

Jonathan Morgan - Ph.D., Biophysics at Notre Dame.

CONTACT INFORMATION	Biophysics Program University of Notre Dame 201G Crowley Hall, Notre Dame, IN, 46556.	Phone: +1 (940) 799-1238 E-mail: jmorga15@nd.edu Citizenship: U.S.
OBJECTIVE STATEMENT	My interests include stochastic simulation, probability/statistical inference, graph neural networks, and reinforcement learning. In my previous work, I implemented the stochastic simulation of a kinetic proof-reading model that incorporated receptor-ligand interactions, MV scanning of an opposing cell surface, cell signaling, and a time-constrained interface between cells. In addition, I evaluated the relevant statistics of the model and worked with collaborators to interpret the biological significance. In another project, I focused on more rigorous analysis, such as finding a general formula for the first passage time distribution and exploring the extreme statistics of a T-cell activation model. My current project involves the application of recurrent neural networks and reinforcement learning to models of ligand discrimination in T-cells. This involves simulating the T-cell environment as a partially observable Markov decision process, statistical analysis of stochastic temporal signals, and optimization of machine learning models.	
EDUCATION & PREPARATION	US Army 2004 - 2011 B.Sc Mathematics Madonna University, Livonia, MI, 2016. M.Sc Applied Mathematics, University of Houston, 2016-2018 (Transferred to Ph.D. at U. Notre Dame.) Ph.D., Biophysics, University of Notre Dame, South Bend, IN, 2018-2023. Advisor: Prof. Alan E. Lindsay.	
ACADEMIC COURSES	Graduate coursework: Advanced Linear Algebra, Scientific Computing, Ordinary and Partial Differential Equations, Mathematical Biology, Physics of Cells, Molecular Biophysics, Biophysical Methods, Principles of Biochemistry, Patterns of Life, Spatial and Temporal Statistics in Environmental Science, Applied Probability, Inferential Statistics, Stochastic Analysis, Bayesian Statistics, Deep Learning with Graphs, Data Mining, and Statistical Learning.	
AWARDS	Sigma Zeta Honors Society at Madonna University, 08/2014 - 05/2016. Dean's List, Madonna University, 08/2013 - 05/2016. Meritorious Winner of the Interdisciplinary Contest in Mathematical Modeling, 02/2015 and 02/2016. Top 10 Image Contest Finalist (Biophysical Society), 02/2020. NSF-GVSP award support 2019-2023	
PUBLICATIONS	Jonathan Morgan, Johannes Pettmann, Omer Dushek, and Alan E. Lindsay <i>T-cell microvilli simulations show operation near packing limit and modulation of antigen recognition.</i> Biophysical Journal Jonathan Morgan and Alan E. Lindsay <i>Modulation of antigen discrimination by duration of immune contacts in a kinetic proofreading model of T cell activation with extreme statistics.</i> bioRxiv	
PRESENTATIONS	Poster Presentation: Biophysical Society Annual Meeting, 02/2020 Oral Presentation: Academic and Research Progress Examination, 03/2020 Poster Presentation: Notre Dame Biophysics Recruitment Dinner 01/2021 Poster Presentation: Quantitative Biology Retreat 04/2022 Poster Presentation: NJIT Conference on Frontiers in ACMS 07/2022 Oral Presentation: Biophysics Retreat 10/2022 Oral Presentation: Dissertation Defense 06/2023	
RESEARCH EXPERIENCE	REU Program Texas A and M: Cryo-Electron Microscopy 06/2015 10-Week Rotation Notre Dame: Theoretical Evolution of Self-Replicating RNA Molecules 08/2018-10/2018 10-Week Rotation Notre Dame: Formation of Modular Structure in Neural Networks 10/2018-12/2018 Research Project: Stochastic Simulations of T-cell Activation and Microvilli Scanning 01/2019-09/2021 Research Project: First Passage Time and Extreme Statistics of T-cell Receptor Activation 09/2021-06/2023 Research Project: T-cell antigen discrimination as a POMDP 01/2023-Present	