

# Harsha Vardhan Tetali

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LinkedIn, Google Scholar, Personal Webpage

## EXPERIENCE

### **Postdoctoral Researcher**

May 2025 - Present

#### **Department of Computer Science, University of Helsinki**

*Multi-source probabilistic inference research group*

Advising and working along students in:

- Machine learning models for Metabolic modeling – implemented and trained a **modified transformer** architecture based Neural network model from scratch in PyTorch with modifications to deal with metabolite concentrations for micro-organisms.
- Physics-informed machine learning for wave propagation using **Fourier Neural Operators**.

### **Staff Engineer - DSP Architecture Team**

May 2023 - Dec 2024

#### **Marvell Technology, Inc.**

*Generative Modeling of NAND Flash*

- **Spatio-temporal Channel Modeling** (includes modeling for different word-lines and blocks within SSD at different strain conditions) for SSD NAND Channel using data collected from physical NAND chips.
- **Demonstrated** the relevance of using Gaussian Processes for Spatio-temporal modeling of SSD NAND Channel Modeling.
- **Developed** a **Spatio-temporal** generative model for SSD NAND using **Gaussian Processes** and implemented it in *PyTorch*.
- **Developed** and **distributed** the functional module for the above to others in the team to use it directly and **simulate NAND Flash behavior at the voltage level**.

*LLMs (GenAI) work*

- **Evaluated** multiple leading **LLMs**, developed metrics, to suggest to use within the company.
- **Evaluated Embedding models** for code and text and **developed** metrics and experiments for the same.
- **Implemented** a local **RAG** for internal use within the company.

*Data Collection for NAND Flash Modeling*

- Wrote scripts to run python programs to collect Voltage level data to extract histograms of voltage (probability distributions) of NAND Flash
- Ran various experiments to exert different stress conditions (program erase cycling, read disturb, and high temperature data retention) on SSD NAND Flash and collect the voltage distribution data.

*Skills Associated:* Python, Pytorch, Scikit-learn, Numpy, Algorithms and Data Structures, Mathematical Modeling, Signal Processing, Machine Learning, Deep Learning, Scripting.

### **Channel Modeling DSP Engineer Intern**

May 2022 - August 2022

#### **Marvell Technology, Inc.**

- **Developed** Spatio-temporal models for SSD NAND channels (estimation of probability densities) with special emphasis in **modeling the tail part** of the distribution to **obtain better error characteristics**.
- **Processed** huge datasets of SSD NANDs at the voltage level and **developed** algorithms that work on producing results from the entire dataset within reasonable time.

**Research & Teaching Assistant**  
**University of Florida, Gainesville**

August 2018 - May 2023

- Digital Signal Processing (Teaching Assistant, Fall 2018, Fall 2021) & Computer networks (Summer 2021)
- **Introducing** physics based constraints into unsupervised machine learning models (dictionary learning and matrix factorization) and **bridging machine learning with mathematical physics** through means of **optimization theory** and ultimately using them for **Structural Health Monitoring** applications.
- This work is mostly based on ideas from **discretization of partial differential equations** and **non-convex optimization**.
- Made **significant contributions** to enhancing **interpretability** in scientific machine learning, particularly **PDE based physics-informed machine learning**.
- Dealt with huge acoustic wave (traveling in solids) datasets and obtained fast algorithms for **data completion/imputation** and similar other processing of signals.
- Published in **IEEE Transactions on Signal Processing (TSP)**, **IEEE Sensors**, **IEEE Machine Learning for Signal Processing (MLSP)**, **Acoustic Society of America (ASA)**, **NeurIPS workshop for Machine Learning in Physical Sciences**, etc.

*Skills Associated:* Signal Processing, Mathematical Modeling, Numerical Optimization, Physics-informed machine learning, MATLAB.

**Teaching Assistant**

August 2016 - May 2018

**Indian Institute of Technology, Gandhinagar (IITGN)**

- Probability and Random Processes, Control Theory, Pattern Recognition and Machine Learning, The Art and Science of Photography (short course)

## EDUCATION

**Graduate, Doctor of Philosophy**

August 2018 - May 2023

*Electrical and Computer Engineering*

University of Florida, Gainesville (GPA: 3.93/4.0)

**Thesis: Physics-Informed Matrix Factorizations and Approximate Eigendecompositions in Structural Health Monitoring**

Advisor: Prof. Joel B. Harley.

**Graduate, Masters of Technology**

August 2016 - June 2018

*Electrical Engineering*

Indian Institute of Technology, Gandhinagar (CPI: 8.94/10)

**Thesis: Estimation of Scene-Flow from Optical-Flow for Rigid Body Translations**

Advisor: Prof. Shanmuganathan Raman.

*Undergraduate, Bachelors of Technology*

July 2012 - May 2016

*Electronics and Communications Engineering*

Sardar Vallabhbhai National Institute of Technology, Surat (CGPA: 7.96/10)

Thesis: **Tracking of Fingers in Sixth-Sense Technology**

Advisor: Prof. Prashant K. Shah.

## **INTERESTS**

Physics-informed machine learning, Computational Physics, Numerical methods, Signal Processing, Large Language Models (LLM), Retrieval Augmented Generation (RAG), Theoretical machine learning, Optimization theory.