

# Varshini Subhash

LinkedIn | Google Scholar | GitHub | Website

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## EDUCATION

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### Harvard University

*M.E in Computational Science and Engineering, GPA: 3.91/4.0*

Cambridge, Massachusetts

*Aug 2021 - May 2023 (Expected)*

### Manipal Institute of Technology

*B.Tech in Mechanical Engineering, CGPA: 9.09/10.0*

Manipal, India

*Aug 2014 - July 2018*

## RESEARCH PUBLICATIONS

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- Zixi Chen\*, **Varshini Subhash\***, Marton Havasi, Weiwei Pan, Finale Doshi-Velez, “What Makes a Good Explanation?: A Harmonized View of Properties of Explanations”, *Trustworthy and Socially Responsible Machine Learning Workshop, NeurIPS 2022*. | [arXiv]
- **Varshini Subhash**, Karran Pandey, Vijay Natarajan, “GPU Parallel Algorithm for Computing Morse-Smale Complexes”, *IEEE Transactions on Visualization and Computer Graphics | IEEE VIS Conference 2020*. [IEEE Xplore]
- Abhijath Ande, **Varshini Subhash**, Vijay Natarajan, “Tachyon: Efficient Shared Memory Parallel Computation of Extremum Graphs”, *Computer Graphics Forum, 2023*

## RELEVANT COURSEWORK AND SKILLS

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- **Courses:** Introduction & Advanced Topics in Data Science (AC 209a/b), Introduction to Machine Learning (MIT 6.036), Advanced Scientific Computing (AM 205), Systems Development for Computational Science (AC 207), Ethics for Engineers (MIT 6.9041), Advanced Natural Language Processing (MIT 6.8610), Probabilistic Machine Learning (AM 207), Large Language Models & Beyond (MIT 6.S986).
- **Skills/Packages:** C++, Python, Machine Learning, Natural Language Processing, Data Science, Parallel Computing, CUDA, NumPy, scikit-learn, HuggingFace API, PyTorch.

## RESEARCH EXPERIENCE

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### Harvard University

*Student Researcher | Advisors: Dr. Weiwei Pan & Prof. Finale Doshi-Velez*

Cambridge, Massachusetts

*February 2022 - Present*

- Synthesized mathematical properties needed for good explanations and quantified trade-offs between them.
- Extracting properties from explanations deployed in human-computer interaction (HCI) settings.
- Exploring statistical summarization of documents via topics by using generative topic models like LDA.

### Massachusetts Institute of Technology

*Student Researcher | Advisors: Prof. Yoon Kim & Dr. Weiwei Pan | Paper*

Cambridge, Massachusetts

*September 2022 - Present*

- Studying the cause and effectiveness of universal adversarial triggers on large language models like DistilBERT and OPT via attention mechanism analysis and trigger perturbations.

### Stanford Existential Risks Initiative

*ML Alignment Theory Scholar | Advisors: Stuart Armstrong & Rebecca Gorman | Paper*

Cambridge, Massachusetts

*Nov 2022 - Dec 2022*

- Demonstrated and interpreted adversarial red teaming and probing on dialogue models like GODEL & ChatGPT.

### Indian Institute of Science

*Research Assistant | Advisor: Prof. Vijay Natarajan | Project Page | Code*

Bangalore, India

*June 2019 - August 2021*

- Designed the **first** fully GPU parallel algorithm for Morse-Smale complex computation – improved upon the state-of-the-art by up to **8.6x**, with algorithmic improvements up to **577.7x** and **5.4x**.

### Indian Institute of Science

*Research Assistant & Intern | Advisor: Prof. Ramsharan Rangarajan | Code*

Bangalore, India

*Jan 2018 - February 2019*

- Improved performance of a parallel mesh optimization algorithm DVR – reduced mesh optimization time by **47.4%**, enabled **100%** scalability with a **40x** speedup for mesh sizes **~14 million**.
- Implemented ‘Provably Good Mesh Generation’ by Bern et al. – developed open-source software for adaptive mesh refinement. Improved obstacle problem accuracy by an **order of magnitude**.

### Indian Institute of Technology

*Research Intern | Advisor: Prof. Arindrajit Chowdhury | Project Page*

Mumbai, India

*May 2017 - June 2017*

- Developed a spray ignition setup for hypergolic propellant combustion in rocket propulsion.

