Ruby Kim

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Overview

Applied mathematician interested in mathematical modeling and analysis of complex biological systems. Looking to work on research problems that contribute to the understanding of human physiology and medicine. Passionate about teaching, mentoring, and community building.

Education

- **Duke University** — **Durham, NC**
  Ph.D. in Mathematics — *Aug 2017–May 2022*
  Thesis: Modeling the Interactions between the Circadian Clock, Dopamine, and Metabolism
  Advisor: Dr. Michael C. Reed
- **Pomona College** — **Claremont, CA**
  B.A. in Mathematics (Applied Track) — *Sep 2013–May 2017*
  Senior thesis: *Stability Analysis of a Tumor-Immune Model*
  Advisor: Dr. Ami E. Radunskaya

Employment

- **University of Michigan** — **Ann Arbor, MI**
  Postdoctoral Assistant Professor, Department of Mathematics — *Aug 2022–present*

Publications

- **Kim R**, Nijhout HF, Reed MC. *Mathematical insights into the role of dopamine signaling in circadian entrainment.* Under revision at Mathematical Biosciences.
- **Kim R**, Witelski TP. *Uncovering the dynamics of a circadian-dopamine model influenced by the light-dark cycle.* Mathematical Biosciences (2022). 344: 108764. `https://doi.org/10.1016/j.mbs.2021.108764`
- **Kim R**, Nijhout HF, Reed MC. *One-carbon metabolism during the menstrual cycle and pregnancy.* PLoS Computational Biology (2021). 17(12): e1009708. `https://doi.org/10.1371/journal.pcbi.1009708`
- **Kim R**, Reed MC. *A mathematical model of circadian rhythms and dopamine.* Theor Biol Med Model (2021). 18(8). `https://doi.org/10.1186/s12976-021-00139-w`
- **Kim R**, Woods T, Radunskaya A. *Mathematical Modeling of Tumor Immune Interactions: A Closer Look at the Role of a PD-L1 Inhibitor in Cancer Immunotherapy.* Spora: A Journal of Biomathematics (2018).

4:25–41. http://doi.org/10.30707/SPORA4.1Radunskaya

Selected Talks

- **Kim, R.** (2022, September). *Using large-scale cortical simulation to test theories of sleep.* Sleep Europe 2022, European Sleep Research Society, Athens, Greece.
- **Kim, R.** (2022, January). *A mathematical investigation of the circadian clock and dopaminergic system.* Mathematical Biology Seminar, University of Utah, Salt Lake City, UT. Virtual.
- **Kim, R.** (2022, January). *A mathematical investigation of the circadian clock and dopaminergic system.* Mathematical Biology Seminar, University of Pennsylvania, Philadelphia, PA. Virtual.
- **Kim, R.** (2021, April). *Mathematical modeling of circadian rhythms and dopamine.* Mathematical Biology Seminar, Duke University, Durham, NC. Virtual.
- **Kim, R.** (2020, May). *A mathematical model of circadian rhythms and dopamine.* Workshop on Mathematical and Computational Methods in Biology. Mathematical Biosciences Institute (MBI), Columbus, OH. Virtual.

Teaching

- **Applied Honors Calculus II** **Ann Arbor, MI**
  Instructor, University of Michigan Department of Mathematics *Fall 2022*
  Give lectures four days per week. Material covers various applications of integrals such as work, center of mass, arclength, surface area, and probability density functions. Theorems are carefully presented and several are proven. The course also covers infinite series and Taylor approximation, as well as introductory ordinary differential equations.

- **Introduction to Coding Theory** **Durham, NC**
  Instructor, Duke Summer Workshop in Mathematics (SWiM) *Summer 2022*
  Virtual week-long summer workshop for rising high school seniors with a particular focus on advancing female and gender minority participation in math. Created materials accessible and engaging to high school students and gave daily interactive lectures. Organized problem solving discussions in the afternoons and mentored student projects on error-correcting codes.

- **Certificate in College Teaching (CCT) Program** **Durham, NC**
  Graduate Instructor, Duke Graduate School *Mar 2018–May 2022*
  Pedagogical training program that promotes current best practices in teaching, appropriate use of instructional tools, and systematic reflection and assessment of teaching outcomes. Involves pedagogical coursework and participation in peer teaching observation.

- **Teaching Committee** **Durham, NC**
  Graduate Representative, Duke Mathematics Department *Aug 2021–May 2022*
  Graduate student representative in the Duke Mathematics Teaching Committee for the 2021-22 academic year. Meet with instructors and teaching faculty to discuss ways to improve teaching practices and policies in undergraduate courses, along with issues that affect undergraduate students and graduate instructors.

- **Laboratory Calculus and Functions II** **Durham, NC**
  Instructor of Record, Duke Mathematics Department *Fall 2021*
  Gave lectures three days per week and designed assignments and quizzes. Met once per week with a

team of undergraduate lab TAs to coordinate the lab component of the course. Staffed Help Room for all Introductory Calculus courses two hours per week.

