Yash Patel

https://yashpatel5400.github.io/, yppatel@umich.edu

Education

University of Michigan, Ann Arbor, MI

Ph.D. Statistics **Sep 2021 - Jun 2026 (Expected)**

▷ Cum. GPA: 4.000/4.000

▷ Selected Courses: Applied Probability and Stochastic Modeling, Computation and Optimization Methods, Monte Carlo Methods, Statistical Theory, Regression Analysis, Stat. Mechanics

Princeton University, Princeton, NJ

Bachelor of Arts **Sep 2014 - Jun 2018**

▷ Major: Mathematics MAT/COS/ORF GPA: 3.680/4.000, Cum. GPA: 3.642/4.000

▷ Certificates: Applications of Computing, Statistics and Machine Learning

▷ Selected Courses: Topology, Real Analysis, Complex Analysis, Theoretical ML (Graduate), Fairness in ML (Graduate), Machine Learning/Pattern Recognition (Graduate), Neural Networks: Theory & Applications, Theory of Algorithms, Analysis of Big Data, Computer Vision, Computer Graphics, Probability/Stochastic Systems

Research Experience

University of Michigan, Ann Arbor, MI

Advisors: Ambuj Tewari, Jeff Regier (PhD Research) **May 2022 - Present**

Investigating 3D heterogeneous reconstruction of proteins from Cryo-EM images. Previously investigated the generation of conformers for proteins using RL and generative models and developed a Bayesian pipeline capable of detecting gravitational lenses in astronomical surveys.

Princeton University, Princeton, NJ

Advisors: Matt Weinberg, Arvind Narayanan (Senior Thesis) **Sep 2017 - May 2018**

https://yashpatel5400.github.io/files/deanonymization.pdf

Investigated the prospects of partially deanonymizing Bitcoin transactions using graph clustering algorithms on a heuristics graph constructed atop the BTC transactions graph. Discovered hierarchical spectral clustering and METIS to have the best performance per the F-score, NMI, and purity, from which several BTC wallets were identified.

Advisor: Matt Weinberg (Junior Paper) **Jan 2017 - May 2017**

https://yashpatel5400.github.io/files/selfish.pdf

Studied the viability of selfish mining attacks in mining pools as an extension to "Majority is Not Enough: Bitcoin Mining is vulnerable" (Eyal) by taking price adjustments into account. Discovered selfish mining was viable for BTC/ETH through 2017.

Columbia University (Mailman School of Public Health), New York, NY

Advisor: Abdulrahmen El-Sayed (Summer Research) **May 2015 - Sep 2015**

https://github.com/yashpatel5400/SexualEqualityABM

Developed agent-based mathematical models for understanding the dynamics of self-efficacy for sexual minority populations from enrollment in exercise coach programs. Simulated dynamics in Python using Matplotlib, Numpy, and NetworkX.

Princeton Plasma Physics Lab, Princeton, NJ

Advisor: Ilya Dodin, Ammar Hakim (Summer Research) **Jun 2013 - Jan 2014**

Developed FDTD numerical simulations in C++/Python to empirically study PDE governing plasma phase space evolution derived in https://arxiv.org/pdf/1006.3717.pdf (Eq. 88). Evolution behavior was verified on standard potential initializations (i.e. cos(x), x^2, x^4): https://yashpatel5400.github.io/files/cos.mp4.

Rutgers University, Newark, NJ

Advisor: Michael Shiflett (Summer Research) **Jun 2012 - Aug 2012**

Investigated the role of axonal guidance in the manifestation of social withdrawal by studying social behavior in mice with NRP2 gene mutations. Was responsible for preparing brain slices, setting up mice trials, and annotating and analyzing the data. A significant difference was observed in social withdrawal between those mice with and without the NRP2 mutation.

