Niksa Praljak

The University of Chicago: niksapraljak1@uchicago.edu
Personal: niksapraljak1@gmail.com
Github: PraljakReps

RESEARCH INTERESTS: Biophysics, protein design, synthetic biology, deep generative modeling, active learning, Bayesian optimization, semi-supervised learning, computational biology, statistical mechanics, computational physics, and microfluidics

EDUCATION

University of Chicago — Autumn 2020 - Present
Chicago, Illinois
PhD Student: Biophysical Sciences Graduate Program
Thesis: Data-driven protein design: integrating deep generative modeling with synthetic biology
PhD co-advisors: Professors Andrew Ferguson and Rama Ranaganathan

Case Western Reserve University — Autumn 2018 - Summer 2020
Cleveland, Ohio
Department of Physics: Visiting Student and Researcher
GPA: 4.0
Research: Integrating computer vision with protein adhesion-based microfludic assays for sickle cell patient diagnostics
Advisors: Drs. Michael Hinczewski (Theoretical Biophysics Research Group) and Umut Gurkan (CASE Biomanufacturing and Microfabrication Laboratory)

Cleveland State University — Autumn 2016 - Spring 2020
Cleveland, Ohio
Undergraduate Majors: Honors Mathematics and Honors Physics
Summa Cum Laude (**COSHP Valedictorian**)
Undergraduate Honors Thesis: Pulsatile Flow Through Idealized Renal Tubules

HONORS & AWARDS

- Finalist for the Grier Prize for Innovative Research in Biophysics — 2021
- The University of Chicago Duchossois Family Institute Fellow — 2021
- National Science Foundation (NSF) Graduate Research Fellowship — 2020
- College of Science and Health Professions (COSHP) Valedictorian — 2020
- OSAPS Research Travel Award — 2019
- CSU College of Graduate Studies Research Travel Award — 2019
- Undergraduate Physics Poster Award, 2019 COSHP Research Day — 2019
- Soft Matter REU Travel Award — 2018
- Mandel Honors Scholarship — 2018
- Ann M. Frangos Mathematics Award (first-ever CSU recipient) — 2017
- Jearl Walker Physics Scholarship — 2017

INDUSTRY EXPERIENCE

Latch Bio — Spring 2022 - Present
Role: Biocomputing Ambassador

- Helping Latch Bio to spread best-practice bioinformatics tooling throughout the scientific community.

PATENTS

Title: DATA-DRIVEN PROTEIN DESIGN USING NORMALIZING FLOWS AND LATENT-CONDITIONED DILATED CASUAL CONVOLUTIONS
Filing Date: February 28, 2022
Inventors: **Niksa Praljak**, Andrew L. Ferguson
U.S. Provisional Patent Application No.: 63/314,898

PUBLICATIONS

Lian* X., **Praljak*** **N.,**, Subramanian* K. S., Ferguson A., & Ranganathan R., "Deep learning-enabled design of synthetic orthologs of a signaling protein", *In preparation* (2022).

- Equal contribution (∗).

Praljak N.,& Ferguson A., "Auto-regressive WaveNet Variational Autoencoders for Alignment-free Generative Protein Design and Fitness Prediction", Accept at *ICLR MLDD* (2022).

Praljak N., Iram S., Goreke U., Singh G., Hill A., Gurkan U.A., & Hinczewski M., "Integrating deep learning with microfluidics for biophysical classification of sickle red blood cells adhered to laminin", *PLoS Comput. Biol.* 17, no. 11 (2021).

Praljak N., Shipley B., Gonzalez A., Goreke U., Iram S., Singh G., Hill A., Gurkan U.A., & Hinczewski M., "A Deep Learning Framework for Sickle Cell Disease Microfluidic Biomarker Assays", *Blood* 136 (Supplement 1), 15 (2020).

Praljak N., Ryan S.D., & Resnick A., "Pulsatile Flow Through Idealized Renal Tubules: Fluid-Structure Interaction and Dynamic Pathologies." *Math Biosci Eng*, 2020, 17(2): 1787-1807

CONFERENCES & PRESENTATIONS

Praljak N., "Autoregressive WaveNet Variational Autoencoders for Alignment-free Generative Protein Design and Fitness Prediction" Poster presentation delivered at the ICLR Machine for Drug Discovery workshop, virtual, April 29th, 2022.

Praljak N., "Data-driven protein design" Oral presentation delivered at the Grier Prize Symposium, University of Chicago, December 7th, 2021.

- Fortunate enough to present to over 200 attendees.

