

Medha Sawhney

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Phone: (540)-824-0840

EDUCATION

- Virginia Tech, Blacksburg, Virginia, USA** GPA: 4.00 / 4.00 *May 2023 - Present*
PhD in Computer Science. Advisor: Anuj Karpatne
- Virginia Tech, Blacksburg, Virginia, USA** GPA: 4.00 / 4.00 *Aug 2021 - May 2023*
MS Thesis in Computer Science. Advisor: Anuj Karpatne
- Manipal Institute of Technology, MAHE, Manipal, India** GPA: 8.34 / 10.00 *Aug 2016 - Aug 2020*
Bachelor's in technology, Major -Electronics and Communication Engineering, Minor -Data Science

CORPORATE EXPERIENCE

- Deep Learning Automation Intern, NVIDIA** *May 2024 – Aug 2024*
- Crafted a multitask learning model capable of dynamically training on multiple heterogeneous datasets with varying class counts and image-resolutions, achieving over 90% accuracy across all datasets despite significant imbalances. Built custom sampler code and researched loss backward strategies in PyTorch to prevent gradient mixing, laying a foundation for future development goals.
 - Challenges: Dataset imbalances (custom batch sampler and dataloader and splitting functions for train set to maintain proportions), high-res image training (patching and padding), multi-GPU efficiency (pipeline parallelism), gradient mixing.
 - Designed and validated two distinct models for detecting video corruption across diverse defect types, including a proof of concept integrating optical flow with video data, successfully addressing domain-specific challenges and data limitations.
 - Enhanced accuracy by 15% in an existing video corruption detection model for GPU validation, reducing false positives by 60% and false negatives by 50%, leading to significant reliability improvements.
- Machine Learning Engineering Intern, Twitter** *Jun 2022 – Aug 2022*
- End to end development and deployment of a broadly applicable ML model using XGBoost within the account health space
 - Boosted Key performance indicators by 74%. Challenges: Data imbalance, feature sparsity, enormous data, data distribution drift
- Machine Learning Engineer Hewlett-Packard R&D, Bangalore, India** *Jan 2020 – June 2021*
- Engineered a self-resolution tool for PC issues, with a 3x BLEU score, employing AWD-LSTM and Natural Language Processing.
 - Designed and implemented a dynamic troubleshooting tool for printer issues based on Recurrent Neural Networks
 - Applied optimization strategies to build hardware-efficient and reliable ML models, including a) identifying performance bottlenecks using CUDA Kernel Profiling with NVIDIA Nsight Systems & Compute and b) examining ML models for bias
- Automatic Driver Assistant Systems Team Intern, The Hi-Tech Robotic Systems, Gurgaon, India** *May 2018 – Jul 2018*
- Developed a Computer Vision based Distraction Detection module using Deep Learning algorithms such as CNNs
 - Cross-compiled a drowsiness detection product on ARM and constructed a unit testing framework for it, using Google test, in C++

ACADEMIC EXPERIENCE

- Graduate Research Assistant, Science Guided Machine Learning Lab, Virginia Tech** *Aug 2021– Present*
- Designed a unified framework, via latent space translations, for jointly training forward and inverse problems in seismic imaging
 - Developing Physics guided machine learning models for equation discovery from videos and simulating PDE flows
 - Constructed an algorithm to detect and track microscopic bacteria cells with a 95% precision by utilizing artificially generated motion and temporal cues for an NSF funded cancer research project. Challenge: Hard to distinguish from background media
 - Engineered an approach to predict force applied by a human cell on underlying fiber intersections using multi-object detection techniques in Computer Vision like RetinaNet
 - Established a pipeline to convert phased-out microscopic imagery of human cell environment to fluorescent images using Pix2Pix and formulated statistical techniques to quantify the results
- Graduate Research Assistant, Informatics Lab, University Libraries, Virginia Tech** *Aug 2021 – Dec 2021*
- Developed a Computer Vision solution to detect plant wilting. Improved performance accuracy by 10% with traditional methods like Support Vector Machines and feature engineering. Challenges: class imbalance, small dataset, images of varying resolutions
- Research Intern, IIIT Hyderabad, Hyderabad, India** *May 2019 – Jul 2019*
- Designed and deployed an object recognition tool on NVIDIA Jetson TX2 board, funded by Defence Organisation (DRDO), India
 - Successfully identified landmarks in aerial imagery also from viewpoints different than trained on, using YOLO and Deep Learning