- **Laboratory Calculus and Functions II** **Durham, NC**
  Lab Instructor, Duke Mathematics Department *Spring 2021*
  Led virtual lab sessions two days per week. Prepared lab lectures and graded lab reports. Coordinated a team of two undergraduate lab TAs. Met once per week with the course coordinator (Rann Bar-On) to discuss course goals and progress. Staffed Help Room for all Introductory Calculus courses two hours per week.
- **Laboratory Calculus and Functions II** **Durham, NC**
  Instructor of Record, Duke Mathematics Department *Spring 2020*
  Gave lectures three days per week and designed assignments, quizzes, and exams. Met once per week with the course coordinator (Rann Bar-On) and a team of graduate instructors to give and receive feedback on course materials and discuss class-related issues. Shifted to virtual learning in the middle of the semester due to the COVID-19 pandemic.
- **Laboratory Calculus and Functions I** **Durham, NC**
  Instructor of Record, Duke Mathematics Department *Fall 2018, Fall 2019*
  Gave lectures three days per week and designed assignments, quizzes, and exams. Met once per week with the course coordinator (Rann Bar-On) and a team of graduate instructors to give and receive feedback on course materials and discuss class-related issues.
- **Laboratory Calculus I** **Durham, NC**
  Lab Teaching Assistant, Duke Mathematics Department *Fall 2017*
  Assisted with lab sessions under the supervision of Tori Akin. Gave mini lectures to introduce students to the lab material and graded lab quizzes. Staffed Help Room for all Introductory Calculus courses two hours per week.

Service

- **Association for Women in Mathematics (AWM)** **Durham, NC**
  Student chapter founder and co-president, Duke Mathematics Department *Jan 2019–May 2022*
  Lead chapter meetings and recruit student members. Created the year-round Duke AWM mentoring program. Coordinate community-building events, talks, and academic enrichment opportunities.
- **Society for Industrial and Applied Mathematics (SIAM)** **Durham, NC**
  Student chapter president, Duke Mathematics Department *Aug 2019–May 2022*
  Lead chapter meetings and liaise with SIAM chapters across other schools in the area. Organize community-building events, research talks, and career development opportunities.
- **Triangle Area Graduate Mathematics Conference (TAGMaC)** **Durham, NC**
  Co-organizer, Duke-UNC-NCSU Mathematics Departments *Fall 2018, Fall 2021*
  Rotating conference for mathematics graduate students in the NC Triangle area, sponsored by the AMS and SIAM chapters at Duke, UNC Chapel Hill, and NC State. Co-organized the Fall 2018 TAGMaC and was the lead organizer for the Fall 2021 TAGMaC.
- **Triangle Contest in Mathematical Modeling (TriCoMM)** **Durham, NC**
  Co-organizer, Duke Mathematics Department *Fall 2021*
  Local mathematical modeling contest for undergraduate students based on the international Mathematical

Contest in Modeling (MCM). Helped organize informational meetings and the weekend-long contest.

- **Graduates Achieving Inclusion Now (GAIN)** **Virtual**
  Moderator, Duke and Purdue Mathematics Departments *Fall 2021*
  Moderator for debriefing discussions on *Racism* and *Allyship and Mentoring*. The conference takes place over four weekends and aims to support math faculty who are interested in taking action against issues of discrimination and systemic inequity.

- **Launch Point Conference** **Virtual**
  Co-organizer, Duke-UNC-WFU Mathematics Departments *Spring 2020*
  Co-organized the first annual Launch Point conference for NC undergraduate and graduate students from underrepresented groups in mathematics. Coordinated plenary and parallel talks, panels, and social events. Sponsored by the AWM and SIAM chapters at Duke, UNC Chapel Hill, and Wake Forest.

Workshops

- **Collaborative Workshop for Women in Mathematical Biology** **Minnetonka, MN**
  Institute for Mathematics and its Applications (IMA) and Optum *Jun 20-24, 2022*
  Collaborative workshop on Mathematical Approaches to Support Women's Health. Member of Project Team 2 on Modeling the Stability and Effectiveness of Dosing Regimens of Oral Hormonal Contraceptives mentored by Dr. Lisette de Pillis and Dr. Heather Zinn Brooks.

- **Data-Driven Mathematical & Statistical Modeling** **Virtual**
  Statistical and Applied Mathematical Sciences Institute (SAMSI) *Jul 12-16, 2021*
  Workshop on model formulation and selection, parameter estimation, sensitivity analysis and uncertainty quantification. Worked in a team of 6 graduate students on a short project introduced by John Nardini on equation learning from stochastic agent-based model simulations.

- **Workshop on Mathematical and Computational Methods in Biology** **Virtual**
  Mathematical Biosciences Institute (MBI) *May 5-8, 2020*
  Workshop with lectures and discussions on recent developments in mathematical and computational methods that arise in biology. Gave a parallel talk on mathematical modeling of circadian rhythms and dopamine.

- **Tutorial Workshop on Parameter Estimation for Biological Models** **Raleigh, NC**
  NC State Research Training Group in Mathematical Biology *Jul 29-Aug 1, 2019*
  Workshop consisting of lectures and hands-on tutorials on basic techniques associated with identifiability theory, parameter estimation, and uncertainty quantification in biological models.

Awards

- **Nomination for Dean's Award for Excellence in Teaching**
  Duke Graduate School *2021*

- **L.P. Smith Award for Excellence in Teaching**
  Duke Mathematics Department *2020*

- **SIAM Student Chapter Certificate of Recognition**
  Society for Industrial and Applied Mathematics (SIAM) *2020*