Kang-Ling Liao

Update: July 27, 2026

Department of Mathematics
University of Manitoba, Canada
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Research Interests

- Mathematical Biology and Modeling: Cancer Immunoediting, Immunology, G Protein Complex, Pattern Formation in Somitogenesis, Gene Regulation, Ecology, Data Fitting
- Dynamical Systems, Differential Equations, Delay Differential Equations, Bifurcation Theory

Selected Academic Positions

- Associate Professor — July 2026 – Present
  Department of Mathematics, University of Manitoba, Canada
- Assistant Professor — January 2022 – June 2026
  Department of Mathematics, University of Manitoba, Canada
- Assistant Professor (Joint appointment) — Before December 2021
  Department of Mathematics (main department) & Department of Biological Sciences
  University of Manitoba, Canada
- Postdoctoral Research Associate — July 2015 –May 2017
  Department of Biology, The University of North Carolina at Chapel Hill, USA
  Mentors: Prof. Alan M. Jones (Department of Biology)
  Prof. Timothy C. Elston (Department of Pharmacology)
- Postdoctoral Fellow — June 2012 – July 2015
  Mathematical Biosciences Institute, The Ohio State University, USA
  Mentors: Prof. Avner Friedman and Prof. Yuan Lou (Department of Mathematics)
  Prof. Xue-Feng Bai (Department of Pathology)

Education

- National Chiao Tung University, Taiwan — March 2012
  (Current name: National Yang Ming Chiao Tung University)
  Ph.D. in Applied Mathematics (Advisor: Prof. Chih-Wen Shih)
  Thesis: *Analysis on mathematical models of somitogenesis in zebrafish*
- National Taiwan University, Taiwan — June 2005
  M.Sc. in Mathematics (Advisor: Prof. Chiun-Chuan Chen)
  Thesis: *Traveling Wavefronts in Cooperative Lotka-Volterra System with Time Delays*
- Fu Jen Catholic University, Taiwan — June 2003
  B.Sc. in Applied Mathematics

Publication (HQPs are highlighted with *, corresponding authors are highlighted with underline, and all authors are listed in order of contribution. IF indicates the impact factor for the year of publication)

Journal Publication

1. **Kang-Ling Liao**, Kenton D. Watt*, Adaptive immunity determines the cancer treatment outcome of oncolytic virus and anti-PD-1, ***Bulletin of Mathematical Biology***, 2025, 87(3):36, IF: 2.
2. **Kang-Ling Liao,** Adam J. Wieler* and Pedro M. Lopez Gascon*, 2024, Mathematical modeling and analysis of cancer treatment with radiation and immune checkpoint inhibitor, ***Mathematical Biosciences***, 374: 109218, IF: 1.9.
3. **Kang-Ling Liao,** Xue-Feng Bai, and Avner Friedman, 2024, IL-27 in combination with anti-PD-1 can be anti-cancer or pro-cancer agent, ***Journal of Theoretical Biology***, 579: 111704, IF: 1.9.
4. **Kang-Ling Liao**, Kenton D. Watt*, and Tom Protin*, 2023, Different mechanisms of CD200-CD200R induce diverse outcomes in cancer treatment, ***Mathematical Biosciences***, 365; 109072, IF: 1.9.
5. Isam Al-Darabsah*, **Kang-Ling Liao**, and Stéphanie Portet, 2023, A simple in-host model for COVID-19 with treatments: model prediction and calibration, ***Journal of Mathematical Biology***, 10; 86(2): 20, IF: 2.2.
6. Kenton D. Watt* and **Kang-Ling Liao**, 2022, Combination therapy for cancer with IL-27 and anti-PD-1: A simplified mathematical model, ***Mathematics in Applied Sciences and Engineering***, 3(4), 200-279.
7. Ting-Ying Wu*, Shalini Krishnamoorthi, Kulaporn Boonyaves, Isam Al-Darabsah*, Richalynn Leong, Alan M. Jones, Kimitsune Ishizaki, **Kang-Ling Liao**, and Daisuke Urano, 2022, G protein controls stress readiness by modulating transcriptional and metabolic homeostasis in Arabidopsis thaliana and Marchantia polymorpha, ***Molecular Plant***, 2022 Nov 1: S1674-2052(22)00372-0, IF: 27.5.
8. **Kang-Ling Liao** and Kenton D. Watt*, 2022, Mathematical modeling and analysis of anti-PD-1 and IFN-gamma synergy in cancer immunotherapy, ***Mathematical Biosciences***, Sep 20; 353: 108911, IF: 4.3.
9. **Kang-Ling Liao** and Kenton D. Watt*, 2022, Mathematical modeling and analysis of CD200-CD200R in cancer treatment, ***Bulletin of Mathematical Biology***, Jul 6; 84(8): 82, IF: 3.5.
10. **Kang-Ling Liao**, Wei-Chen Chang*, Jeffrey M. Marcus, and Jenn-Nan Wang, 2021, Mathematical modeling of eyespot pattern formation in butterfly wings, ***Journal of Theoretical Biology***, No. 531, 110898, IF: 2.405.
11. Annette Dumas*, **Kang-Ling Liao**, and Ken M. Jeffries, Mathematical modeling of heat shock protein in fish, 2021, ***Mathematical Biosciences***, 108692, IF: 3.935.
12. **Kang-Ling Liao**, Chih-Wen Shih, and Chi-Jer Yu, 2018, The snapback repellers for chaos in multi-dimensional maps, ***Journal of Computational Dynamics***, No. 5, 81-92, IF: 1.69.
13. Meral Tunc-Ozdemir, **Kang-Ling Liao**, Timothy Ross-Elliot, Timothy C. Elston, and Alan M. Jones, 2018, Long-distance communication in Arabidopsis involving a self-activating G protein, ***Plant Direct***, No. 2, e00037, IF: 1.31.