Praljak N., Shipley B., Gonzalez A., Goreke U., Iram S., Singh G., Hill A., Gurkan U.A., Hinczewski N., "A Deep Learning Framework for Sickle Cell Disease Microfluidic Biomarker Assays" Oral presentation delievered at the 62nd American Society of Hematology (ASH) Annual Meeting and Exposition, virtual meeting, December 5-8, 2020.

Praljak N., Iram S., Singh G., Hilis A., Goreke U., Gurkan U., & Hinczewski M. Investigating Heterogeneity within Sickle Cell Disease Using Deep Learning. Poster presentation delivered at the Fall 2019 Ohio-Region Section of the American Physical Society, Flint, MI, October 11-12, 2019.

Praljak N., Iram S., Singh G., Goreke U., Gurkan U., & Hinczewski M. Deep Learning for Automatic Patient-Specific Adhered Sickle Cell Image Segmentation. Poster presentation delivered at Conference on Machine Intelligence for Medical Imaging 2019, Austin, TX, September 22-23, 2019.

Praljak N., Ryan S.D., & Resnick A. Pulsatile Flow Through Single Idealized Renal Tubules: Fluid-Structure Interaction and Dynamics Pathologies. Poster presentation delivered at 15th annual College of Sciences and Health Professions Research Day 2019, Cleveland, OH, April 26, 2018.

- Awarded best poster and presentation.

Praljak N., Ryan S.D., & Resnick A. Pulsatile Flow Through Multi-Coupled Idealized Renal Tubules: Fluid-Structure Interaction and Dynamics Pathologies. Poster presentation delivered at American Physical Society March Meeting 2019, Boston, MA, March 4-8, 2018.

Praljak N., & Resnick A. Analysis of Pulsatile Flow through an Elastic Tube using Computational Methods. Oral and poster presentation delivered at Ohio Physiological Society 33rd Annual Meeting, Cincinnati, OH, September 28-29, 2018.

Praljak N., & Resnick A. Analysis of Pulsatile Flow through an Elastic Tube using Computational Methods. Poster presentation delivered at 15th Annual Northeast Ohio Undergraduate Research Symposium, Kent, OH, August 2, 2018.

TEACHING EXPERIENCE

Physics Lab Assistant 2018 - 2019
Department of Physics, Cleveland State University
Supervisors: Dr. Petru Fodor and Tara Peppard

- Setting up lab equipment and experiments for University Physics I & II (i.e., Classical Mechanics and Electromagnetism).
- Teaching physics experiments and lab techniques to freshman undergraduate students, while also grading lab reports.

Mathematics Tutor 2017 - 2018
Mathematics Learning Center, Cleveland State University
Supervisors: Dr. Jason Stone

- Tutoring undergraduates in various mathematical topics that particularly range from Calculus to Statistics.

STEM Peer Teacher (SPT) 2016 - 2018
Operation STEM and National Science Foundation
Cleveland State University
Supervisors: Drs. Susan Carver and John Holcomb

- Improving the retention rate of STEM students at inner-city public universities.
- Increasing the number of minority students successfully furthering their STEM education.
- Teaching the discussion sections as I saw fit, allowing me to tailor my lessons to the specific needs of each of my students.

BIOREPS (**BIO**physical **RE**search **P**roblem **S**ets) 2018

Case Western Reserve University
Principal Investigator: Dr. Michael Hinczewski

- Creating open-source and easily shareable biophysics homework sets based on peer-reviewed publications and supported by the National Science Foundation.

WORKSHOPS & SUMMER SCHOOLS

AI + Science Summer School at University of Chicago 2022
Aalto Seminar on Advances in Probabilistic Machine Learning 2021
Stanford Graph Learning Workshop, *Sept 16, 2021* 2021

MENTORSHIP & COMMUNITY SERVICE

The Leadership Alliance, *Graduate mentor*
Machine Learning for Science and Engineering Club, *President*
Society of Physics Students, *Outreach organizer and Math liaison*
Math Club, *Physics Liasion*
Jack, Joseph, & Morton Mandel Honors College, *Upper-Division Honors Mentor*
Arts and Humanities Alive (AHA!) Festival, *organizer*
Model UN, *Chair Representative*
Cuyahoga Community Library, *1-2-3 Read and Homework Center Volunteer*

COMPUTATIONAL SKILLS

- Programming Languages: Python (daily), SQL, C++, MATLAB, Mathematica and Julia
- Machine and deep learning tools: PyTorch (Daily), PyTorch Lightning, Tensorflow, Keras, Rapids.ai, BoTorch (Daily), GPyTorch (Daily), MXNet, Sklearn, JAX
- Tools: Git (Daily), Bash (Daily), Vim (Daily), Tmux (Daily), PyMol, Biopython, NumPy (Daily), Google Colab, Latex, Inkspace, Microsoft Office, Gmail and Google Drive
- Past Programming Languages: Java