griend, D.A. Defining the relationship: computer-driven characterization of the binding of host and guest molecules. West Michigan Regional Undergraduate Science Conference, Grand Rapids, MI (poster, November 10, 2018), and Joint Mathematics Meetings, Baltimore, MD (poster, January 18, 2019).

Kazmierczak, N.P.; **Chew, J.A.**; Vander Griend, D.A. The tie that binds: optimal design of equilibrium spectrophotometric titrations. West Michigan Regional Undergraduate Science Conference, Grand Rapids, MI (poster, November 10, 2018). *N. Kazmierczak presenting.*

Crow, E.; **Chew, J.A.**; Turner, J.M. Characterizing the Grbner bases of generic ideals. West Michigan Regional Undergraduate Science Conference, Grand Rapids, MI (poster, November 4, 2017).

**Chew, J.A.** Cake and what I learned from cutting it. TEDx Valencia High School, Placentia, CA (oral presentation, April 23, 2015).

## Research Experience

**Cornell University Department of Mathematics**, Ithaca, New York USA

*NSF REU* **June 2019-August 2019**

Studied the equilibrium configurations of flexible helical springs using optimal control. Developed numerical methods to find unstable configurations and demonstrated the presence of saddle-node bifurcations in the equilibrium configurations of twisted springs.

**Calvin University Department of Chemistry and Biochemistry**, Grand Rapids, Michigan USA

*Student Researcher* **May 2018 - September 2020**

1. *Development of a parallelized, high-throughput website for equilibrium binding analysis:* Applied several classes of optimization algorithms to the simultaneous determination of reaction stoichiometry and binding constants of equilibrium systems of host-guest binding. Evaluated speed, convergence, and accuracy to devise a new hybrid algorithm. Currently implementing this new methodology in a supercomputer software package to facilitate fast, high-throughput analysis via a website interface.
2. *Mathematical and computational analysis of 1:1 equilibrium binding:* Wrote Monte Carlo simulations to determine the robustness of global analysis for determination of binding constants of 1:1 host-guest equilibrium binding. Numerically demonstrated the benefits of using mathematically-derived optimal parameters for the titration experiment.

**Calvin University Department of Mathematics and Statistics**, Grand Rapids, Michigan USA

*Student Researcher* **May 2017 - August 2017**

Worked towards a new proof of the 3-variable Moreno-Sociás conjecture to prove the

generalized conjecture. Used computer algebra systems to compute Gröbner bases of generic ideals. Formulated a conjecture characterizing generic Gröbner bases and proved the 2-variable case.

## Other Professional Experience

**Calvin University Department of Computer Science**, Grand Rapids, Michigan USA

*Computer science grader* **January 2019 - December 2019**
Graded weekly problem sets and projects in algorithms and data structures classes in C#, Java, Ada, Clojure, and Ruby.

*Girls Who Code facilitator* **January 2017 - May 2017**
Taught middle-school and high-school girls programming fundamentals using Python.

**Calvin University Center for Student Success**, Grand Rapids, Michigan USA

*Mathematics and computer science tutor* **September 2018 - January 2019**
Taught calculus, scientific computing and modeling, data structures, and algorithm fundamentals. Assisted students with Python, C++, and C# projects.

**CalvinHacks at Calvin University**, Grand Rapids, Michigan USA

*Operations Director* **February 2019 - February 2020**
Responsible for venue selection, resource allocation, and departmental communication for hackathon expecting 200+ participants.

**Calvin University Campus Ministries**, Grand Rapids, Michigan USA

*Worship Coordinator* **August 2017 - May 2020**
Responsible for planning and leading worship services 2-3 times a week. Planned and led plenary services and workshops at annual international Symposium on Worship.

## Programming Languages

MATLAB, C, C++, Python, R, LaTeX