Kyle C. Nguyen

WEBPAGE ⇗: https://kcnguyen3191.github.io/
GITHUB ⍥: https://github.com/kcnguyen3191
LINKEDIN in: https://www.linkedin.com/in/kyle-c-nguyen/
EMAIL ✉: kcnguye2@ncsu.edu

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

MAY, 2024 - PRESENT

Postdoctoral Appointee, SANDIA NATIONAL LABORATORIES
- Developed AI-driven surrogate models for infectious disease simulations using neural ordinary differential equations, advancing predictive modeling in large-scale systems.
- Automated workflows with Bash scripts in high-performance computing environments, reducing simulation runtime by 50% and improving computational efficiency.
- Collaborated with interdisciplinary teams to integrate diverse data sets and improve simulation accuracy.

AUG, 2019 - MAY, 2024

Graduate Research Assistant, FLORES LAB AT NCSU
- Developed an automated cell tracking pipeline for movies using convolutional neural networks (CNNs) in Python with the PyTorch framework, achieving a 10% increase in true positive rate compared to traditional methods.
- Implemented YOLO-Net for radar imaging classification, achieving above 90% accuracy in object detection tasks.
- Conducted transfer learning using pre-trained CNN models (AlexNet, VGG, ResNet, DenseNet) for worm age classification with over 70% accuracy, integrating guided back-propagation and guided Grad-CAM for explainable AI.
- Designed and implemented a CNN-based algorithm in PyTorch for neuron tracing in worm images, leveraging a region-growing approach to enhance accuracy and segmentation performance.
- Developed a method for the estimation of population-level parameters of a partial differential equation using physics-informed neural networks (PINNs) and linear mixed-effect modeling techniques in Python with PyTorch framework, resulting in a 1-2% improvement in accuracy for three different parameters.

MAY, 2022 - AUG, 2022

Quantitative Research Intern, DUKE UNIVERSITY SCHOOL OF MEDICINE
- Developed a mathematical model for binding kinetics of binary mixtures of monoclonal antibodies interacting with antigen-presenting multiple epitopes.
- Performed parameter estimation and compared the new model's performance to previous models, demonstrating its superiority.

MAY, 2021 - AUG, 2021	**Quantitative Research Intern**, DUKE UNIVERSITY SCHOOL OF MEDICINE - Developed an open-source R package for bivalent analyte binding kinetics and performed parameter estimation on data of a broadly neutralizing HIV-1 mAb binding to the HIV-1 envelope glycoprotein gp120. - Conducted parameter identifiability analysis, advising experimentalists that extending the dissociation phase to 3 times longer would yield reliable parameter estimation.
MAY, 2020 - AUG, 2020	**Machine Learning Intern**, NASA LANGLEY RESEARCH CENTER - Developed a new feature for NASA's Prototype Verification System (PVS) library to convert proof formulas to prenex normal form using object-oriented programming in Common Lisp. - Created tokenizers that convert prenex normal form of proof formulas to tokens. - Developed a CNN-based lemma suggester for the PVS library, which takes tokens of proof formulas as inputs and suggests the top-k relevant lemmas.
MAY, 2018 - AUG, 2018	**Undergraduate Research Assistant**, ARIZONA STATE UNIVERSITY - Prostate Cancer: Modeled the dynamics of prostate cancer tumors under intermittent androgen suppression therapy, fitting and forecasting patients' prostate-specific antigen data. Studied the dynamics of prostate cancer drugs and incorporated drug injections into the model. - Melanoma: Studied a previous model that quantified environment-mediated drug resistance in melanoma and developed a simplified mathematical model that can fit experimental data.

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. *npj Syst Biol Appl.* 2025.

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. Applications of machine learning and topological data analysis in parameter estimation and developing surrogate models for agent-based models. *Theoretical and Biological Division Seminar, Los Alamos National Laboratory*; March 2025; Los Alamos, New Mexico, USA (virtual).

2. Model-form error correction using universal differential equations for an agent-based model of infectious disease. *SIAM Conference on Computational Science and Engineering (CSE25)*; March 2025; Fort Worth, Texas, USA.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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).

8. 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).

9. 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).

10. 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

Aug, 2021 - Aug, 2024	**Graduate Research Fellowship**, National Science Foundation (NSF)
Apr, 2024	**Winton-Rose Award for Research Excellence**, Department of Mathematics, North Carolina State University
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

Feb, 2025 - Present	**Data Science Co-mentor**, East Tennessee State University Co-mentored two groups of Master's students for two semester-long scientific machine learning projects.
Jan, 2025 - Present	**Data Science Co-mentor**, North Carolina State University Co-mentored a group of Master's students in the Foundations of Data Science for a semester-long generative artificial intelligence projects.
Jun, 2024 - Present	**Math and Analytics Co-mentor**, Sandia National Laboratories Co-mentored a PhD student intern through the Math and Analytics (MARTIANS) program.
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

Natural Language Processing (NLP) Specialization, Coursera
Generative Adversarial Networks (GANs), Coursera
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, SIAM Undergraduate Research Online
Seminar: NSF GRFP Success Strategies: Writing Effective Essays at Biomathematics Seminar

Technical Skills

Programming Languages :   MATLAB, Python, R, Julia
Data science framework :   PyTorch, Keras, Tensorflow, Scikit-learn, Pandas, Lux
Others :   Prototype Verification System.