14. **Kang-Ling Liao**, Charles E. Melvin, Rosangela Sozzani, Roger D. Jones, Timothy C. Elston, and Alan M. Jones, 2017, Dose-duration reciprocity for G protein activation: modulation of kinase to substrate ratio alters cell signaling, ***PLoS One***, No. 12(12), e0190000, IF: 2.766.
15. Kuan-Wei Chen*, **Kang-Ling Liao** and Chih-Wen Shih, 2017, The kinetics in mathematical models on segmentation clock genes in zebrafish, ***Journal of Mathematical Biology***, No. 25, 1-54, IF: 1.786.
16. Liang Ying, Daisuke Urano, **Kang-Ling Liao**, Tyson L Hedrick, Yajun Gao, Alan M Jones, 2017, A nondestructive method to estimate the chlorophyll content of Arabidopsis seedlings, ***Plant Methods***, No. 13: 26, IF: 4.269.
17. **Kang-Ling Liao**, Roger D. Jones, Patrick McCarter, Meral Tunc-Ozdemir, James A. Draper*, Timothy C. Elston, David Kramer, and Alan M. Jones, 2017, A shadow detector for photosynthesis efficiency, ***Journal of Theoretical Biology***, No. 414, 231-244, IF: 1.833.
18. Avner Friedman and **Kang-Ling Liao**, 2015, The role of the cytokines IL-27 and IL-35 in cancer, ***Mathematical Biosciences and Engineering***, No. 12(6), 1203-1217, IF: 1.006.
19. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2014, Mathematical modeling of Interleukin 35 promoting tumor growth and angiogenesis, ***PLoS One***, No. 9(10), e110126, IF: 3.234.
20. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2014, Mathematical modeling of Interleukin-27 induction of anti-tumor T cells response, ***PLoS One***, No. 9(3), e91844, IF: 3.234.
21. **Kang-Ling Liao** and Yuan Lou, 2013, The effect of time delay in a two-patch model with random dispersal, ***Bulletin of Mathematical Biology***, No. 76, 335-376, IF: 1.292.
22. **Kang-Ling Liao**, Xue-Feng Bai, and Avner Friedman, 2013, The role of CD200-CD200R in tumor immune evasion, ***Journal of Theoretical Biology***, No. 328, 65-76, IF: 2.303.
23. **Kang-Ling Liao** and Chih-Wen Shih, 2012, A lattice model on somitogenesis of zebrafish, ***Discrete and Continuous Dynamical Systems - Series B***, No. 17, 2789-2814, IF: 0.88.
24. **Kang-Ling Liao**, Chih-Wen Shih, and Jui-Pin Tseng, 2012, Synchronized oscillations for a mathematical model of segmentation in zebrafish, ***Nonlinearity***, No. 25, 869-904, IF: 1.602. [**Nonlinearity highly downloaded collection** 2012, selected and certified by the Nonlinearity]
25. **Kang-Ling Liao** and Chih-Wen Shih, 2012, Snapback repellers and homoclinic orbits for multi-dimensional maps, ***Journal of Mathematical Analysis and Applications***, No. 386, 387-400, IF: 1.05.

Book Chapter

26. **Kang-Ling Liao**, Chih-Wen Shih, and Jui-Pin Tseng, Multidimensional dynamics: From simple to complicated, in Discrete Time Systems, Editor: Mario Alberto J$ord a' n$, Publisher: InTech, April 2011.

Works in Revision

27. **Kang-Ling Liao,** Adam Wieler*, 2026, Modeling combination therapy for ER-positive breast cancer with radiotherapy, endocrine therapy, and immune checkpoint inhibitor, ***PLOS Computational Biology***, in revision.
28. Julien Arino, Morgan Craig, Clotilde Djuikem*, **Kang-Ling Liao**, Stéphanie Portet, 2026, Within-host immunology to age-of-infection epidemiology via a virtual cohort, ***Journal of the Royal Society Interface***, in revision.

Student Thesis

29. Kenton D. Watt* and **Kang-Ling Liao,** Mathematical modeling and analysis for multiple myeloma treatment [M.Sc. thesis completed in December 2025].
30. Joshua Beaudin* and **Kang-Ling Liao,** Mathematical modeling and analysis for HER2-positive breast cancer with endocrine therapy, radiotherapy, and immune checkpoint inhibitor [M.Sc. thesis expected completed in December 2026].

Works in Preparation

31. **Kang-Ling Liao**, Boqi Zhang*, and Huu Le*, Mathematical modeling and analysis for ER-positive breast cancer with endocrine therapy SERM, SERD, and AI, in preparation.

Ongoing Project

32. **Kang-Ling Liao,** Maxim Gibson*, and Neha Shahrawat*, Mathematical modeling for treatments in triple negative breast cancer.
33. Jenn-Nan Wang and **Kang-Ling Liao**, Bayesian parameter estimation and ensemble Kalman filter method in cancer immunology modeling.
34. Chang-Yuan Cheng and **Kang-Ling Liao**, Mathematical analysis for the dynamics in the tumor microenvironment under cancer immunotherapy.
35. **Kang-Ling Liao** and Michael Chan, Mathematical modeling for SYTL3 in T-cell infiltration.
36. Joshua Beaudin*, Lihini Kankanamge*, Puneet Velidi*, Adenane Rim*, **Kang-Ling Liao**, and Michael Chan, UCP2 in T-cell infiltration.
37. Charles Arthus-Maxime Sonnet*, Stéphanie Portet, and **Kang-Ling Liao**, Epithelial-to-mesenchymal transition (EMT) in cancer.
38. Sarthak Sahoo*, Mohit Kumar Jolly, and **Kang-Ling Liao**, Epithelial-to-mesenchymal transition (EMT) in Estrogen receptor positive breast cancer.

