





Kyle C. Nguyen

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Education

- MAY, 2024 | **Doctor of Philosophy, Biomathematics**
NORTH CAROLINA STATE UNIVERSITY
ADVISOR: *Prof. Kevin Flores*
GPA: 4.0/4.0
- MAY, 2019 | **Bachelor of Science, Computational Mathematical Science**
ARIZONA STATE UNIVERSITY
Summa Cum Laude
GPA: 4.0/4.0

Research Experience

- AUG, 2019 -
PRESENT | **Graduate Research Assistant, FLORES LAB AT NCSU**
MENTOR: *Prof. Kevin Flores*
- Developed parameter estimation techniques with applications in biology. This includes combining Physics Informed Neural Networks (PINNs) with linear mixed-effects modeling, convolutional neural networks (CNN) with topological data analysis (TDA), Prokhorov metric framework (PrMF) with k -means clustering for parameter estimation of heterogeneous populations.
- Developed CNN models including self-attention models for classification tasks with applications in radar images, *C. elegans* images. Analyzed results using explainable machine learning techniques to help shed the light on models performance.
- Developed mathematical models for the "Go or Grow" hypothesis in Glioblastoma Multiforme.
LANGUAGES: MATLAB, Python.
- SUMMER
2022 | **Quantitative Research Intern, DUKE UNIVERSITY SCHOOL OF MEDICINE**
MENTORS: *Drs. Janice McCarthy and Moses Sekaran*
- Developed a mathematical model for binding kinetics of binary mixtures of monoclonal antibodies interacting with antigen presenting multiple epitopes.
- Performed parameter estimation. Compared the new model's performance to the previous models.
LANGUAGE: R.
- SUMMER
2021 | **Quantitative Research Intern, DUKE UNIVERSITY SCHOOL OF MEDICINE**
MENTORS: *Drs. Janice McCarthy and Moses Sekaran*
- Developed an open-source R package for bivalent analyte binding kinetics. Performed parameter estimation on data of a broadly neutralizing HIV-1 mAb binding to HIV-1 envelope glycoprotein gp120. Performed parameter identifiability analysis to help with experimental design.
LANGUAGES: R, MATLAB.

SUMMER 2020	Machine Learning Intern, NASA LANGLEY RESEARCH CENTER MENTORS: <i>Drs. Mariano Moscato and J. Tanner Slagel</i> - Developed a new feature for NASA's Prototype Verification System (PVS) library that convert proof formulas to prenex normal form using object-oriented programming in Common Lisp. - Developed a tokenizers that convert prenex normal form of proof formulas to tokens. - Developed a CNN-based lemma suggester for PVS library, which takes tokens of proof formulas as inputs and suggests the top-k relevant lemmas. LANGUAGES: Python, Common Lisp, PVS.
MAY, 2018 - MAY, 2019	Undergraduate Research Assistant, ARIZONA STATE UNIVERSITY MENTOR: <i>Prof. Yang Kuang</i> - Prostate cancer: Modeled the dynamics of prostate cancer tumor under intermittent androgen suppression therapy patients. Fitting and forecasting patients' prostate specific antigen data. Studied the dynamics of prostate cancer drugs. Incorporated the drugs injection into the model. - Melanoma: Studied the previous model that quantified Environment-Mediated Drug resistance in melanoma. Developed a simplified mathematical model that can fit experiment data. LANGUAGE: MATLAB.

Publications

(* equal contribution)

1. Malik, A. A.*; **Nguyen, K. C.***; Nardini, J. T.; Krona, C. C.; Flores, K. B., Nelander, S. Mathematical modeling of multicellular tumor spheroids quantifies inter-patient and intra-tumor heterogeneity. *submitted*.
2. **Nguyen, K. C.**; Jameson, C. D.; Baldwin, S. A.; Nardini, J. T.; Smith, R. C.; Haugh, J. M.; Flores, K. B. Quantifying fluidization patterns in mesenchymal cell populations using topological data analysis and agent-based modeling. *Math. Biosci.* 2024
3. **Nguyen, K.***; Li, K.*; Flores, K.; Tomaras, G. D.; Dennison, S. M.; McCarthy, J. Parameter estimation and identifiability analysis for a bivalent analyte model of monoclonal antibody-antigen binding. *Anal. Biochem.* 2023.
4. **Nguyen, K.**; Rutter, E. M.; Flores, K. Estimation of parameter distributions for reaction-diffusion equations with competition using aggregate spatiotemporal data. *Bull. Math. Biol.* 2023.
5. Reckell, T.*; **Nguyen, K.***; Phan, T.; Crook, S.; Kostelich, E.; Kuang, Y. Modeling the synergetic properties of drugs in hormonal treatment for prostate cancer. *J. Theor. Biol.* 2021.
6. Phan, T.; **Nguyen, K.**; Sharma, P.; Kuang, Y. The impact of intermittent androgen suppression therapy in prostate cancer modeling. *Appl. Sci.* 2019.

