

TARUN SHARMA

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EDUCATION

Caltech, Pasadena Sept 2018 – Present
PhD in Computation and Neural Systems GPA: 4.2/4.0
Research: **Computer vision applications using real-world noisy datasets**, self-supervised learning, object detection, multi-object tracking, long-tailed datasets, animal behavior and ecological datasets.

PESIT, Bangalore, India Aug 2013 – May 2017
B.E in Computer Science and Engineering GPA: 9.4/10.0
Relevant Courses: Design and Analysis of Algorithms, Advanced Machine Learning, Software Engineering, Advanced Data Structures.

WORK EXPERIENCE

Machine Learning Engineer (MLE) Intern, **DoorDash** (Sunnyvale, CA) June 2025 – Sept 2025

- Improved image search performance by **6–8%** through fine-tuning embeddings and cleaning noisy data clusters.
- Engineered **highly parallelized Databricks** workflows to **annotate millions of images using VLMs**, to train and deploy **image classification models**, to audit and **improve data quality using VLMs**, and to fine-tune embeddings using **metric learning**.
- Built **visualization and annotation tools** leveraging **online learning** to prioritize samples, yielding a **30% accuracy improvement** compared to random selection.
- Compared methods to **identify human annotation errors using VLMs**.
- Produced **optimized fine-tuning workflows** and **scalable annotation pipelines using VLMs**, which the team continues to use for training, **enabling sustained improvements in image search quality**.

Intern, Monterey Bay Aquarium Research Institute - **MBARI** (Monterey, CA) June 2023 – Aug 2023

- Compared multiple **self-supervised and semi-supervised computer vision** approaches for **using unlabeled data** to improve classification performance in cases of **real-world datasets exhibiting long tailed distributions**.
- Trained a robust generalized animal detector **currently being used by the in-house team**. Achieved a **100% increase** in balanced accuracy score for classification of animals when unlabeled data is used for semi-supervised contrastive pretraining. **Published our results in a CVPR workshop paper**.

Research Assistant, **Brown University** (Providence, RI) Aug 2017 – June 2018

- Worked in the lab of Professor Thomas Serre on various projects involving **computer vision research and applications to real world data**. Examples include **analyzing eye tracker video data** using methods such as **object detection**, zebrafish behavioral analysis using **tracking and pose estimation**, predicting action potentials from **videos using RNNs**, and comparing computer vision models and human visual saliency maps.
- Each of these projects involved multiple rounds of collecting data, **training computer vision pipelines, evaluating, bootstrapping, and refining performance**. **Resulted in publishing 3 papers and 1 preprint**.

Intern, **SAP** (Bangalore, India) Jan 2017 – June 2017

- Worked on the **thematic segmentation of text data using recurrent neural networks** to automatically break up company onboarding and training videos into short chapters for maximizing engagement.
- Proposed a strategy to combine the results of our machine learning model with additional contextual cues. This project **resulted in a company patent**.

Intern, **MadStreetDen** (Chennai, India) May 2015 – Aug 2015

- Worked on using machine vision to make a navigational assistive system for the visually impaired that would run on a smartphone. Used **traditional image processing algorithms** such as **dense optic flow and motion parallax cues** to estimate **approaching obstacles from a single camera**. Also worked on object identification using neural networks and face recognition algorithms.
- We were successfully able to demonstrate a working prototype with **real-time obstacle detection** and classification using a single camera resulting in a **published paper**.

SKILLS

Skills: **Computer vision** – experience working real world noisy data, object detection, multi-object tracking, self-supervised learning, weak supervision, human in the loop training, online learning, long tailed distribution; machine learning, temporal data analysis and visualization. **VLMs** – making api calls to OpenAI for annotating/querying data.

Languages and Technologies: **Python, PySpark**, Java, Inkscape, Figma, Blender, Unity.

Frameworks and Libraries: **PyTorch, OpenCV**, SQL, Tensorflow, ROS.

Cloud Platforms: **Databricks, AWS EC2**, AWS Sagemaker.