Award

- Best Poster Award, SIAM Conference on the Life Sciences 2014. 2014
- Postdoctoral Research Fellowship, 2014
  Mathematical Biosciences Institute, The Ohio State University.
- Postdoctoral Research Abroad Award, National Science Council of Taiwan. 2012

Grant (PI stands for Principal Investigator)

- NSERC Emerging Infectious Disease Modelling Initiative (EIDM), August 2021-March 2024
  Huaiping Zhu at The York University is the PI and there are around 70 co-applicants
  One Health Modelling Network for Emerging Infections (OMNI)
- The Fields Institute November 2022 – July 2023
  Co-applicants: Julien Arino, Stéphanie Portet, Kang-Ling Liao
  Conference on Computational and Mathematical Population Dynamics 6 (CMPD6)
- Pacific Institute for the Mathematical Sciences November 2022 – July 2023
  Co-applicants: Julien Arino, Stéphanie Portet, Kang-Ling Liao
  Conference on Computational and Mathematical Population Dynamics 6 (CMPD6)
- The Canadian Applied and Industrial Mathematics Society November 2022 – July 2023
  Co-applicants: Julien Arino, Stéphanie Portet, Kang-Ling Liao

Conference on Computational and Mathematical Population Dynamics 6 (CMPD6)

- NSERC-DGECR-Discovery Launch Supplement, PI April 2020- March 2021
  Mathematical analysis and modeling of Notch signaling in zebrafish somitogenesis
- NSERC Discovery Grant (Evaluation Group: Mathematics and Statistics – EG1508), PI
  April 2020- March 2027
  Mathematical analysis and modeling of Notch signaling in zebrafish somitogenesis
- Research Startup Grant, PI, University of Manitoba Before 2024
- Ministry of Science and Technology Grant, Taiwan, PI December 2017 – July 2018
  Mathematical modeling and analysis of anti-PD-1 combination therapy in cancer immunotherapy

Mitacs Grant (PI stands for Principal Investigator)

- 2025 Mitacs Globalink Research Internship Projects (supporting one student), PI Summer 2025
  Mathematical analysis and modeling for the opposite functions of immune checkpoint inhibitors in cancer treatment
  Intern: Charles Arthus-Maxime Sonnet (M. Sc. in Mathematics, INSA Rennes, France)
- 2025 Mitacs Globalink Research Internship Projects (supporting one student), PI Summer 2025
  CAR-T cell treatment in acute and chronic B cell leukemias and then extend this model to CAR-T cell treatment in cancer treatment
  Intern: Neha Shahrawat (B. Sc. in Engineering, Georgia Institute of Technology, USA)
- 2025 Mitacs Globalink Research Internship Projects (supporting one student), PI Summer 2025
  Mathematical modeling and analysis for the oncolytic virotherapy (OV) in cancer immunology
  Intern: No matched intern
- 2024 Mitacs Globalink Research Internship Projects (supporting one student), PI Summer 2024
  Mathematical modeling and analysis of cancer immunotherapy
  Intern: No matched intern
- 2023 Mitacs Globalink Research Internship Projects (supporting one student), PI Summer 2023
  Mathematical modeling and analysis of cancer immunotherapy
  Intern: Olha V. Kryva (B. Sc. in Mathematics, TaRAS Shevchenko National University of Kyiv, Ukraine)
- 2022 Mitacs Globalink Research Internship Projects (supporting two students), PI Summer 2022
  Mathematical modeling and analysis of cancer immunotherapy
  Intern: Tom Protin (M. Sc. in Engineering, INSA Rennes, France)

Journal Reviewer

Since 2017

- Applied Mathematical Modelling
- PLOS Computational Biology
- Journal of Theoretical Biology
- Mathematical Biosciences
- Bulletin of Mathematical Biology
- Journal of Mathematical Biology

- Mathematical Biosciences and Engineering
- Discrete and Continuous Dynamical Systems - Series B (DCDS-B)
- Computational and Applied Mathematics Journal

Before 2017

- The Scientific Pages of Cell and Developmental Biology
- Journal of Mathematical Biology
- IEEE Journal of Biomedical and Health Informatics
- Tamkang Journal of Mathematics
- Taiwanese Journal of Mathematics

Membership

- Society for Mathematical Biology (SMB) 2019, 2025-Present
- Maud Menten Institute-Mathematics for the Life Sciences 2024 - Present

Service

- Department of Mathematics, University of Manitoba, Canada
  - Search Committee for the Department Head Position in Mathematics September 2020 – July 2021
  - Research Committee July 2024 – June 2025
  - Strategic Planning committee July 2024 – **Present**
  - Scholarships and Awards Committee July 2024 – December 2024
  - Colloquium Organizer August 2020 – January 2022, July 2022 – June 2024
  - Nominating Committee August 2020 – January 2022, July 2022 – June 2024, July 2025 - **Present**
  - Comprehensive Exam Subcommittee September 2020 – July 2021
  - Undergraduate Studies Committee August 2019 – July 2020
  - Design Comprehensive Exam – ODE portion September 2020, September 2023
  - Design Comprehensive Exam – Introductory numerical analysis portion September 2023
  - Design Admission Questions for M. Sc. program application – Applied Mathematics portion February 2023
  - NSERC Discovery Grant proposal internal panel review for Stéphanie Portet, 2024 Fall term
  - NSERC Discovery Grant proposal internal panel review for Julien Arino, 2022 Fall term