Presentations

Oral Presentations

1. Mathematical Modeling of Multicellular Tumor Spheroids Quantifies Inter-Patient and Intra-Tumor Heterogeneity. *The Triangle Area Graduate Mathematics Conference (TAGMaC)*; March 2024; Chapel Hill, North Carolina, USA.
2. Leveraging topological data analysis for parameter estimation of an agent-based model. *Triangle Computational and Applied Mathematics Symposium (TriCAMS)*; Lighting talk; November 2023; Durham, North Carolina, USA.
3. Quantifying fluidization patterns in mesenchymal cell populations using topological data analysis and agent-based modeling. *The Triangle Area Graduate Mathematics Conference (TAGMaC)*; September 2023; Raleigh, North Carolina, USA.
4. Leveraging topological data analysis for parameter estimation of an agent-based model of collective motion. *10th International Congress on Industrial and Applied Mathematics (ICIAM)*; August 2023; Tokyo, Japan.
5. Parameter estimation and identifiability of bivalent analyte binding model for kinetics data of HIV monoclonal antibody-antigen interaction. *Duke Global Health Discovery Collaboratory Meeting*; January 2023; Durham, North Carolina, USA (virtual).

6. Parameter estimation and identifiability of bivalent analyte binding model for kinetics data of HIV monoclonal antibody-antigen interaction. *Duke Center for Human Systems Immunology Weekly Meeting*; April 2022; Durham, North Carolina, USA (virtual).
7. Bivalent analyte binding model fitting for high throughput kinetics data of HIV mAb-antigen interaction. *17th Annual Duke Center for AIDS Research Virtual Fall Scientific Retreat*; Impact talk; October 2021; Durham, North Carolina, USA (virtual).
8. Lemma suggesting in prototype verification system. *Safety Critical Avionics Systems Branch, NASA Langley Research Center*; August 2020; Hampton, Virginia, USA (virtual).

Poster Presentations

1. Quantifying fluidization patterns in mesenchymal cell populations using topological data analysis and agent-based modeling. *Emerging Directions Workshop, National Institute for Theory and Mathematics in Biology*; February 2024; Chicago, Illinois, USA.
2. Quantifying fluidization patterns in mesenchymal cell populations using topological data analysis and agent-based modeling. *Predictive Modeling in Biology and Medicine Conference*; November 2023; Riverside, California, USA.
3. Leveraging topological data analysis for parameter estimation of an agent-based model. *Triangle Computational and Applied Mathematics Symposium (TriCAMS)*; November 2023; Durham, North Carolina, USA. **Best poster award.**
4. Estimation of parameter distributions for reaction-diffusion equations with competition using aggregate spatiotemporal data. *10th International Congress on Industrial and Applied Mathematics (ICIAM)*; August 2023; Tokyo, Japan.
5. A mathematical model for binding kinetics of binary mixtures of monoclonal antibodies interacting with antigen presenting multiple epitopes. *18th Annual Duke Center for AIDS Research Virtual Fall Scientific Retreat*; September 2022; Durham, North Carolina, USA.

Awards, Honors and Scholarships

APRIL, 2024	Winton-Rose Award, Department of Mathematics, North Carolina State University
AUG, 2021 - PRESENT	Graduate Research Fellowship, National Science Foundation (NSF)
2020 - 2023	H.T. Banks Graduate Award, North Carolina State University
JAN, 2020 - MAY, 2020	NSF Mathematical Biology Research Training Group Fellowship, North Carolina State University
AUG, 2019 - MAY, 2020	Lucas Best First Year Student, Biomathematics Graduate Program, North Carolina State University
AUG, 2019 - MAY, 2020	Center for Research in Scientific Computation Fellowship, North Carolina State University

Teaching, Leadership, and Mentoring Experience

MAY, 2023 - JUL, 2023	DRUMS Mentor Assistant , NORTH CAROLINA STATE UNIVERSITY Helped mentoring a group of 4 undergraduate students.
AUG, 2021 - MAY, 2023	Mentor , AMS MENTORING Mentored first year graduate students through AMS MentoRing program organized by AMS Graduate Student Chapter at NCSU.
AUG, 2020 - MAY, 2023	Mentor , UNDERGRADS UNION GRADS Mentored undergraduate students through Undergrads Union Grads program organized by the NCSU Math Department.
MAY, 2021 - MAY, 2022	Treasurer , BIOMATHEMATICS GRADUATE STUDENT ASSOCIATION Handled and kept track of the finances.
AUG, 2019 - MAY, 2021	Graduate Teaching Assistant , NORTH CAROLINA STATE UNIVERSITY Led three weekly Calculus III recitation sessions for over 100 students. Hold weekly office hours. Wrote and graded weekly homework. Graded exams and provided detailed solutions.
MAY, 2019 - JUL, 2019	REU Mentor Assistant , ARIZONA STATE UNIVERSITY Helped mentoring a group of 4 undergraduate students.
AUG, 2018 - MAY, 2019	Lead Mathematics Tutor , ARIZONA STATE UNIVERSITY Managed the mathematics tutor team within the tutoring center. Prepared and hosted content training for tutors. Collaborated with other leads to develop professional development training and virtual training for tutors.
JAN, 2018 - AUG, 2018	Mathematics Tutor , ARIZONA STATE UNIVERSITY Guided students through math, computer sciences, chemistry and physics questions, helped them understand the concepts of the subjects. Assisted lead tutor during math content training.

Certificates

Data Science Math Skills, COURSERA

Professional Associations

American Mathematical Society (AMS)
Models of Infectious Disease Agent Study (MIDAS)
Society for Industrial and Applied Mathematics (SIAM)

Professional Outreach and Service

Reviewer: Journal of the Royal Society Interface
Seminar: NSF GRFP Success Strategies: Writing Effective Essays at Biomathematics Seminar

Technical Skills

Programming Languages : MATLAB, Python, R
Frameworks and Libraries : PyTorch, Keras, Tensorflow, Scikit-learn, Pandas
Others : Prototype Verification System.