

DEVASHRI DEULKAR

+91 8421391677

Email

Linkedin

Github

Education

Indian Institute of Technology, Kharagpur <i>Bachelor's Degree (B.Tech) in Computer Science and Engineering</i>	Dec 2021 – Present <i>CGPA: 8.56/10</i>
Jawahar Navodaya Vidyalaya, Amravati <i>Class X, CBSE</i>	Sept 2015 – Mar 2019 <i>Percentage: 97.00%</i>
Sant Tukaram National Model School, Latur <i>Class XII, CBSE</i>	Aug 2019 – Mar 2021 <i>Percentage: 95.60%</i>

Experience

Undergraduate Researcher Indian Institute of Technology Kharagpur, India <i>Spiking Neural Networks (LSM) under Prof. Soumik Bhattacharya</i>	May 2025 – Present
<ul style="list-style-type: none">Conducted a systematic literature review of 30 research papers on Spiking Neural Networks (SNNs), reservoir computing, and learning rules such as STDP and reward-modulated plasticity.Identified gaps in existing architectures and formulated a research direction on Reinforced Liquid State Machines (RLSM) for temporal sequence learning.Built the entire Liquid State Machine pipeline from scratch in Python, including LIF neurons, synaptic plasticity, reservoir connectivity, and WTA readout mechanism.Designed and evaluated models on temporal classification tasks (SHD/N-MNIST); currently benchmarking RLSM against LSTM/GRU baselines and performing ablation studies.	
Research Intern Indian Institute of Science Bengaluru, India <i>Distributed ML on heterogeneous setup under CNI Lab</i>	May 2024 – July 2024
<ul style="list-style-type: none">Trained a GPT-2 (124M) model using DeepSpeed, exploring how frameworks like ZeRO (Zero Redundancy Optimizer) can minimize memory redundancy across GPUs and improve training efficiency of clusters.Conducted a literature review of existing model parallelism, alongside optimizations like ZeRO and used in training.Developed a pipeline to profile, with custom modifications introduced to track communication and computation time.Achieved a speed of 80k tokens/sec with 2 GPU- RTX 4060ti to train GPT-2 (124M) model	
Research Trainee Neuromatch Academy Oregon, United States <i>Computational Neuroscience: Pupil Decoder</i>	Feb 2024 – March 2024

Research Trainee Neuromatch Academy Oregon, United States <i>Computational Neuroscience: Pupil Decoder</i>	Feb 2024 – March 2024
<ul style="list-style-type: none">Developed a GLM predicting different aspects of ocular motion from neural activity of a mouse's primary visual cortex recorded while in the dark (Stringer et al. 2019)Built a decoder for the pupil's position/ change of position / magnitude of the movement and the direction of movementAnalyzed neural activity across nine cortical depths and three time gaps to investigate the temporal relationship between V1 neural information and behavior, determining whether neural information precedes or follows behaviorBest performance was achieved for synchronous activity 46%, with future neural spike counts better at decoding present pupil information compared to past spike counts	
Projects	

Generative Modeling Benchmark on MNIST: VAE vs GAN (FID/IS Evaluation) <i>Advanced ML (CS60073)</i>	Nov 2025
<ul style="list-style-type: none">Implemented an MLP-based Variational Autoencoder (VAE) with reparameterized latent sampling; logged reconstruction, KL, and ELBO trends per epochImplemented an MLP-based GAN (Generator/Discriminator) with non-saturating objective, label smoothing, and stable training loop (1D-step + 1G-step per iteration)Generated fixed-grid samples per epoch to qualitatively track training progression and diagnose mode collapse/diversity issuesBuilt a CNN feature extractor and computed quantitative metrics: Inception Score (IS) and Fréchet Distance (FID) for VAE vs GAN comparisonsEnforced controlled experimental settings (CPU-only, fixed splits, fixed hyperparameters, fixed noise batches) for fair model comparison	
Probabilistic Inference: Gaussian Processes, EM & Variational Inference <i>Advanced Machine Learning (CS60073) Full Score</i>	

Probabilistic Inference: Gaussian Processes, EM & Variational Inference <i>Advanced Machine Learning (CS60073) Full Score</i>	Oct 2025 – Nov 2025
<ul style="list-style-type: none">Implemented Gaussian Process Regression (RBF kernel) from scratch, computing posterior predictive mean and uncertainty bands for noisy function observations	

- Developed a full-covariance **Gaussian Mixture Model** and implemented the **EM algorithm** (responsibilities + parameter updates), verifying monotonic log-likelihood ascent
- Implemented **EM for Bayesian Linear Regression** to estimate prior/noise precisions (λ, β) and analyzed **evidence vs iterations** under polynomial feature expansions
- Built **mean-field Variational Inference** for Bayesian Logistic Regression in **PyTorch** using the **reparameterization trick**; evaluated predictive calibration via **Brier score** against MAP baseline
- Ensured numerical correctness via **Cholesky-based solves**, **log-sum-exp** stabilization, diagonal jitter/regularization, and fixed random seeds for reproducibility

Robust Image Captioning: ViT–Transformer & SmolVLM Benchmarking

Feb 2025 – Apr 2025

Deep Learning (CS60010)

- Implemented an end-to-end **image captioning pipeline** with a **ViT-based image encoder** and a **Transformer text decoder**, trained under a strict **15GB GPU memory** constraint
- Benchmarked zero-shot captioning using **SmolVLM** and reported standardized captioning metrics (**BLEU**, **ROUGE-L**, **METEOR**, **BERTScore**) for a strong baseline comparison
- Designed and implemented a robustness suite using **patch-wise occlusion** (16×16 grid) at **10%, 50%, 80%** masking; measured metric deltas to quantify performance degradation
- Logged and serialized (**original caption**, **generated caption**, **occlusion level**) tuples to create a controlled dataset for downstream analysis and model attribution
- Built a **BERT-base** classifier to identify whether a caption was produced by **SmolVLM vs custom model**; enforced a strict **image-disjoint 70:10:20 split** and reported **macro Precision/Recall/F1**

Achievements

- Secured an **All India Rank of 199*** in Joint Entrance Exam (JEE) Advanced 2021 among more than 160,000 reserved candidates
- Qualified for the Indian Institute of Science fellowship in 2021 by securing an **All India Rank of 221*** reserved category

Relevant Coursework

Theory:

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| <ul style="list-style-type: none"> • Advance Machine Learning • Social Computing • Linear Algebra, Numerical and Complex Analysis • Probability and Statistics | <ul style="list-style-type: none"> • Deep Learning • Machine Learning • Advanced Calculus • Algorithms |
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Certifications:

- | BCI &Neurotechnology Spring School 2023, 140 hours 14 Credit course by Top researchers
- | Cyber-Physical Systems Summer School 2022, IIT Kgp

Technical Skills

Languages: Proficient - C, C++, Python | Familiar - Bash, Html, Matlab, LaTeX

Libraries/Frameworks: OpenCV, NumPy, Matplotlib, PyTorch, TensorFlow, HuggingFace

Software Skills: Git, GitHub, VS Code, Google Colab