- Faculty/College/School unit, University of Manitoba, Canada
  - Panelist for FoS Research Instrumentation Grant May 2026 – June 2026
  - Search Committee for Assistant Professor in Microbiology September 2022 – February 2023
  - Core Search Committee for Indigenous Scholars in Faculty of Science September 2020 – July 2021

Research Leave

- January 2022 – June 2022

Research Visiting

- Prof. Jenn-Nan Wang, Department of Mathematics, National Taiwan University, Taiwan
  Project: Bayesian parameter estimation in cancer immunology modeling.
  December 27, 2023 – January 26, 2024, May 7, 2024 – May 29, 2024, April 21, 2025- May 23, 2025,
  Project: Application of ensemble kalman filter method in model calibration.
  December 17, 2025-January 2, 2026, May 1, 2026 – May 30, 2026
- Prof. Chang-Yuan Cheng, Department of Mathematics, National Kaohsiung Normal University, Taiwan
  Project: Mathematical analysis for the dynamics of tumor microenvironment in cancer immunotherapy
  May 22, 2024 – May 29, 2024

Mentoring Experience

- University of Manitoba, Canada

  (i) Department of Mathematics - Supervisor

  Postdoctoral Fellows

  - Suzan Farhang Sardroodi (OMNI Postdoctoral Fellow) February 2022 – December 2023
    Co-supervise with Dr. Julien Arino, Dr. Stéphanie Portet, and Dr. Morgan Craig (Université de Montréal)
    [Next position: Post-doctoral researcher at University of Toronto]
  - Isam Al-Darabsah (PIMS Postdoctoral Fellow) September 2020 – August 2022
    [Current position: Assistant Professor of Mathematics at Jordan University of Science and Technology]

  Ph.D. Students

  - Cécile Verrier, Applied Mathematics, Lille University, France Start in September 2026
    Co-supervise with Prof. Sophie Dabo (main supervisor, Applied Mathematics, Lille University, France)
  - Kuan-Wei Chen, Applied Mathematics, National Yang Ming Chiao Tung University, Taiwan
    September 2015 – August 2021
    Co-supervise with Prof. Chih-Wen Shih (main supervisor, Applied Mathematics, National Yang Ming Chiao Tung University, Taiwan)
    [Next position: Postdoctoral Fellow at National Center for Theoretical Sciences-Mathematics Division, Taiwan]
    [Current position: Postdoctoral Fellow at Meiji Institute for Advanced Study of Mathematical Sciences, Japan]
  - Wei-Chen Chang, Mathematics, National Taiwan University, Taiwan
    July 2019 – August 2020
    Co-supervise with Prof. Jenn-Nan Wang (main supervisor, Mathematics, National Taiwan University, Taiwan)
    [Current position: Engineer at Taiwan Semiconductor Manufacturing Company (TSMC), Taiwan]

  M.Sc. Students

  - Sidratul Muntaha Start in September 2026

Co- supervise with Dr. Margherita Maria Ferrari

- Gabriel Ogulu, course-route M.Sc. in Mathematics January 2026 – **Present**
  Co-supervision with Dr. Richard Slevinsky (main supervisor)
  [Expected completion time: December 2026].
- Joshua Beaudin September 2024 – **Present**
  [Expected completion time: December 2026]
- Solomon Mensah January 2023 – **Present**
  Co- supervise with Dr. Julien Arino (main supervisor), since January 2024
  [Expected completion time: August 2026]
- Kenton D. Watt September 2023 – December 2025
  [Completion time: 2025 Fall term]
  * Provide funding support for vising Prof. Wenrui Hao at Pennsylvania State University during May 2024 – June 2024.
- Charles Arthus-Maxime Sonnet (Mitacs Globalink Research Internship project), Mathematics, INSA Rennes, France May 2025 – August 2025
  Co-supervise with Dr. Stéphanie Portet (main supervisor)
- Kai-Ching Chang, Mathematics, National Chung Cheng University, Taiwan
  September 2024 – August 2025
  Co-supervise with Dr. Chih-Chiang Huang (Mathematics, National Chung Cheng University, Taiwan)
  [Expected completion time: August 2027]
- Tom Protin (Mitacs Globalink Research Internship project), Engineering, INSA Rennes, France May 2022 – August 2022
  [Next position: M.Sc. student at INSA Rennes]
- Niloofar Fasaeiyan January 2020 – June 2020
- Annette Dumas (Exchange M.Sc. student), Mathematics, ENS Lyon University, France
  June 2019 - August 2019
  [Next position: Ph.D. student, Institut Camille Jordan, Université Claude Bernard - Lyon 1]

Undergraduate Students

- Anmol Anmol (Summer undergraduate), Engineering May 2026 – **Present**
- Leana Madlangsakay (Summer undergraduate), Statistics May 2026 – **Present**
- Lily Harms (Summer undergraduate), Science General May 2026 – **Present**
- Maxim Gibson (USRA 2026), Applied Mathematics and Computer Science Option
  May 2026 – **Present**
- Neha Shahrawat (Mitacs Globalink Research Internship project), Engineering, Georgia Institute of Technology, USA May 2025 – April 2026
- Boqi Zhang (URA 2025), Mathematics May 2025 – **Present**
- Huu Le (USRA 2025), Computer Science and Mathematics May 2025 – December 2025
- Hai Anh Le (URA 2025), Computer Science May 2025 – June 2025

