# ASHKA SHAH

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## EDUCATION

**University of Chicago** *Exp Graduation: 2025*
Ph.D. in Computer Science

**Harvey Mudd College** *May 2016*
B.S. in Physics

**Computer Skills** Python, PyTorch, Tensorflow, C++
**Research Interests** AI for science, causal discovery, knowledge graphs, optimal experimental design, systems biology

## RESEARCH EXPERIENCE

**University of Chicago** Fall 2019-current
*Department of Computer Science, Advised by Rick Stevens* *Chicago,IL*

- Parallel causal discovery using overlapping graph partitioning. Proof that divide-and-conquer strategy produces consistent results in infinite data limit. Empirical analysis of speed and accuracy with comparable algorithms.
- Developed SP-GIES – a structure learner that achieves 4x speedup compared to existing algorithms. SP-GIES learns causal relationships of gene interaction networks using interventions (GitHub link)
- Leveraged graph representations of enumerated drug libraries for efficient navigation of the chemical space using scaffold subgraphs.
- Investigated use of counterfactuals and adverserial examples in tabular RNA sequence model robustness.
- Implemented and trained deep learning image models to predict dock scores of COVID-19 protein targets for virtual screening tasks.

**Flatiron Institute** Summer 2023
*Center for Computational Biology, Advised by Olga Troyanskaya* *New York, NY*

- A case study on causal discovery with human tissue-specific gene expression data for inferring gene regulatory networks from functional networks (GitHub link).

**Argonne National Laboratory** Summer 2020, 2021
*Advised by Rick Stevens, Arvind Ramanathan* *Chicago,IL*

- Developed optimal experimental design algorithms for selecting interventional experiments for recovering causal mechanisms in gene regulatory networks.
- Implemented DNA Assembly protocols on Opentrons OT-2 pipetting robots for Argonne's Rapid Prototyping Laboratory.

## WORK EXPERIENCE

**Lawrence Livermore National Laboratory** June 2016 - Aug 2019
*National Ignition Facility Computation Software Engineer, Supervised by Jarom Nelson Livermore, CA*

- Designed, developed and tested VBL (Virtual Beamline) laser propagation model of NIF laser system in C++ for use in high performance computing environments.

## RELEVANT COURSEWORK

Probabilistic Graphical Models *Toyota Institute of Technology, Spring 2022*
Machine Learning *University of Chicago, Spring 2020*
Biophysics of Biomolecules *University of Chicago, Spring 2020*
Topics in Computer Architecture *University of Chicago, Winter 2020*
Machine Learning in Medicine, *University of Chicago, Fall 2019*
Argonne Training Program on Extreme-Scale Computing (ATPESC) *Argonne National Laboratory, Summer 2020*

## TEACHING

CMSC 35440 - Machine Learning in Biology and Medicine *University of Chicago, Autumn 2023*
CMSC 14100 - Introduction to Data Science Guest Lecture *University of Chicago, Summer 2022*
CMSC 14100 - Introduction to Computer Science I *University of Chicago, Fall 2019*

## PAPERS

**Causal Discovery over High-Dimensional Structured Hypothesis Spaces with Causal Graph Partitioning**
*Under review for KDD* *Feb 2023*

**Causal Discovery and Optimal Experimental Design for Genome-Scale Biological Network Recovery**
*PASC 2023* *June 2023*

**Scaffold-Induced Molecular Subgraphs (SIMSG): Effective Graph Sampling Methods for High-Throughput Computational Drug Discovery**
*BMC Bioinformatics Supplement* *April 2022*

**Probing Decision Boundaries in Cancer Data Using Noise Injection and Counterfactual Analysis**
*Computational Approaches to Cancer Workshop at Supercomputing 2021* *Nov 2021*

**IMPECCABLE: Integrated Modeling PipelinE for COVID Cure by Assessing Better LEads**
*ICPP '21: 50th International Conference on Parallel Processing, Lemont, IL* *August 2021*

## POSTERS

**Hypothesis Ranking and Causal Discovery for Antimicrobial Resistance (AMR)**
*University of Chicago Data Science Institute AI + Science Summer School* *August 2022*

**Addressing Challenges in Developing Virtual Beamline (VBL): A Large-Scale, High-Energy Parallel Laser Simulation Code**
*Grace Hopper Celebration Poster Session* *Sept 2018*

## HONORS AND LEADERSHIP

Secretary of Energy Achievement Honor Award Feb, 2021 *National Virtual Biotech Lab Team*
Graduate Women in Computer Science Co-Chair 2020-2022 *University of Chicago*
Crerar Fellowship 2019 *University of Chicago*

## VOLUNTEER WORK

South Side Science Festival *Summer 2022*
Editor at ACM's Student Magazine XRDS *2021-2022*
CS Education Week *Little Village High School, Fall 2020*
Girls Who Code *2018-2019*