AWARDS / HONORS

- Scholarship to attend Grace Hopper Celebration Conference by AnitaB.org and Virginia Tech, 2022
- Best Paper Presentation for “An Efficient Approach to Detect Driver Distraction during Mobile Phone Usage”, ICECNS-GOA 2018
- 2nd place for building a conversational agent to raise awareness of STDs, OK Google: Let’s Build Hackathon, WTM Manipal, 2018
- 2nd position in Advanced Robotics Challenge by World Robot Olympiad Association (WRO) for Tetris solving bot, 2017

VOLUNTEER EXPERIENCE

- External reviewer for KDD’22, IJCV’23, AAAI’24 workshop, CVPR’24 workshop and ICLR’24
- Guided a team of 30+ members as Coding Head, RoboManipal, official robotics student project team at MIT, Manipal 2018-2019
- Mentored 150+ students under the GirlScript Manipal Winter Programme on C++, Java, & Object Detection using OpenCV, 2018

TECHNICAL SKILLS

- PyTorch
- Jupyter Lab
- BigQuery ML
- Machine Learning
- Deep Learning
- TensorFlow
- Programming Languages: Python, Java, C++, MATLAB, R

PUBLICATIONS

Journal Publications

1. **Medha Sawhney***, Bhas Karmarkar*, Eric J. Leaman, Arka Daw, Anuj Karpatne, and Bahareh Behkam. (2024) “Motion Enhanced Multi-Level Tracker (MEMTrack): A Deep Learning-Based Approach to Microrobot Tracking in Dense and Low-Contrast Environments.” *Advanced Intelligent Systems* 6, no. 4 (2024): 2300590. <https://doi.org/10.1002/aisy.202300590> (*equal contribution)

Peer-reviewed Conference & Workshop Proceedings

1. **Medha Sawhney***, Bhas Karmarkar*, Eric J. Leaman, Arka Daw, Anuj Karpatne, and Bahareh Behkam. “Detecting and Tracking Hard-to-Detect Bacteria in Dense Porous Backgrounds.” In *Computer Vision for Animal Behavior Tracking and Modeling (CV4Animals) Workshop at CVPR 2023*. (*equal contribution)
2. Maruf, M., Arka Daw, Kazi Sajeed Mehrab, Harish Babu Manogaran, Abhilash Neog, **Medha Sawhney**, Mridul Khurana et al. “VLM4Bio: A Benchmark Dataset to Evaluate Pretrained Vision-Language Models for Trait Discovery from Biological Images.” *Advances in Neural Information Processing Systems, NeurIPS 2024*
3. **Medha Sawhney**, Vasundhara Acharya, and Krishna Prakasha. “An Efficient Approach to Detect Driver Distraction during Mobile Phone Usage.” *International Journal of Engineering and Technology (UAE)* 7, no. 4.41 (2018): 86-90.

Preprints

4. Abinash Padhi*, Arka Daw*, **Medha Sawhney**, Maahi M. Talukder, Atharva Agashe, Sohan Kale, Anuj Karpatne and Amrinder Nain. “Deep Learning Enabled Label-free Cell Force Computation in Deformable Fibrous Environments.” *bioRxiv* (2022): 2022-10
5. **Medha Sawhney***, Bhas Karmarkar*, Eric J. Leaman, Arka Daw, Anuj Karpatne, and Bahareh Behkam. “MEMTRACK: A Deep Learning-Based Approach to Microrobot Tracking in Dense and Low-Contrast Environments.” (*equal contribution)
2. Gupta, Naveen*, **Medha Sawhney***, Arka Daw*, Youzuo Lin, and Anuj Karpatne. “A Unified Framework for Forward and Inverse Problems in Subsurface Imaging using Latent Space Translations.” *arXiv preprint arXiv:2410.11247* (2024). (under review) (*equal contribution)