- Evan Offord (URA 2024), Mathematics May 2024 – August 2024
- Kenton D. Watt (USRA-FoS 2020, USRA 2021), Mathematics June 2020 – August 2023
  [Next position: Mathematics, M.Sc-thesis. program, University of Manitoba, started in Fall 2023]
- Adam Wieler (USRA-NSERC 2023, USRA 2024 with co-op), Mathematics
  May 2023 – December 2025
  * Provide funding support for vising Prof. Jaekyoung Kim at KAIST during May 2024 – June 2024
  [Current position: Computational Mathematics, M.Sc-thesis. program, University of Waterloo, started in Winter 2026]
- Pedro Lopez Gascon (USRA-FoS 2023), Mathematics May 2023 – December 2023
- Olha V. Kryva (Mitacs Globalink Research Internship project), Mathematics, TaRAS Shevchenko National University of Kyiv, Ukraine June 2023 – August 2023
- Manisha Seneviratne (Summer undergraduate), Mathematics June 2020 - July 2020
  [Current position: Mathematics tutoring position at Learna for kids from Grade 3-8]

Department of Mathematics – Supervisor for Summer School Research Project

3MC-PIMS-IDMS-ICMS Summer School in Quantitative Molecular and Cellular Biology, June 16, 2025 – June 27, 2025

Co-supervise with Prof. Michael Chan (Biomedical Sciences, National Chung Cheng University, Taiwan)

- Adenane Rim, First-year Postdoctoral Fellow in Mathematics, University Ibn Tofail, Africa
- Puneet Velidi, Second-year M.Sc. in Mathematics and Statistics, University of Victoria, Canada
- Lihini Kankanamge, Second-year M.Sc. in Mathematics, University of Manitoba, Canada
- Joshua Beaudin, Second-year M.Sc. in Mathematics, University of Manitoba, Canada

Department of Mathematics – Advisory Committee

- Ghazale Farjam (Ph.D. student of Dr. Julien Arino, switched to IIS program in 2023)
  June 2023 - August 2023
- Syeda Atika Batool Naqvi (Ph.D. student of Dr. Stéphanie Portet, applied for IIS program in September 2023) April 2023 – August 2023
- Akshay Prameela Kumary (Ph.D. student of Dr. Stéphanie Portet)
  September 2020 – August 2021

Department of Mathematics – Graduate Committee

- Lihini Kankanamge (M.Sc. student of Dr. Stéphanie Portet) August 2026
- Kenton D. Watt December 2025
- Tijotop Ahmed Binjibon (M.Sc. student of Dr. Stéphanie Portet) August 2025
- Deokro Lee (M.Sc. student of Dr. Stéphanie Portet) August 2020

Department of Mathematics – Examiner for Project Course's Report Qualifying

- Jannatun Irana Ira (M.Sc.-course based student of Dr. Stéphanie Portet) August 2025

Department of Mathematics – Chair M. Sc. Defense

- Md. Mehadi Hasan (M.Sc. student of Dr. Julien Arino) August 2025
- Alireza Sharifi (M.Sc. student of Dr. Leo Butler) November 2023

(ii) Department of Biological Sciences - Supervisor

Undergraduate Students

- Xander Bjornsson (Pre-Honours course, Honours course, Co-Op undergraduate, USRA-FoS) September 2020-May 2022

  Honours Thesis: Mathematical modeling of cytokine Interleukin-27 in tumor treatment

  [Next position: Epidemiology, M.Sc.-thesis program, McGill University, started in Fall 2023]
- Elah Zainab Ajene (Pre-Honours course) October 2021 – January 2022

- Department of Biology, The University of North Carolina at Chapel Hill, USA

  (i) Mentoring new lab members in fluorescence microscope experiment Fall 2016

  (ii) Mentoring undergraduates in mathematical modeling and data analysis
  - YeonJin Kang (Major in Biology) August 2016 –May 2017
  - James A. Draper (Major in Engineering) July 2015 –June 2016
- Mathematical Biosciences Institute, The Ohio State University, USA

  Project supervisor, Joint 2014 MBI-CAMBAM-NIMBioS Summer graduate program July 2014

Teaching Experience at University of Manitoba

- Department of Mathematics
  - MATH 8410 – Reading course: Mathematical Modeling and Analysis in Cancer Immunotherapy [Supervising: Joshua Beaudin] Winter 2025
  - MXML 4920 - Undergraduate Research Projects-2 Fall 2023 [Supervising: Adam Wieler and Pedro Lopez Gascon]
  - MATH 4920 – Topics in Mathematics 1 Fall 2021 [The course materials are totally developed by Kang-Ling Liao]
  - MATH 4380 / Math 7380 – Mathematical Biology Winter 2021, Winter 2023, Winter 2025
  - MATH 3610 – Introduction to Mathematical Modelling Fall 2020, Fall 2021, Fall 2025
  - MATH 3440 – Ordinary Differential Equations Fall 2020, Fall 2023
  - MATH 2160 – Numerical Analysis 1 Fall 2019, Fall 2022, Fall 2023, Fall 2024, Fall 2025
  - MATH 2140 – Modelling Fall 2019
  - MATH 2132 – Engineering Mathematical Analysis 2 Winter 2019
  - MATH 1700 – Calculus 2 Winter 2026
  - MATH 1524 – Mathematics for Management and Social Sciences Fall 2024
  - MATH 1520 - Introductory Calculus for Management and Social Sciences Winter 2023
  - MATH 1500 – Introduction to Calculus Winter 2020
- Department of Biological Sciences
  - BIOL 4890 – Special topics of modeling in biology (co-teach with Jay Kormish) Fall 2021

[New course in the Biological Sciences. The course materials are mainly designed by Kang-Ling Liao, and Dr. Kormish provided suggestions for the course materials. 100% of the lectures were taught by Kang-Ling Liao]

