Nachiketa Patil

MS by Research
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Examination	University	Institute	Year	CPI/%
MS by Research	IIT Bombay	IIT Bombay	2024–Present	7.86
B.E. [CSE]	University of Mumbai	Atharva College of Engg.	2019–23	8.86

Internship

ML Research Intern | *Motilal Oswal Financial Services Limited* [May'26 – Aug'26]

- Targeted existing generators producing invalid price candles, with up to **29%** of bars structurally impossible.
- Developed **CandleDiff**, a diffusion-based synthetic financial data generator with **6.79M** parameters.
- Implemented scenario-based path generation conditioned on **company fundamentals** and market context.
- Achieved **100%** candlestick validity and cut the backtest-overfitting gap by **29%** across **7,280** quarters.
- Benchmarked **6** time-series foundation models for stock forecasting; zero-shot won **12/24** pairs.
- Submitted **2 papers** to **ACM ICAIF'26**, on CandleDiff and time-series foundation model benchmarking.

Positions of Responsibility

Department System Administrator | *CMInDS, IIT Bombay* [Jul'24 – Present]

- Architected the dept's **HPC cluster** from scratch and configured **Slurm** for fair multi-user GPU scheduling.
- Handled **GPU server** procurement end-to-end: specs, quotations, tenders and post-delivery setup.
- Set up and maintain department **LDAP** and **mail servers** serving all students and staff.
- Built internal portals for **helpdesk**, **room booking** and **admissions** used across the department.
- Managed network racks, **UPS** and **NAS**; procured and administered **E2E, vast.ai** cloud access.

Department Technical Secretary | *CMInDS, IIT Bombay* [Mar'25 – May'26]

- Onboarded incoming MSR and PhD batches; provisioned department **LDAP**, portal privileges, and mailing lists.
- Conducted **Missing Semester** sessions, mentoring 50+ students on **Linux, Git, LaTeX, HPC and Slurm**.
- Served as primary technical contact, resolving issues across GPU servers, portals and networking.

Organizer | *TechConnect 2025, CMInDS, IIT Bombay* [Nov'24 – Dec'25]

- Finalised and invited speakers for the department's annual **TechConnect** symposium.
- Planned and ran the poster presentation session, coordinating presenters, slots and scheduling.
- Managed logistics across catering, venue setup and transport for 1000+ attendees.

Teaching Assistant | *DS203: Programming for Machine Learning* [Jul'26 – Present]

- Created weekly coding challenges and assignments, achieving 100% automated grading reliability.
- Mentored 100 students in office hours, resolving their technical and academic queries.

Social Media Head | *National Service Scheme (NSS), Undergraduate* [Aug'20 – May'21]

- Designed event posters and creatives for **NSS** drives run online during COVID-19 restrictions.
- Live-streamed events on **YouTube** and **Instagram**, growing engagement across the chapter's channels.
- Automated generation and distribution of certificates for volunteers after each online event or activity.

Key Projects

Mycroft: Effective and Efficient External Data Augmentation | *M.S.R. Thesis*
Advisors: Prof. Arjun Bhagoji, Prof. Parthe Pandit (Under review at TMLR) [Feb'25 – Present]

- Proposed Mycroft, a protocol enabling data owners to show **dataset utility** without sharing full data.
- Designed three selection methods operating under varying access to model gradients and labels.
- Boosted weak-class accuracy from **14.09%** to **49.51%** with 32 samples, versus **26.40%** for random.
- Validated across 4 budgets, 7 training configurations, and up to **70%** data and label noise.

ChronoSSM: Temporally Aware Autoregressive State Space Models
Advisors: Prof. Arjun Bhagoji, Prof. Francesco Bronzino (ENS Lyon) (Under review at KDD'27) [Dec'25 – Jul'26]

- Found two-stage training learns event content but fails to encode timing in its representations.
- Trained **temporally aware** representations in **ChronoSSM** via joint event and timing heads on **Mamba-2**.
- Achieved **+323%** better temporal cohesion on network traffic and **+154%** generation quality on knowledge graphs.

Aligning Representations: A New Regularizer for Adversarial Training
Advisor: Prof. Arjun Bhagoji (To be submitted to ICLR'27) [Jan'26 – Present]

- Addressed the trade-off where standard adversarial training degraded benign accuracy by 15%.
- Developed **RepAlign**, matching clean and adversarial features via **4** state-of-the-art feature alignment techniques.
- Pushed the CIFAR-10 clean-robust Pareto frontier: clean acc. **83.34%** to **86.27%**, robust **522%** to **54.18%**.