Hardware: Raspberry Pi and add-on boards, sensors and cameras; Arduino and IMUs.

AI coding tools: **Cursor** and **GPT**.

DISSERTATION PROJECTS

Ant monitoring using computer vision, Prof. Joseph Parker 2023-Present

- Designed and deployed custom multi-sensor Raspberry Pi camera systems for **large-scale video collection** (30s/hour across multiple colonies), generating **high-volume real-world datasets**.
- Built an end-to-end data pipeline integrating **motion detection** for preprocessing, **SQL for metadata management**, blob detection to **initialize and accelerate human annotations**, and comparing **computer vision methods for detection, tracking, and visualization** of ant movement patterns.
- Evaluated and benchmarked **detection and multi-object tracking** algorithms for **crowded scenes**, addressing real-world challenges such as **occlusion and high density**.
- Developed robust **visualization and analysis methods** — direction/angle estimation, velocity flow fields, and trajectory-based classification — that yielded **novel ecological insights** on velvety tree ants, **despite imperfect tracking data**.

Flight and gaze stabilization system of fruit flies, Prof. Michael Dickinson 2018-2023

- Designed and built a rotating experimental arena with cameras, IMU sensors, and servo motors to study flight stabilization under controlled rotations.
- Created a **3D model** of a fly head from multi-slice scans in **Blender** and **generated synthetic training** data to enable single-view **3D head pose estimation**.
- Applied **computer vision methods** such as **pose estimation** and edge detection to quantify head and wing kinematics from video; used **signal processing (Fourier transforms)** to analyze responses and performed **statistical modeling** to demonstrate that stabilization response magnitude is a direct function of mechanosensory cell activity.
- Developed an **unsupervised behavior discovery** pipeline using **pose estimation, continuous wavelet transforms**, and **clustering of spectral features** with a watershed algorithm.

SELECTED PUBLICATIONS

- **Tarun Sharma**, Danelle E. Cline, Duane Edgington (2024) **Making use of unlabeled data: Comparing strategies for marine animal detection in long-tailed datasets using self-supervised and semi-supervised pre-training**. *CVPR workshop proceedings 2024*, pp. 1224-1233.
- **Tarun Sharma**, Julian M. Wagner, Sara M. Beery, William B. Dickson, Michael H. Dickinson, Joseph Parker (2024) **Monitoring Social Insect Activity with Minimal Human Supervision**. *CVPR workshop proceedings 2024*, pp. 1244-1253.
- Linsley, D., Eberhardt, S., **Sharma, T.**, Gupta, P., Serre, T., (2017) **What Are the Visual Features Underlying Human Versus Machine Vision?** Proceedings of *ICCV Workshops 2017*, pp. 2706-2714
- **Sharma, T.**, Apoorva, J.H.M, Lakshmanan, R., Gogia, P., Kondapaka, M., (2016) **NAVI: Navigation aid for the visually impaired**. *IEEE Xplore*, doi:10.1109/CCAA.2016.7813856
- Kotri, J., **Sharma, T.**, Kejriwal, S., Dasari, Y., Abinaya, S., (2019) **Thematic Segmentation of Long Content using Deep Learning and Contextual Cues**. *US Patent*. Patent number: US 10,339,922 B2
- Govindarajan, L., **Sharma, T.**, Colwill, R., Serre, T., (2018) **Neural Computing on a Raspberry Pi: Applications to Zebrafish Behavior Monitoring**. Proceedings of *VAIB 2018*, Corpus ID: 52950335

LEADERSHIP ROLES

- Co-organizer of [NeurIPS Workshop on Computational Sustainability: CompSust \(2023\)](#), NeurIPS
- President of [Neurotechers](#) (2022 – 2023), Caltech
- Co-organizer and Instructor for [Computer Vision for Ecology Summer School \(2022-2024\)](#), Caltech
- TA for [BE/Bi 106: Comparative Biomechanics \(2021\)](#), Caltech