- BIOL 4544 – Advanced Developmental and Cellular Biology (guest lecture- introduce mathematical modeling in biology) Winter 2020
- BIOL 3542 – Developmental Biology (guest lecture- introduce mathematical modeling in Biology Winter 2019, Winter 2020, Fall 2020, Fall 2021
- BIOL 2520 – Cell Biology (guest lecture- introduce mathematical modeling in biology) Winter 2019, Winter 2020

- Maud Menten Institute
  - 3MC-PIMS-IDMS-ICMS summer school in Quantitative molecular and cellular biology
    - Teaching three sections about the skills and applications of "parameter estimation, evolutionary algorithm, and identifiability analysis June 2025

Teaching Experience – Instructor During Postdoctoral Fellow Position at The Ohio State University

- Linear Algebra, The Ohio State University, USA Fall 2013

Teaching Experience – Instructor During Graduate Student Period at National Chiao Tung University

- Precalculus (for international students), National Chiao Tung University, Taiwan. Fall 2008

Teaching Experience - Teaching Assistant During Undergraduate and Graduate periods

- Ordinary Differential Equations (I), National Chiao Tung University, Taiwan. Fall 2009
- Linear Algebra, National Chiao Tung University, Taiwan. August 2006 – June 2008, Spring 2008
- Linear Algebra, National Taiwan University, Taiwan. August 2004 – June 2005
- Calculus, National Taiwan University, Taiwan. August 2003 – June 2004
- Calculus, Fu Jen Catholic University, Taiwan. Spring 2002

Teaching Training / Certificate

- CATL course: Just-in-Time UM Learn Series: Creating Exams and Question Library; importing questions from older exams to Question Library October 6, 2025
- CATL course: Generative AI in Teaching and Learning March 5, 2025
- CATL course: TLCN06 Teaching Dossier December 16, 2024
- CATL course: TLCN07 Mental Health in The Classroom-Responding to Students Demonstrating Mental Health Distress December 10,2024
- CATL course: TLCN03 Navigating Challenging Student Situations December 10, 2024
- CATL course: Teaching Skills Program-Effective Communication: How to Have Better Conversations with Your Students (one in-person training and one VR training section) October 28 – December 9, 2024
- CATL course: The Flipped Classroom-Part II August 15, 2024
- CATL online course: The Flipped Classroom-Part I June 25, 2024
- CATL online course: Open Educational Resources – What, How, Why June 18, 2024
- CATL online course: Experiential Learning Community of Practice: Bringing Work-Integrated Learning into The Classroom April 24, 2024

- CATL online course: Open Educational Resources, Part I February 14, 2024
- CATL course: Experiential Learning - Assessing Experiential Learning October 10, 2023
- CATL course: Experiential Learning - Designing Effective Learning Experiences/Reflections, October 3, 2023
- CATL course: Experiential Learning - Preparing Students to Learn Experientially September 26, 2023
- CATL online course: Use Zoom Whiteboard and Polling to Engage Students in Online Classes, August 31, 2023
- CATL course: Strategies for Maintaining a Respectful Classroom Environment August 15, 2023
- CATL course: Designing and Evaluating Assessment Strategies August 14, 2023
- CATL online course: Delivering Your Online Course - A Package Left at The Door or a Singing Telegram That Sings Back March 23, 2023

Personal Development

- Attend "2026 Maud Menten Institute HQP Summit and Working Group Meetings" at University of Victoria August 14, 2026 – August 16, 2026
- Attend "2024 Maud Menten Institute HQP Summit and Working Group Meetings" at University of British Columbia September 27, 2024 – September 29, 2024
- Attend the workshop "The road to tenure and promotion: What you need to know and how to get there" April 22, 2024

Skills in Programming and Software

- Mathematical and Programming Software
  Matlab, Mathematica, Maple, C++, C, R, Fortran, XPP
- Data and Image Analysis
  ImageJ, GraphPad Prism
- 3D printing design
  Tinkercad
- Graphics Editor
  Adobe Photoshop, Adobe illustrator

Skills in Biological Experiment

- Fluorescence microscopy
- Basic molecular biology skills

Conference Organizing

- Applied for BIRS 2027 Scientific Program -Banff September 2025
  Co-organizers: Kang-Ling Liao (leading organizer), Wenrui Hao, Weitao Chen, Stephanie Portet, Federico Bocci
  Emerging Mathematics in Biology and Medicine: Bridging Modeling with Data and Life Sciences
- Local co-organizer for The 6th International Conference on Computational and Mathematical Population Dynamics, Winnipeg, MB, Canada May 2023
- Co-organizer of Workshop for young researchers in mathematical biology
  Mathematical Biosciences Institute, The Ohio State University, USA August 2012 - August 2014

Minisymposium Organizing

- Co-organizer of Minisymposium for The Society for Mathematical Biology (SMB) 2026 Annual Meeting, University of Graz, Austria July 2026
  Section Title: Data-Driven Modeling in Biology and Medicine
- Co-organizer of Minisymposium for The Society for Mathematical Biology (SMB) 2025 Annual Meeting, Alberta, Canada July 2025
  Section Title: Data-Driven Modeling in Biology and Medicine
- Co-organizer of Minisymposium for The Society for Mathematical Biology 2023 Annual Meeting, Columbus, OH, USA July 2023
  Section Title: Data-Driven Modeling and Model Calibration in Biology
- Organizer of Minisymposium for The 6th International Conference on Computational and Mathematical Population Dynamics, Winnipeg, MB, Canada May 2023
  Section Title: Mathematical Modeling and Analysis in Cancer Immunotherapy
- Organizer of Minisymposium for the Society for Mathematical Biology 2019 Annual Meeting, Montreal, Canada. July 2019
  Section Title: Mathematical Modeling of Cancer Therapy
- Co-organizer of Minisymposium for The 5th International Conference on Computational and Mathematical Population Dynamics, Florida, USA May 2019
  Section Title: Data-Driven Modeling in Cell Biology