Sequential Learning to Defer for Long-Horizon Agents | *CS6103* | *Guide: Prof. Arpit Agarwal* [Jan'26 – Apr'26]

- Showed myopic deferral over-defers, scoring worse than never deferring across all **43** environments.
- Formulated a deferral advantage learned via policy-iteration actor-critic, fixing simultaneous-update divergence.
- Outperformed the simultaneous-update baseline on **28/28** tabular and **22/29** neural held-out setups.
- Extended deferral to **ALFWorld** LLM agents, beating every confidence-based baseline on 60 held-out tasks.

Introducing Robustness in 2D-DPO | *CS769* | *Guide: Prof. Ganesh Ramakrishnan* [Jan'25 – Apr'25]

- Diagnosed missing segment-level **noise robustness** in 2D-DPO, causing a win-rate drop from **43% to 37%**.
- Formulated **Robust 2D-DPO** and trained a **Pythia 6.9B** model on **6,400** HelpSteer-2D prompts.
- Attained a win-rate rise from **37% to 45%** under noise, confirming robustness to noisy labels.
- Accelerated model training and inference by parallelising over **4** × **NVIDIA H100** GPUs.

Unified Multi-Task Image Denoising and Deblurring | *GNR650* | *Guide: Prof. Biplab Banerjee* [Jul'25 – Nov'25]

- Found that fine-tuning on text images hurt face deblurring, dropping quality to **26.77 dB**.
- Engineered a multi-task U-Net architecture tuning **1.35% parameters** via LoRA on frozen **DINOv3 ViT-Small**.
- Attained **32.44 dB** SIDD denoising PSNR and recovered **26.92 dB** on unseen face deblurring.

CLIP from Scratch: Image-Text Retrieval | *CS725* | *Guide: Prof. Preethi Jyothi* [Aug'24 – Nov'24]

- Addressed cross-modal retrieval needing joint alignment between visual features and text captions.
- Constructed PyTorch dual-encoders combining **ResNet** and **DistilBERT** with contrastive projection heads.
- Enabled bidirectional **Top-5** text-to-image retrieval and zero-shot image classification on unseen classes.

Emotion Classification in Hindi Text | *CS626* | *Guide: Prof. Pushpak Bhattacharyya* [Aug'24 – Nov'24]

- Tackled severe class imbalance across **20,304** Hindi sentences dominated by the neutral class.
- Verified **162 scenarios**: 9 classifiers across 6 dataset variations using 3 embedding techniques.
- Attained **84.33%** accuracy on suspense sub-classification, with **85.66%** annotator agreement.

Papers

- Adrien Schoen, Nachiketa Ratnakar Patil, Arjun Bhagoji, and Francesco Bronzino. "ChronoSSM: Training for Temporally Aware Representations in Autoregressive State Space Models." arXiv preprint arXiv:2608.10120 (2026).
- Sarvesh Shashidhar, Ritik, Nachiketa Patil, Suraj Racha, and Ganesh Ramakrishnan. "Inducing Robustness in a 2 Dimensional Direct Preference Optimization Paradigm." arXiv preprint arXiv:2505.01706 (2025).

Technical Skills

- **Programming Languages**: Python, C++, SQL, Bash/Shell, LaTeX.
- **Frameworks & Libraries**: PyTorch, Hugging Face, Scikit-learn, OpenCV, NumPy, Pandas, Matplotlib, Jupyter.
- **HPC & Server Operations**: CUDA, Linux, Slurm, AWS SageMaker.
- **Tools & Platforms**: Docker, Git, AWS S3, Weights & Biases, NAS.

Relevant Coursework

- Human-Centered AI: From Learning Models to Responsible Systems
- Speech and Natural Language Processing and the Web
- Advanced Topics in Deep Learning for Image Analysis
- Advances in Safety-Critical Machine Learning
- Foundations of Machine Learning
- Optimisation in Machine Learning
- Robust Machine Learning

Extracurricular Activities

- Attended **Google India Networking Research Summit**, Bengaluru (Jan 2026), on large-scale network design.
- Attended the **India AI Impact Summit** pre-event (Jan 2026), covering recent industry advances in AI research, policies and deployment.
- Invited to visit **VigyanLabs**, Mysuru, to study how energy-efficient data centres are designed and run.
- Hobbies & Interests: Drawing, Following Formula 1 (F1) Racing.