

# VEDANT SACHDEVA

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## EXECUTIVE STATEMENT

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I am researching dimensionality reduction methods with an intent to understand how to predict out-of-sample phenomenon. In particular, I focus on variational autoencoders trained on protein sequences. Occasionally, I contribute to open source software packages, such as FAMSA or Biopython.

## EDUCATION

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### University of Chicago

June 2022

Thesis Title: Predictive Strategies in Time-Varying Environments

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

Ph.D, Biophysical Sciences

William Rainey Harper Dissertation Fellow

Radix Trading Fellow

### Rutgers University, New Brunswick

May 2017

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

Presidential Scholar

## PROFESSIONAL EXPERIENCES

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### Evozyne

July '22 - Present

*Research Scientist*

- Trained and analyzed variational autoencoders to understand how latent spaces are organized for protein families using minimal data models to elucidate how VAEs learn.
- Proposed two distinct methods for improving generative capacity of AI models for protein design, using insights from minimal models.
- Developed several analysis pipelines using bioinformatics tools for QC methods

### University of Chicago - PhD Program in Biophysical Sciences

Feb '18 - June '22

*Doctoral Researcher*

- 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 in particular genes
- tracked population statistics in experimental yeast biology systems
- Published 3 first author papers, with 1 more in preparation
- Co-refereed a paper for Physical Review X
- Classroom experience with GPU optimization and CUDA C++

### Visitor

June '17-August '17

*Center for Computational Biology - Flatiron Institute*

- Used statistical physics tools to explore a machine learning algorithm called a Restricted Boltzmann Machine
- 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

## PUBLICATIONS

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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 on arXiv November 2022.

**V. Sachdeva**, T. Mora, A. Murugan, S.E. Palmer, A. Walczak. Evolving Optimal Constrained Sensory Encoding Schemes in State-Space Model Frameworks. Thesis Chapter.

V. Ngampruetikorn\*, **V. Sachdeva\***, J. Torrence, J. Humplik, D. Schwab, S.E. Palmer. Inferring Couplings in Networks Across Order-Disorder Phase Transitions. Published on arXiv August 2021.

**V. Sachdeva**, A. Walczak, T. Mora, and 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, and A. Murugan. Tuning Environmental Timescales to Evolve and Maintain Generalists. Published in Proceedings of the National Academy of Sciences in May 2020.

## SKILLS

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

Mathematics: Information Theory, Maximum-Entropy methods, Statistical Physics, Computational Modeling, Statistics, Regression Methods

Experiment: Flow cytometry, yeast culture, cell transformation, high throughput sequencing

## PRESENTATIONS AND TALKS

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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.