Presentation

Invited Talk

- The SMB 2026 annual meeting, University of Graz, Austria July 2026
  Modeling combination therapy for ER-positive breast cancer with radiotherapy, endocrine therapy, and immune checkpoint inhibitor
- Department of Mathematics, National Taiwan University, Taiwan May 2026
  Modeling combination therapy for ER-positive breast cancer with radiotherapy, endocrine therapy, and immune checkpoint inhibitor
- Department of Mathematics, National Taiwan University, Taiwan December 2025
  Mathematical modelling and analysis of multiple myeloma treatment
- Department of Mathematics, National Taiwan University, Taiwan December 2025
  Akaike information criterion and identifiability analysis
- The SMB 2025 annual meeting, University of Alberta, Canada July 2025
  Mathematical modeling ER-positive breast cancer treatment
- Department of Mathematics, National Taiwan University, Taiwan May 2025
  Mathematical modeling ER-positive breast cancer treatment
- Department of Mathematics, National Kaohsiung Normal University, Taiwan May 2024
  Mathematical modeling in biology: Cancer immunotherapy
- Department of Mathematics, National Chung Cheng University, Taiwan May 2024
  Mathematical modeling in biology: Cancer immunotherapy

- Department of Mathematics, National Taiwan University, Taiwan May 2024
  IL-27 in combination with anti-PD-1 can be anti-cancer and pro-cancer agent
- Spring eastern AMS sectional meeting, Howard University, USA April 2024
  IL-27 in combination with anti-PD-1 can be anti-cancer and pro-cancer agent
- Department of Mathematics, National Taiwan University, Taiwan January 2024
  The opposite functions of CD200-CD200R in cancer treatment- Part II
- Department of Mathematics, National Taiwan University, Taiwan January 2024
  The opposite functions of CD200-CD200R in cancer treatment- Part I
- The SMB 2023 annual meeting, The Ohio State University, USA July 2023
  A simple in-host model for Covid-19 with treatments-model prediction and calibration
- Dynamics Systems in the Life Sciences, The Ohio State University, USA July 2023
  The opposite functions of CD200-CD200R in cancer treatment
- The 6th International Conference on Computational and Mathematical Population Dynamics, University of Manitoba, Canada May 2023
  The opposite functions and treatment outcomes of CD200-CD200R in cancer
- CAIMS/SCMAI 2022 (online) June 2022
  Analysis on mathematical models of somitogenesis in zebrafish
- Immunology seminar series talk, Department of Immunology, University of Manitoba May 2022
  Mathematical modeling in cancer immunotherapy
- Online Biomath Seminar Talk, Department of Mathematics & Statistics, Texas Tech University, USA May 2022
  Mathematical modeling in cancer immunotherapy
- Virtual SMB 2021 annual meeting June 2021
  The role of CD200-CD200R in cancer immunotherapy
- Theoretical Biology Seminar, Department of Mathematics, The Pennsylvania State University, USA April 2021
  Analysis of mathematical models of somite formation in zebrafish
- The SMB 2019 Annual Meeting, The University of Montreal, Canada July 2019
  Mathematical modeling in cancer immunotherapy
- The 5th International Conference on Computational and Mathematical Population Dynamics, Bahia Mar Fort Lauderdale Beach, Florida, USA. May 2019
  Data driven modeling of G protein signaling in plant cells
- Department of Mathematics, University of California, Riverside, USA. May 2019
  Mathematical application for somite formation and cancer immunotherapy
- 12th AIMS Conference on Dynamical Systems, Differential Equations and Application, NCTS Mathematics Division, Taiwan. July 2018
  Mathematical modeling of Interleukin-35 promoting tumor growth and angiogenesis
- Departments of Biological Sciences and Mathematics, University of Manitoba, Canada April 2018
  Applications of mathematics in biology

- Department of Mathematics, The Ohio State University, USA. February 2018
  Applications of mathematics in biology
- Department of Mathematics, Siena College, USA. February 2018
  Applications of mathematics in biology
- Department of Applied Mathematics, National Chung Hsing University, Taiwan January 2018
  Applications of mathematics in biology
- Department of Mathematics, National Chung Cheng University, Taiwan December 2017
  Applications of mathematics in biology
- Department of Mathematics, National Taiwan University, Taiwan December 2017
  Applications of mathematics in biology
- ReaDiNet 2017: International Conference on Mathematical Biology, National Center for Theoretical Sciences Mathematics Division, Taiwan. October 2017
  Mathematical modeling in cancer immunotherapy
- Department of Mathematics, Tamkang University, Taiwan March 2017
  Mathematical modeling in cancer immunotherapy
- Department of Mathematical Sciences, University of Arkansas, USA. February 2017
  Mathematical models for cancer immunotherapy
- AMS 2017 Joint Mathematics Meeting, Atlanta, USA. January 2017
  Mathematical modeling of anti-PD-1 and IL-27 synergy in inhibiting tumor growth
- Department of Biology, The University of North Carolina at Chapel Hill, USA. April 2015
  Mathematical models for somitogenesis and cancer immunotherapy
- Department of Mathematics, Renimin University of China, China April 2015
  How time delays affect the dynamics of mathematical models in ecology and somitogenesis?
- Institute of Mathematics, Academia Sinica, Taiwan February 2015
  Mathematical modeling for cancer immunotherapy
- Department of Applied Mathematics, National University of Kaohsiung, Taiwan February 2015
  Mathematical modeling of anti-PD-1 and IL-27 synergy in inhibiting tumor growth
- Department of Engineering Sciences and Applied Mathematics, Northwestern University, USA. January 2015
  A Mathematical model for anti-PD-1 and IL-27 drugs in cancer treatment
- H. Lee Moffitt Cancer Center, Tampa, USA. January 2015
  To what degree anti-PD-1 improves the efficacy of immunotherapeutic drugs?
- Workshop 3: Cancer and the Immune System, Mathematical Biosciences Institute, The Ohio State University, USA. November 2014
  Mathematical modeling of Interleukin-35 promoting tumor growth and angiogenesis
- The 10th AIMS Conference on Dynamical Systems, Differential Equations and Applications Madrid, Spain July 2014
  (i) *The role of CD200-CD200R in cancer immunoediting*
  (ii) *Mathematical modeling of Interleukin-27 induction of anti-tumor T cells response*

