Purvi Goel

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Education

Stanford University
Palo Alto, CA

PhD in Computer Science — *Fall 2020*

- Research focus in computer graphics and its applications to navigating large parameter spaces, particularly in the creation and application of lightweight spatiotemporal data structures.

Brown University
Providence, RI

Masters of Science in Computer Science, Concentration GPA: 4.0/4.0 — *Conferred May 2020*

- **Relevant Coursework** — Advanced Computer Vision, Deep Learning, Prescriptive Analytics

Bachelor of Science in Computer Science, Concentration GPA: 4.0/4.0 — *Conferred May 2019*

- **Awards** — Senior Prize; Brown Research Symposium Honorable Mention; Sigma Xi Honor Society
- **Relevant Coursework** — Advanced Computer Graphics, Data Science, Computer Vision, Computational Photography, Software Engineering, User Interfaces, Linear Algebra, Image Understanding, Design & Analysis of Algorithms, Computer Systems

Academic Research Experience

Stanford University

Graduate Researcher

- Focusing on spatiotemporal data structures for browsing and exploration of animation and simulation ensembles on the magnitude of gigabytes to terabytes of data. My research also focuses on unified data structures for many different animated physics-based phenomena, data structures optimized for evaluating spacetime queries, and interfaces for user-driven data browsing

Brown University

Undergraduate Researcher

- Research focus was extracting 3D objects from a series of 2D images; framed the question as an optimization problem using a differentiable path tracing approach. The optimization landscape for geometry and appearance is riddled with local minima, necessitating a coarse-to-fine pipeline on mesh geometry and a mesh colors material representation.

Publications

- Goel, P., James, D. Unified Many-Worlds Browsing of Arbitrary Physics-based Animations. 2022 ACM Transactions on Graphics (SIGGRAPH).
- Goel, P., Cohen, L., Guesman, J., Thamizharasan, V., Tompkin, J. Ritchie, D. Shape from Tracing: Towards Reconstructing 3D Object Geometry and SVBRDF Material from Images via Differentiable Path Tracing. 2020 International Conference on 3D Vision (3DV), 1186 - 1195.
- Goel, P., Chen, L. On the Robustness of Monte Carlo Dropout Trained with Noisy Labels. 2021 Women in Computer Vision (WiCV).
- Chen, L., Yang, D., Goel, P., Kabul, I. Robust Deep Learning with Active Noise Cancellation for Spatial Computing. 2020. arXiv:2011.08341

Industry Experience

Pixar (Research Team)
Emeryville, CA

Researcher Intern — *Summer 2022*

- Created a rendering pipeline and training strategy to speed up rendering of animated heterogenous volumes, like clouds and smoke, by up to 10x using NVIDIA's Instant-NGP NeRF model.
- Instrumented the Instant-NGP code base with a CUDA-based path tracer for heterogeneous volumes including implementations of null scattering and delta tracking.

Facebook (Uncertainty Research)
Menlo Park, CA

Short-time Visiting Researcher — *Summer 2020*

- Worked on quantifying and controlling for uncertainty in neural networks predictions arising from mislabeled or biased datasets
- Led a small research team on work identifying the sparsity of neural networks augmented with some uncertainty techniques, a trait that combats overfitting to false patterns in datasets.

Facebook (AI Research)
Menlo Park, CA

Software Engineering Intern — *June 2019 - August 2019*

- Implemented state-of-the-art neural models for protein prediction tasks from papers to benchmark FAIR's BERT model. The models were trained on large datasets of protein sequences to recover properties like protein function and folding behavior.
- Built an optimization pipeline for protein structure prediction using gradient descent to minimize the potential energy of molecular structures.

Amazon (SmartHome)
Sunnyvale, CA

Software Engineering Intern — *June 2018 - August 2018*

- Created a device-to-device communication API for Amazon Echo and Dot devices using the MQTT messaging protocol. The project included a leader-election algorithm to detect when important SmartHome devices disconnected from the home network.

Google (Cloud–Stadia)

Waterloo, ON

Software Development Intern

January 2018 - April 2018

- Implemented a software implementation of the graphics rendering pipeline for Google's cloud gaming service Stadia. This allowed teams to debug vertex and fragment shaders and included texture sampling, rasterization, and visualization with XCB.

Amazon (Lab126 Devices–Cameras)

Menlo Park, CA

Software Engineering Intern

June 2017 - August 2017

- Developed Amazon Cloud Camera infrastructure for server-side communication to Amazon servers in time for the products' launch. This allowed cameras to synchronize settings and servers to quickly control data flow between different devices

Leadership Experience

WiGRAPH

Resource Coordinator, Social Media Coordinator

- Finding and advertising research-related resources and job opportunities for women researchers in Computer Graphics.
- Work with the rest of the Executive Team to plan yearly research panels and events, such as the Berthouzoz Women in Research lunch at SIGGRAPH, WiGRAPH event at the Symposium for Geometry Processing, and a new Rising Stars program.

Mosaic+ Diversity and Inclusion program

Mentor

- Helped organize and lead Brown's first pre-orientation program to introduce incoming students from underrepresented backgrounds to computer science. This involved building introductory coding projects, arranging faculty talks and other logistics, and introducing students to university research.
- Participated in a mentorship program to advise Mosaic+'s minority students through their university careers

Women in Computer Science

Mentor

- Mentored both masters and undergraduate women concentrating in computer science as part of Brown and Stanford's WICS club
- Participated in club mentorship events such as research and internship panels

MEANS Database

Technical Lead

- Working with meansdatabase.com, an application connecting local food banks in need with volunteers, restaurants, and other food donors.
- Leading a team of three students to help MEANS scale their codebase, implement more intuitive dashboards, and a more efficient notification system to meet increased demand during the COVID pandemic.

Brown CubeSAT

Technical Lead

- Worked on the technology side of Brown's CubeSAT Club with computer science and engineering students to successfully launch the university's first satellite into orbit.
- Led a team of five fellow undergraduate students to create a communication platform between the satellite and a mobile application that could be easily installed on a smartphone. The driving motivation was to make both space and the satellite as easily accessible as possible.

Brown University Department of Computer Science

Teaching Assistant

- **Advanced Computer Graphics (Head TA, '20)** – Topics Covered: Pathtracing, Mesh Operations, Linear Optimization, Simulation
- **Computer Graphics ('19)** – Topics Covered – Real-time Rendering, Raytracing, GPU Graphics Pipeline, Procedural Generation
- **Computer Vision ('19)** – Topics Covered : Image Filtering, Feature Matching, SIFT, Neural Networks, Camera Calibration
- **Writing3D ('17)** : Topics Covered: Text-based experiences in Virtual Reality
- **Introduction to Object Oriented Programming ('16)** – Topics Covered: Polymorphism, Interfaces, Inheritance, JavaFX, GUI

Skills

Languages and Technologies OpenGL/GLSL, C++, Python, Sparse Solvers, Eigen, Legion/Regent, Pytorch, Houdini, OpenFrameworks

Away From Keyboard Triathlon, Powerlifting, Watercolor, Composting, and Coffee. Lots of coffee.