Stanley Nicholson

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Education

GPA

Illinois Institute of Technology (IIT) **BS: 3.96/4.0, MS: 4.0/4.0**
– Joint Bachelor and Masters of Science in Applied Mathematics
– Minors in Computer Science and Bioinformatics
– Camras Scholarship (Full-tuition)

University of Wisconsin-Parkside (UWP) **4.0/4.0**
– Early College Credit Program (High school Dual Enrollment)

Lakeview Technology Academy **5.8/5.0**
– Valedictorian

Relevant Coursework

Real and Complex (Audited) Analysis Functional Analysis Measure Theoretic Probability Linear Algebra I/II
Partial and Ordinary Differential Equations Stochastic Dynamics Numerical ODE, PDE, and Linear Algebra
Abstract Algebra Topology (Audited) Mathematical Statistics

Cell Biology Biochemistry Computational Biochemistry Bioinformatics Genetics

Electricity and Magnetism Continuum Mechanics (Audited) Digital Signal Processing

Research Interests

Mathematical Biology Stochastic Processes PDE Multiscale Modelling

Experience

Researcher in Mathematical and Computational Biology **December 2021 – Present**

- Developing and establishing mechanical theory of biochemical interactions using stochastic estimation of molecular dynamics simulations with Bob Eisenberg and David Minh at IIT
- Employing computational packages such as **NumPy, MATLAB, OpenMM** on UCSD's supercomputing center Expanse to generate and analyze molecular dynamics simulations
- Collaborating with postdoc at the NIH's National Institute on Drug Abuse to develop theory of opioid binding to the -opioid receptor using the coherence function
- Presenting paper in arXiv (https://arxiv.org/abs/2211.16372) at Joint Mathematical Meeting 2023

Co-founder and Lead Engineer of Receptify **October 2021 – May 2022**

- Cofounded the startup Receptify: a student-first web-based platform meant to provide justice and a clear path to resources for survivors of sexual violence on college campuses
- Awarded Socially Responsible Modelling (SoReMo) Fellowship to research feature set and design parameters for web app to support survivors of sexual violence
- Secured $19,000 in grant support from the Grainger Foundation, the Kaplan Institute, and the SoReMo Initiative to develop the platform and forge a partnership with IIT
- Initiated and attempted $300,000 joint IIT-Receptify DOJ federal grant to pilot software with IIT

Researcher in COVID Drug Modeling **August 2021 – December 2021**

- Established a novel and more applicable statistical technique for analyzing drug-dose response for COVID Moonshot project with David Minh and Lulu Kang at IIT
- Demonstrated theoretical robustness of statistical model through numerical simulations
- Awarded $1000 RES-Match grant from IIT's Pritzker Institute of Biomedical Science and Engineering
- Paper in progress, see **Publications**

Researcher in Bridge-Pedestrian Dynamics **June 2021 – August 2021**

- Developed and simulated coupled bridge-pedestrian dynamics model with pedestrian traffic model under supervision of Igor Belykh at Georgia State University
- Demonstrated that increases in pedestrian traffic lead to dangerous bridge instability
- Perused and analyzed current literature for methods to both develop and curate model
- Lead collaboration and meetings between three other REU participants alongside Ph.D. student and research professors
- Presenting paper in progress at SIAM Conference on Applications of Dynamical Systems 2023, see **Publications**

Researcher in Stochastic Modeling and Machine Learning **September 2020 – June 2021**

- Applied stochastic modeling to transcription factor regulation with Jinqiao Duan at IIT and Romit Maulik at Argonne National Laboratory
- Utilized machine learning algorithms (normalizing flows) via **PyTorch** and **NumPy** to analyze noisy high-dimensional data
- Awarded $1000 RES-Match grant from IIT's Pritzker Institute of Biomedical Science and Engineering
- Presented work at Symposium for Undergraduates in the Mathematical Sciences (SUMS) conference at Brown University on March 14, 2021

Developer for Single Cell RNA Data Visualizer **June 2020 – September 2020**

- Designed early stages of single cell RNA-sequence data visualizer with Dr. Natalia Maltsev at the University of Chicago
- Implemented web app for analyzing and visualizing RNA-Seq data using **pandas**, **NumPy, Matplotlib**, **chart.js**, and **d3.js**

Bacteriophage Research Project (HS) **September 2018 – February 2019**

- Researched effect of temperature on bacteriophage infectivity in *Mycobacterium smegmatis* under guidance of Carthage College professor
- Presented poster in biology project fair

Awards

- Passed IIT's graduate qualifying exams in Applied Analysis and Probability at Ph.D. level
- Outstanding Graduate Research Award for IIT's Annual Student Poster Day (Link to my poster)

- First Place ($5000) in aSweatLife Pitch Competition for Receptify
- Third place ($5000) in Grainger's Technology Innovation Competition for Social Good for Receptify
- Third place ($2000) in Audience Choice Award for Kaplan Institute Pitch Tank for Receptify

Technical Skills

Python (*6 years*), MATLAB (*3 years*), LaTeX (*3.5 years*), React, Java, C#, SQL (*1.5 years*)

Publications

- S. Nicholson, D. Minh, B. Eisenberg, *"H-bonds in Crambin: Coherence in an α-helix"* (https://arxiv.org/abs/2211.16372)
- *In Progress:* V. La, S. Nicholson, A. Haneef, L. Kang, D. Minh, *"Including control data in fits to concentration-response curves improves estimates of half-maximal concentrations"*
- *In Progress*: K. Daley, S. Nicholson, I. Jibre, A. Champneys, and I. Belykh, *"Crowd heterogeneity-induced instabilities of footbridges"*

Presentations

- October 2022 – Midwest Enzyme Conference: *"H-bonds in Crambin: Coherence in an α-helix"*
- October 2022 – St. Jude National Undergraduate Symposium: *"H-bonds in Crambin: Coherence in an α-helix"*
- October 2022 – UT Southwestern Computational Biology Program Retreat: *"H-bonds in Crambin: Coherence in an α-helix"*
- November 2022 – IIT SIAM Chapter: "*My Favorite Theorem -- The Feynman-Kac formula: the Bridge between Stochastic and Partial Differential Equations*" (Link to video)
- January 2023 – Joint Mathematical Meeting: *"Linear Systems Analysis of Atomic Interactions using Molecular Dynamics"*
  - Pi Mu Epsilon Undergraduate Student Poster Session I
  - AMS-BIO SIGMAA Special Session on Undergraduate Research Activities in Mathematical and Computational Biology II
- May 2023 – SIAM Conference on Applications of Dynamical Systems: *"Crowd heterogeneity-induced instabilities of footbridges"*
  - Minisymposium on "Disorder-promoted cooperative dynamics"

Extracurricular

Teaching Assistant for Multivariate Calculus **August 2022 – Present**

- Teach a recitation/discussion section and grade quizzes for 50+ students

President of the Machine Learning Club **August 2021 – Present**

- Organize bi-weekly ML seminars and career development workshops for 200+ person club
- Hosted hackathon in 2021 and forging partnerships with Chicago-area ML/AI student organizations such as Northwestern and companies like Blue Cross Blue Shield

Member of Society for Industrial Applied Mathematics Chapter **August 2021 – Present**

- Organize, plan, and participate in weekly meetings on mathematics and guest lectures