- The 6th International Symposium on Biomathematics and Ecology: Education and Research Marymount University, US A. October 2013
  The role of CD200-CD200R in tumor immune evasion

Contributed Talk

- AMS 2017 Joint Mathematics Meeting, Atlanta, USA. January 2017
  A shadow detector for photosynthesis efficiency
- AMS 2015 Joint Mathematics Meeting, San Antonio, USA. January 2015
  The contradictory experimental results of CD200-CD200R in cancer proliferation
- NCTS International Conference of Nonlinear Dynamics with Application to Biology, NCTS Mathematics Division, Taiwan. May 2014
  The effect of time delay in a two-patch model with random dispersal
- Taida Institute for Mathematical Sciences, Taiwan May 2014
  The roles of CD200-CD200R and Interleukin-27 in cancer immunoediting
- The 6th International Congress of Chinese Mathematicians, Taida Institute of Mathematical Sciences, Taiwan July 2013
  The dynamics for kinetic model of segmentation clock genes in zebrafish
- SIAM Conference on Applications of Dynamical Systems, Snowbird, USA. May 2013
  The relation between two-cell model and N-Cell model on somitogenesis of zebrafish
- Mathematical Conference and Annual Meeting of the Taiwan Mathematical Society, Chung Yuan Christian University, Taiwan December 2011
  Synchronized oscillations in a mathematical model of segmentation in zebrafish
- NCTS Workshop on Dynamical Systems, National Center for Theoretical Sciences Mathematics Division, Taiwan. May 2011
  The dynamics for segmentation clock gene of zebrafish.
- 2nd Japan-Taiwan Joint Workshop for Graduate Students, Meiji University, Japan February 2011
  Synchronized oscillation for segmentation clock gene of zebrafish

Departmental Talk

- Applied and Computational Mathematics Seminar Series, Department of Mathematics, University of Manitoba, Canada
  (i) Analysis on mathematical models of somitogenesis in zebrafish February 2019
  (ii) Mathematical modeling in cancer immunotherapy March 2019
- Postdoctoral Seminar, Mathematical Biosciences Institute, The Ohio State University, USA.
  (i) The functions of Interleukins in tumor microenvironment November 2014
  (*ii) The roles of CD200-CD200R and IL-12 cytokine family in cancer immunoediting* February 2014
  (iii) Analysis on mathematical models of somitogenesis in zebrafish February 2013

Poster

- 30th Annual Plant Molecular Biology Retreat, Wrightsville, USA. September 2016
  How AtRGS1 expression level affects endocytosis in plant cells?

- Phosphorylation & G-protein mediated signaling networks (**Gordon Research Conference**), University of New England. USA June 2016
  Fluctuation detection by a receptor-like regulator of G signaling complex
- 29th Annual Plant Molecular Biology Retreat, Asheville, USA. September 2015
  How plant cells sort through noise to detect signal: dynamics of photosynthate sensing by the heterotrimeric G protein pathway?
- SIAM Conference on the Life Sciences 2014, Charlotte, USA August 2014
  The role of CD200-CD200R in cancer suppression and promotion
  [Poster Award by SIAM Conference on the Life Sciences 2014]
- Math Biology: Looking at the Future (MBI's 10th Anniversary Meeting), Mathematical Biosciences Institute, The Ohio State University, USA September 2012
  From two-cell model to N-cell model of somitogenesis in zebrafish
- NCTS Workshop on Dynamical Systems, National Center for Theoretical Sciences Mathematics Division, Taiwan. May 2012
  The dynamics for two-cell model and N-cell model of somitogenesis in zebrafish
- SIAM Conference on Applications of Dynamical Systems, Snowbird, USA. May 2011
  From synchronous oscillations to oscillation-arrested for segmentation clock gene of zebrafish

Conference/Seminar (Attendance)

- MMI Mathematical Biology Seminar 2024 Fall - Present
- MfPH Workshop on Endemic COVID-19, on-line January 2022
- Within-host modelling seminar, on-line (hosted by Jane Heffernan) Winter 2022, Winter 2021
- Biomedical mathematics online colloquium, KAIST 2022 Winter
- The One Society Network (OSN) online seminar 2022 Winter

Other Research Experience

- Mathematical Biosciences Institute, The Ohio State University, USA
  Mentor: Prof. Avner Friedman (on cancer immunoediting modeling)
  Prof. Yuan Lou (on mathematical models in spatial ecology) September - October 2012
- The University of Kansas, U.S.A
  Mentor: Prof. Weishi Liu (on geometric singular perturbation theorem) July 2009