

VEDANT SACHDEVA

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EDUCATION

University of Chicago

August 2017 - June 2022

Thesis Title: Predictive Strategies in Time-Varying Environments

Advisors: Arvind Murugan (amurugan@uchicago.edu), Stephanie Palmer (sepalmer@uchicago.edu)

Ph.D in Biophysical Sciences

William Rainey Harper Dissertation Fellow

Radix Trading Fellow

Rutgers University, New Brunswick

September 2013 - May 2017

Thesis Title: Linking Restricted Boltzmann Machines to Generalized Hopfield Models for Pattern Recognition

Advisor: Anirvan Sengupta (anirvans@physics.rutgers.edu)

B.S. in Physics with Highest Honors, Mathematics - Summa Cum Laude

Presidential Scholar

PROFESSIONAL EXPERIENCES

Research Scientist

July '22 - Present

Evozyne

- Trained and analyzed variational autoencoders to understand how latent spaces are organized for protein families using minimal data models to elucidate how VAEs learn, working primarily in Tensorflow and pyTorch
- Leveraged understanding from the above to propose and rigorously test a curriculum learning-based machine learning method
- Developed neural process regression as a potential generative model for new proteins
- Developing discrete diffusion as a potential generative model for new proteins
- Developed several analysis pipelines used by other members of the team to perform QC on data streams

Doctoral Researcher

Feb '18-June '22

University of Chicago - PhD Program in Biophysical Sciences

- Utilized information theoretic measures to make predictions on time-series data
- Used probabilistic graph models and Markov Chain Monte Carlo methods to model antibody binding affinities
- Analyzed high throughput sequencing data to identify mutations and explore selection functions for an experimental yeast system
- performed evolution experiments in novel experimental yeast system, OrthoRep
- Published 3 first author papers, with 1 more in preparation
- Co-referred a paper for Physical Review X
- Classroom experience with GPU optimization, and CUDA C++

PUBLICATIONS

M. Falk, J. Wu, A. Matthews, **V. Sachdeva**, N. Pashine, M. Gardel, S. Nagel, A. Murugan. Learning to learn: Non-equilibrium design protocols for adaptable materials. Published in Proceedings of the National Academy of Sciences in June 2023.

V. Ngampruetikorn*, **V. Sachdeva***, J. Torrence, J. Humplik, D. Schwab, S.E. Palmer. Inferring Couplings in Networks Across Order-Disorder Phase Transitions. Published in Physical Review Research in June 2022.

V. Sachdeva, A. Walczak, T. Mora, S.E. Palmer, Optimal Prediction with Resource Constraints Using the Information Bottleneck. Published in PLoS Computational Biology in March 2021.

V. Sachdeva*, K. Husain*, J. Sheng, S. Wang, A. Murugan. Tuning Environmental Timescales to Evolve and Maintain Generalists. Published in Proceedings of the National Academy of Sciences in May 2020.

SKILLS

Coding: Python, MatLab, some proficiency with C++, R

Mathematics: Information Theory, Computational Modeling, Statistics, Statistical Physics, and Regression Methods

Experiment: Flow cytometry, yeast culturing, cell transformations, and high throughput sequencing

Additional language proficiencies: Hindi and French

PRESENTATIONS AND TALKS

Finding the Optimal Observer Using the Information Bottleneck Framework. Talk. CNRS-UChicago Workshop. April 2021.

Predicting the future from the past in visual object motion: optimal representations of mixed stochastic/deterministic trajectories. Talk. American Physical Society, March Meeting. March 2020.

Predicting the future from the past in visual object motion: Optimal representations of mixed stochastic/deterministic trajectories. Poster. Society for Neuroscience. October 2019.

Tuning Evolution Towards Generalists via Resonant Environmental Cycling. Talk. American Physical Society, March Meeting. March 2019.

Pattern Recognition in Restricted Boltzmann Machines. Poster. Quantitative Biology, June 2017.

SUPPORTING EXPERIENCES

Visitor

June '17-August '17

Center for Computational Biology - Flatiron Institute

- Used statistical physics tools to explore phase transitions in machine learning algorithms
- Participated in journal clubs connecting machine learning, neuroscience, and physics

Director of Administration

Jan '15 - December '15

Institute of Domestic and International Affairs

- co-managed a team of 80 to provide a non-traditional educational experience for 1000 high school students on international public policy
- led a team of 8 individuals to prepare visual aids, manage registration, and provide logistical support throughout the conference

Part-time Lecturer

Fall '14 - Spring '17

Department of Physics and Astronomy - Rutgers University, New Brunswick

- Responsible for teaching a second-year engineering physics lab course.
- Expectations include curriculum feedback, course preparation, teaching using both blackboard and discussion-based methods, and student work evaluation.

NBA Data Analytics Hackathon Participant

September 24th, 2016

NBA

- Developed a new metric for player defense using granular data on player position
- Integrated computational modeling by developing a value for every position on the court as a function of distance from the basket

Peer Instructor

September '15 - Spring '17

Aresty Research Center for Undergraduates - Rutgers University, New Brunswick

- Responsible for fostering increased involvement in research for undergraduates
- Expectations include creating a forum for new researchers to voice concern, teaching researchers conflict resolution methods, teaching communication methods in research, and explaining the role of research in society to young researchers.

Vice President - Society of Physics Students

May '16-April '17

Rutgers University, New Brunswick

- Responsible for event planning and club activities with the President, Treasurer, and Secretary