## WORK EXPERIENCE

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- basys.ai** Cambridge, Massachusetts  
*Research Data Scientist* Dec 2022 - Present  
Developing a machine learning algorithm to detect diabetic progression using computer vision.
- NVIDIA** Cambridge, Massachusetts  
*Deep Learning Performance Intern* May 2022 - Aug 2022  
Developed and implemented two GPU-parallel algorithms for sliding window inference in 3D U-Net segmentation model. Obtained ~22% performance improvement in testbed implementation of NVIDIA's MLPerf benchmark for the model.
- Deloitte** Bangalore, India  
*Business Analyst* Aug 2018 - June 2019  
Led cloud deployment of Windchill configurations on client servers, performance tuning and part classification.

## AWARDS & HONORS

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- Research publication adapted as a graduate machine learning course – CS6216: Advanced Topics in Machine Learning (Spring 2023) at National University of Singapore (NUS). 2023
- Recipient of the **Adobe Research Women-In-Technology Scholarship 2022** – awarded a cash prize of \$10,000 for accomplishments in academics and research in Computer Science. 2022
- Selected as an ML Alignment Theory Scholar and awarded \$6000 by the **Stanford Existential Risks Initiative**. 2022
- Selected to represent Harvard University at the **Grace Hopper Celebration 2022**. 2022
- Accepted as a **Google CS Research Mentorship Program Scholar 2021**. 2021

## PROJECTS

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- Algorithmic Bias in Recidivism Risk-Assessment for Criminal Justice** | *Report*  
Predicted risk of recidivism in criminal justice using Lasso-regularized logistic regression on the COMPAS dataset. Detected biased predictions with and without race as a predictor and determined optimal classification thresholds.
- Homelessness in the United States**  
Predicted homelessness trends in the US by comparing multi-linear, polynomial & Lasso-linear regression, random forests and boosting models. Obtained best predictive performance across 33 states from random forests and boosting.
- Machine Learning for Medical Diagnosis**  
Developed machine learning models for pathology classification in chest X-rays and evaluated performance.
- Parallel Matrix Factorization for Recommender Systems**  
Implemented parallel matrix factorization for gradient descent with a  $2.7\times$  speedup and runtime benefit of 424 secs.

## TEACHING EXPERIENCE

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- Course Developer & Teaching Fellow**, CS 181, Introduction to Machine Learning (Spring 2023), by Weiwei Pan.
- Teaching Fellow**, CS50 - Introduction to Computer Science (Fall 2021), by David Malan.
- Teaching Assistant**, Brave Behind Bars - Introduction to Computer Science (Summer 2022) | TEJI, MIT | [Feature].

## INVITED TALKS

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- Research Seminar, Flagship Pioneering Intelligence, 2023.
- 'What makes a good explanation?', Lightning Talk at Women in Data Science (WiDS) Conference, Cambridge 2023.
- 'What makes a good explanation?', Spotlight Talk at Trustworthy Embodied AI Workshop, NeurIPS 2022.
- Panelist, Harvard IACS Graduate Admissions Information Panel 2022.
- Panelist, Harvard IACS Research & Thesis Panel, Graduate Student Orientation 2022.
- Women in High Performance Computing (WHPC) Lightning Talk at the Supercomputing Conference 2021.
- 'GPU Parallel Computation of Morse-Smale Complexes', ACM ARCS Symposium 2021. [Slides] [Poster]
- 'GPU Parallel Computation of Morse-Smale Complexes', IEEE VIS 2020 Conference. [Talk] [Preview]
- 'GPU Parallel Computation of Morse-Smale Complexes', Bangalore VIS Workshop 2020.

## SOCIAL IMPACT

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- Humans of AI Podcast** | *Volunteer* | [Webpage] Jan 2021 - Sept 2021
- She Belongs Podcast** | *Co-Founder & Co-Host* | [YouTube] [Spotify] [Medium] Sept 2020 - Present  
Discusses gender inequity and why women belong at the table. Over 2.4k views on YouTube.
- Coronavirus Visualization Team, Harvard University** | [Webpage] May 2020 - Aug 2021  
*Project Planning Co-Director* | *Project Co-Lead* | *Community Manager*