Work Experience

Meta, Menlo Park, CA *(SWE, IC5)* **Jul 2018 - Sep 2021**

Augmented Reality Projects (2019-2021)

▷ Designed and implemented real-time (72 FPS) novel dynamic object reconstruction algorithm for 300k+ vertex meshes in Unity HLSL/C#. **Patent Pending**

▷ Implemented real-time (72 FPS) point cloud, dense mesh, and TSDFs (KinectFusion) scene reconstruction & rendering on HMDs & lenticular displays with C++/OpenGL/GLES/OpenCL

▷ Implemented deep learning model in PyTorch and optimized via SNPE & QAT to run at 30 FPS on Qualcomm SoC for Portal platforms. Added translation support for quantized nodes in JIT-compiled PyTorch to Caffe2.

Manifold (2018-19) `https://yashpatel5400.github.io/files/manifold.pdf`

▷ Added farm rendering through Docker, RabbitMQ, and Kubernetes. Improved depth estimation efficiency by 30% with "Gaussian funnel."

▷ Created test suite with Travis CI integration, extending coverage from 10% to 100%.

Amazon, Seattle, WA *(SWE Intern)* **Jun 2017 - Aug 2017**

▷ Developed debugging service in Java (Spring MVC) for Kiva Picking Optimization team. Deployed globally to Amazon Robotics-enabled fulfillment centers via AWS (EC2, S3, SNS/SQS).

Spirent Communications, Holmdel, NJ *(SWE Intern)* **Jun 2016 - Aug 2016**

▷ Developed parallelized data profiling and querying web application, for visualizing and computing streaming statistics. Implemented using Python, with Flask, SQLite, and Plotly.

Awards

2x NSF GRFP Honorable Mention (2020, 2022)
Outstanding First-Year Ph.D. Student Award (2022)
Outstanding Graduate Student Instructor Team Award (2022)
Siemens Westinghouse National Competition Semifinalist (2014)
1st in Category: 2013 Regional Delaware Valley Science Fair, 1/10 considered for ISEF
Best Use of Machine Learning: HackPrinceton (Spring 2017)
AIME Qualifier (2014)
2x Top 30 Team: International SpaceX HyperLoop Competition (2016, 2017)
▷ `https://yashpatel5400.github.io/files/hyperloop.pdf`
Top 6: Regional Goldman Sachs Quant Quest Competition (2016)
2x Honorable Mention (50 of 1150): SIAM Moody's Mega Math Challenge (2013, 2014)
▷ `https://yashpatel5400.github.io/files/moodys.pdf`

Manuscripts

Diffusion Models for Probabilistic Deconvolution of Galaxy Images
Li Y, Xue Z, **Patel Y**, Regier J,
ICML Machine Learning for Astrophysics Workshop, 2023.

RL Boltzmann Generators for Conformer Generation in Data-Sparse Environments
Patel Y, Tewari A
NeurIPS Machine Learning in Structural Biology (MLSB) Workshop, 2022.

Scalable Bayesian Inference for Finding Strong Gravitational Lenses
Patel Y, Regier J
NeurIPS Machine Learning and the Physical Sciences Workshop, 2022.

Manuscripts In Submission

Variational Inference with Coverage Guarantees
Patel Y, McNamara D, Loper J, Regier J, Tewari A

Invited Presentations

Implementation of Novel Magneto-Inertial Confinement Reactor Designs Towards Viable Confined Fusion, 2014 Monmouth Junior Science Symposium (1 of 10 in NJ).

Upon the Effect of Excess Neurons on the Manifestation of Autism, 2013 Monmouth Junior Science Symposium (1 of 6 in NJ).

Upon the Effect of Excess Neurons on the Manifestation of Autism, 2013 South Jersey Chapter Human Factors and Ergonomics Society Conference (1 in NJ).

Upon the Effect of Excess Neurons on the Manifestation of Autism, 2013 Institute of Electrical and Electronics Engineers (IEEE) Annual Research Conference

Teaching Experience

University of Michigan, STATS 315 TA **Jan 2022 - present**
Created HWs and lab materials for first offerings of this introductory deep learning course and taught labs. Awarded Outstanding Graduate Student Instructor Team Award in Winter 2022.

University of Michigan, STATS 250 TA **Sep 2021 - Dec 2021**

Princeton University, COS 126, 217, 226 Lab TA **Jan 2016 - May 2016**
Undergraduate lab teaching assistant for introductory CS sequence (Introduction to CS, Algorithms and Data Structures, and Introduction to Programming Systems)