

Shachi Deshpande

PHD CANDIDATE · DEPARTMENT OF COMPUTER SCIENCE
Cornell Tech and Cornell University, New York, NY 10044

Education

Cornell University

PHD IN COMPUTER SCIENCE

- Advisor: Prof. Volodymyr Kuleshov

New York

Present

Cornell University

MS IN COMPUTER SCIENCE

- Advisor: Prof. Volodymyr Kuleshov

New York

Aug 2022

Indian Institute of Technology, Bombay

BTECH WITH HONORS IN COMPUTER SCIENCE

- Advisor: Prof. Sudarshan

Mumbai

Aug 2018

Publications

Probabilistic Conformal Prediction Improves Translation of Polygenic Risk Scores into Clinical Practice.

Shachi Deshpande, Kamilė Stankevičiūtė, April Wei, Volodymyr Kuleshov. (In Preparation)

Online Calibrated Regression for Adversarially Robust Forecasting.

Volodymyr Kuleshov and **Shachi Deshpande**. (In Submission)

Calibrated Propensity Scores for Causal Effect Estimation.

Shachi Deshpande and Volodymyr Kuleshov.

Uncertainty in Artificial Intelligence (UAI), 2024

SCIS Workshop, International Conference on Machine Learning (ICML) 2023

Online Calibrated and Conformal Prediction Improves Bayesian Optimization.

Shachi Deshpande, Charles Marx and Volodymyr Kuleshov.

International Conference on Artificial Intelligence and Statistics (AISTATS) 2024

Deep Multi-Modal Structural Equations For Causal Effect Estimation With Unstructured Proxies.

Shachi Deshpande, Kaiwen Wang, Dhruv Sreenivas, Zheng Li and Volodymyr Kuleshov.

Neural Information Processing Systems (NeurIPS) 2022

Calibrated and Sharp Uncertainties in Deep Learning via Simple Density Estimation.

Volodymyr Kuleshov and **Shachi Deshpande**.

International Conference on Machine Learning (ICML) 2022. (Spotlight)

New Genome Similarity Measures based on Conserved Gene Adjacencies.

Daniel Doerr, Luis Antonio B. Kowada, Eloí Araujo, **Shachi Deshpande**, Simone Dantas, Bernard M.E. Moret, and Jens Stoye.

Journal of Computational Biology 2017.

Research and Internships

PROBABILISTIC CONFORMAL PREDICTION FOR POLYGENIC RISK SCORES

NOV 2023-CURRENT

Prof. Volodymyr Kuleshov, Prof. April Wei | Cornell University

We design a unified framework to enforce probabilistic conformal and calibrated prediction of Polygenic Risk Scores (PRS) for demographically rare populations. With reliable predictive PRS uncertainties, we demonstrate an improved ability to perform clinical decision-making on several semi-simulated and real datasets derived from the UK Biobank.

MULTIMODAL GENERATIVE CAUSAL MODELS FOR IMPROVING AGRICULTURAL YIELD

MAY 2023 - AUG 2023

Swati Sharma, Angels de Luis Balaguer, Emre Kiciman and Ranveer Chandra | Microsoft Research, Redmond

We built causal models to answer ‘what-if’ queries from farmers as a part of the FarmBeats project. The conversational system aids decision making and improves the agricultural yield by estimating causal effects. The causal model incorporates multimodal covariates like satellite images of agricultural farms and historical weather time-series.

CALIBRATION OF LEARNED PROPENSITY SCORE MODELS FOR CAUSAL INFERENCE

NOV 2022-MAY 2023

Prof. Volodymyr Kuleshov | Cornell University

We propose probabilistic calibration to improve the effectiveness of propensity score models in causal effect estimation. Calibration reduces the variance and error bounds on causal effect estimates, thus allowing the use of simple propensity models that improve the computational throughput of Genome-Wide Association Studies by more than two-fold.

DEEP MULTIMODAL STRUCTURAL EQUATIONS FOR CAUSAL INFERENCE

AUG 2021-MAY 2022

Prof. Volodymyr Kuleshov | Cornell University

We incorporate multi-modal, unstructured information in modern datasets within the framework of causal inference using deep structural equations. We propose novel generative architectures and inference algorithms that scale to multi-modal setups with missing data. We create multimodal causal inference benchmarks for evaluation of causal effect estimation.

