

# Harsha Vardhan Tetali

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LinkedIn, Google Scholar, Personal Webpage

<b>EXPERIENCE</b>	<b>Postdoctoral Researcher</b> <b>Department of Computer Science, University of Helsinki</b> <i>Multi-source probabilistic inference research group</i> Advising and working along students in:	May 2025 - Present
	<ul style="list-style-type: none"><li>Machine learning models for Metabolic modeling – implemented and trained a <b>modified transformer</b> architecture based Neural network model from scratch in PyTorch with modifications to deal with metabolite concentrations for micro-organisms.</li><li>Physics-informed machine learning for wave propagation using <b>Fourier Neural Operators</b>.</li></ul>	
	<b>Staff Engineer - DSP Architecture Team</b> <b>Marvell Technology, Inc.</b> <i>Generative Modeling of NAND Flash</i>	May 2023 - Dec 2024
	<ul style="list-style-type: none"><li><b>Spatio-temporal Channel Modeling</b> (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.</li><li><b>Demonstrated</b> the relevance of using Gaussian Processes for Spatio-temporal modeling of SSD NAND Channel Modeling.</li><li><b>Developed</b> a <b>Spatio-temporal</b> generative model for SSD NAND using <b>Gaussian Processes</b> and implemented it in <i>PyTorch</i>.</li><li><b>Developed</b> and <b>distributed</b> the functional module for the above to others in the team to use it directly and <b>simulate NAND Flash behavior at the voltage level</b>.</li></ul>	
	<i>LLMs (GenAI) work</i>	
	<ul style="list-style-type: none"><li><b>Evaluated</b> multiple leading <b>LLMs</b>, developed metrics, to suggest to use within the company.</li><li><b>Evaluated Embedding models</b> for code and text and <b>developed</b> metrics and experiments for the same.</li><li><b>Implemented</b> a local <b>RAG</b> for internal use within the company.</li></ul>	
	<i>Data Collection for NAND Flash Modeling</i>	
	<ul style="list-style-type: none"><li>Wrote scripts to run python programs to collect Voltage level data to extract histograms of voltage (probability distributions) of NAND Flash</li><li>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.</li></ul>	
	<i>Skills Associated:</i> Python, Pytorch, Scikit-learn, Numpy, Algorithms and Data Structures, Mathematical Modeling, Signal Processing, Machine Learning, Deep Learning, Scripting.	
	<b>Channel Modeling DSP Engineer Intern</b> <b>Marvell Technology, Inc.</b>	May 2022 - August 2022

- **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** August 2018 - May 2023  
**University of Florida, Gainesville**

- 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 Eigen-decompositions 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.