Nishka Katoch

Website | nishkakatoch@gmail.com | Linkedin | Github

AI researcher with expertise in deep learning, generative models, and quantum-enhanced algorithms, driving innovations in scalable RAG systems and robust deepfake detection. Skilled in building production-ready pipelines with Docker, Milvus, and modern ML frameworks, delivering measurable improvements in accuracy, efficiency, and resilience. Proven leader in research and cross-functional collaboration, with publications, scholarships, and hands-on experience across computer vision, NLP, ASR, and medical imaging.

TECHNICAL SKILLS

Languages: Python, C/C++, Java, SQL, HTML/CSS, JavaScript
ML/DL Frameworks: PyTorch, TensorFlow, Scikit-learn, Monai, nnUNet, AxonDeepSeg, fastai
Tools: Linux, Git, Jupyter, SSH, ROS, Unity, Docker, Ivadomed, MuJoCo, Django, PostgreSQL, Milvus
Domains: Computer Vision, Generative Models, Natural Language Processing, Multilingual ASR, Medical Imaging, Domain Adaptation, Self-Supervised Learning, RAG, Quantum Computing
Soft Skills: Research Communication, Analytical Thinking, Technical Writing, Team Collaboration, Problem-Solving

EDUCATION

M.Sc., Computer Science (ML & AI Thesis) – University of Montréal (Mila) Sep 2021 – Aug 2025

- **Supervisor:** Prof. Julien Cohen-Adad and Prof. Guy Wolf
- **Thesis:** Multi-Contrast Image-to-Image Translation for Axon and Myelin Segmentation

B.Tech., Computer Science – Banasthali University Jul 2017 – May 2021

EXPERIENCE

AI Research Intern | Team Lead (Intern Cohort) - Tech Mahindra, Hyderabad Aug 2025 – Ongoing

- Leading two deep learning research projects: benchmarking embedding models & vector quantization for scalable RAG systems, and enhancing GAN-based deepfake detection with quantum algorithms.
- Develop and test pipelines with Docker and Milvus, evaluating trade-offs in accuracy, latency, and memory to optimize enterprise-scale deployment.
- Advance a patented deepfake detection pipeline by integrating GANs with quantum algorithms, improving resilience against state-of-the-art synthetic image generation.

AI Intern – Custom Quality Build (Remote) Apr 2024 – Mar 2025

- Built a computer vision pipeline using the Segment Anything Model (SAM) and diffusion models, generating novel interior design variations from raw house images.
- Designing a text-to-image control interface to allow interactive, natural language–based customization of design outputs.

ML Research Intern – Maker's Lab, Tech Mahindra (Remote) Dec 2023 – Jan 2024

- Designed and deployed a Hindi ASR system with >90% accuracy on diverse regional datasets. Fine-tuned Indic language models for multilingual speech-to-text tasks, improving robustness across dialects.
- Conducted a comparative review of 20+ ASR and transformer-based architectures, identifying optimal approaches for multilingual speech-to-text.

Web Application Development Intern – CRIS, Delhi Jun 2020 – Nov 2020

- Developed 4 modules in a Django web app, digitizing workflows, increasing efficiency by 70%.
- Optimized databases by reducing redundancy 60%, enhancing scalability, and reporting.
- Mentored junior developers on software engineering best practices.

Research Assistant – IIIT Delhi, India May 2018 – Jul 2018

- Built ROS-Unity UAV swarm control interface with <80ms latency for VR simulations.
- Simulated predator-prey dynamics to evaluate real-time multi-agent collaboration.

SELECTED PROJECTS & PUBLICATIONS

Unpaired Modality Translation for Pseudo-Labeling – MICCAI 2024 | NeuroPoly Lab
Domain Adaptation, Diffusion Models, nnUNet, VQ-VAE, Medical Image Segmentation

- Created a SyncDiff-based domain adaptation pipeline, improving segmentation accuracy on out-of-distribution microscopy data by 12%.
- Applied VQ-VAE compression, accelerating training while retaining 95% image fidelity.

Multi-Contrast Axon Segmentation via Latent Diffusion – Thesis | NeuroPoly Lab
Privacy-Preserving Machine Learning, Latent Diffusion Models, Healthcare AI

- Designed privacy-preserving latent diffusion models for medical imaging, achieving 80% Dice score using synthetic contrast data.
- Demonstrated domain adaptation without requiring access to real patient data.

SpeechBrain Scaling Study – Academic Project
Self-Supervised Learning, Model Scaling, Speech Recognition, Benchmarking

- Benchmarked wav2vec2, RAVE, and SpeechBrain across dataset sizes, validating theoretical scaling laws.
- Informed efficient model deployment strategies for multilingual ASR in low-resource environments.

Single-Cell RNA Analysis of Alzheimer's Disease – Academic Project
Transcriptomics, Bioinformatics, Gene Expression, Alzheimer's Disease

- Analyzed single-cell transcriptomics to identify genetic and environmental factors.
- Visualized gene expression patterns to explore biomarkers for Alzheimer's.

SCHOLARSHIPS & AWARDS

- Awarded a Study, Development Scholarship for my research with Prof Julien Cohen-Adad at Mila.
- Awarded an International Student Scholarship to pursue my master's at the University of Montreal.
- Awarded "Top Student" in "Data Analysis Using Python" workshop by CETPA Infotech 2019 .