LEARNING SPATIAL RELATIONSHIPS FOR ROBOTIC MANIPULATION

JUNE 2022-AUG 2022

Dr. Chaitanya Mitash | Research at Amazon Robotics

We perform spatial reasoning between objects in cluttered scene images with zero-shot generalization to unseen object classes, aimed at improving scene understanding and enabling robotic arm manipulation of new objects.

CALIBRATING UNCERTAINTIES FOR BAYESIAN OPTIMIZATION

JAN 2021-MAY 2021

Prof. Volodymyr Kuleshov | Cornell University

We propose a simple algorithm to calibrate the uncertainty of posterior distributions over the objective function as part of the Bayesian optimization process. We show that by improving the uncertainty estimates of the posterior distribution with calibration, Bayesian optimization makes better decisions and arrives at the global optimum in fewer steps.

STREAMING QUERY OPTIMIZATION

AUG 2017-MAY 2018

Prof. S Sudarshan | Undergraduate Thesis, IIT Bombay

We proposed dynamic tuple routing policies to optimize join computation in streaming query application within a distributed computing environment. We designed parallel query execution policies and demonstrated reduction in latency of computation without compromising the application throughput in simulated star join datasets.

DERIVATIVE CLOUDS

AUG 2017-MAY 2018

Prof. Umesh Bellur | R & D Project, IIT Bombay

We performed an empirical study of the impact CPU and memory overcommitment on application performance over a range of derivative setups and virtualization frameworks. We determined efficient Virtual Machine cluster configurations corresponding to application requirements through empirical validation of our models.

MAXIMUM LIKELIHOOD ESTIMATION OF PHYLOGENETIC TREES

JUNE 2016-AUG 2016

Prof. Bernard Moret | Summer@EPFL Scholar, EPFL, Switzerland

We inferred the evolutionary history of plant genomes using sequential genetic data using maximum likelihood estimation. We used a graphical gene connection model to incorporate gene similarities and demonstrated significant reduction in the computational requirements of phylogenetic (evolutionary) tree reconstruction for plant species.

Awards and Fellowships

2022	Doctoral Grant for Grace Hopper Celebration , Cornell University
2022	NeurIPS Travel Grant , Women in ML
2018	Cornell University Fellowship , Cornell University
2013	INSPIRE Scholarship , Dept of Science and Technology, Govt of India
2013	Dhirubhai Ambani Scholarship , Reliance Foundation
2008	National Talent Search Examination Scholarship , NCERT, Govt of India

Seminars and Talks

Oct 2023 **Causality Discussion Group**, TU Darmstadt, Germany (Virtual)
Oct 2023 **Microsoft Research**, Cambridge, UK (Virtual)
Sept 2022 **Machine Learning Reading Group**, Cornell Tech, NY, USA
Aug 2022 **Amazon Robotics**, Boston, MA, USA

Teaching Experience

Spring 2021 **Deep Probabilistic and Generative Models**, Teaching Assistant
Fall 2020 **Applied Machine Learning**, Teaching Assistant
Summer 2020 **Introduction to Programming Using Python**, Teaching Assistant
Spring 2020 **Interactive Computer Graphics**, Teaching Assistant
Fall 2017,
Spring 2018 **Computer Programming and Utilization**, Teaching Assistant

Key Coursework

Causal Machine Learning, Reinforcement Learning, Decision Theory, Topics in Machine Learning and Natural Language Processing (Seminars), Emerging Cloud Technologies, Model Checking, Computer Graphics, Information Retrieval, Probability Theory, Stochastic Processes

Outreach & Professional Development

SERVICE AND OUTREACH

2021-2022 **Computer Science Graduate Organization, Cornell Tech**, Vice-President
2021-2022 **Dept of Computer Science, Cornell**, Mentor for incoming Graduate students
2019-2020 **CS Graduate Admissions Committee, Cornell**, Reviewer
2017-2018 **Dept of Computer Science, IIT Bombay**, Academic mentor

REVIEWER

AISTATS 2022, 2023
ICML 2023
NeurIPS 2021, 2022, 2023

EXTRACURRICULAR

Coordinator for internship recruitment of undergraduate students at IIT Bombay	2016-2017
Panelist for BitStream Newsletter at IIT Bombay	2015-2016
Organizer of programming competition CodeBlitz at Techfest, IIT Bombay	Winter 2014