Ashim Dahal

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Education

University of Southern Mississippi — Expected May 2027
B.Sc. in Computer Science; GPA: 3.87/4.0; Keystone Honors Scholar — *Hattiesburg, MS*

Research & Work Experience

Cyber Innovations Lab, University of Southern Mississippi — Aug 2023 – Present
Undergraduate Research Assistant — *Hattiesburg, MS*

- Developed **POVQA**, a preference-optimized video question answering system reducing input tokens by **40%** while maintaining 95%+ accuracy on long-context video understanding tasks using vision transformers and rationale generation.
- Created **Redemption Score**, a novel multi-modal evaluation framework for image captioning that triangulates distributional, perceptual, and linguistic signals; outperformed traditional metrics on human correlation benchmarks.
- Led ablation studies on **CLIP and Vision Transformers** for remote sensing segmentation, resulting in **3 peer-reviewed publications** (CVPR Workshops, IEEE T-CSS, IEEE Sensors Journal).
- Optimized distributed training pipeline across **6 GPUs** using PyTorch DDP and mixed precision (AMP), reducing training time by **65%** and enabling 3x faster experimental iteration.
- Led research design for **$51,000 NASA EPSCoR-funded project** on efficient vision-language models, drafting proposal objectives and currently executing experimental evaluation and model optimization.

Data Research Council for Students — Jun 2022 – Aug 2023
Machine Learning Researcher & Instructor — *Kathmandu, Nepal*

- Designed and delivered **5 Python/ML bootcamps** to **350+ students** (92% satisfaction rate), covering CNNs, PyTorch distributed training, and production API deployment with FastAPI.
- Built **6 production-ready computer vision tools** with FastAPI endpoints; developed GAN-based image enhancement pipeline for NASA JunoCam imagery, earning **Best Local Project + Global Nomination** at NASA Space Apps 2022.
- Implemented zero-day cyber attack detection system using MLPs with custom weighted loss functions and SHAP explainability, achieving 94% accuracy on imbalanced datasets.

Technical Projects

3D Gaussian Splatting + Real-Time MVS Reconstruction | *CUDA, PyTorch, Computer Graphics* — 2025

- Building real-time multiview stereo reconstruction pipeline with dynamic 3D Gaussian Splatting for novel view synthesis; funded by **$5,500 DCUR research grant**.
- Implementing custom CUDA kernels for splat rasterization and optimizing differentiable rendering for 30+ FPS performance.

Kolmogorov-Arnold Networks Study | *PyTorch, JAX* | github — 2024

- Conducted comprehensive analysis of Convolutional KANs on ImageNet (AlexNet), MNIST (LeNet), and tabular datasets; identified critical efficiency bottlenecks in learnable activation functions.
- Published findings showing **2.3x training slowdown** vs standard CNNs with minimal accuracy gains; provided optimization recommendations for future KAN architectures.

Torchy | *PyTorch, Python* | github (15 stars, 5 forks) — 2023

- Created lightweight PyTorch training wrapper library adding utilities (logging, checkpointing, mixed precision) while preserving native `nn.Module` workflows; enables framework-agnostic rapid prototyping.
- Published to PyPI with documentation and examples; adopted by open-source community for educational and research use.

Romanized Nepali Chatbot (Jelly) | *NLP, Transformers, Flask* | github (9 stars) — 2022

- Developed first Romanized Nepali conversational chatbot using fine-tuned BlenderBot (1.3B parameters) targeting low-resource language accessibility; deployed web interface with Flask.
- Released a preprint indexed by Europe PMC analyzing efficacy of native language for mental health conversational support.

Selected Publications (24+ citations on Google Scholar)

A. Dahal, S. A. Murad, N. Rahimi. "POVQA: Preference-Optimized Video Question Answering with Rationales for Data Efficiency." *arXiv preprint*, 2025.

A. Dahal, S. A. Murad, N. Rahimi. "Embedding Shift Dissection on CLIP: Effects of Augmentations on VLMs' Representation Learning." *CVPR Workshops*, 2025.

A. Dahal, S. A. Murad, N. Rahimi. "Heuristic Comparison of Vision Transformers Against CNNs for Semantic Segmentation on Remote Sensing Imagery." *IEEE Sensors Journal*, 2025.

Technical Skills

Languages: Python, C++, C#, SQL, JavaScript, CUDA
ML/DL Frameworks: PyTorch (DDP, Lightning), TensorFlow, JAX, Hugging Face Transformers, scikit-learn
Computer Vision: Vision Transformers (ViT, CLIP), 3D Gaussian Splatting, Diffusion Models (Stable Diffusion), Neural Radiance Fields (NeRF), Video QA, Image Segmentation, Multiview Stereo, Object Detection (YOLO)
MLOps & Tools: Docker, Git, Weights & Biases, FastAPI, Flask, Linux/HPC, SLURM, Neovim, LaTeX
Cloud & Hardware: AWS (EC2, S3), CUDA Programming, Multi-GPU Training, Mixed Precision (AMP)

Honors & Leadership

$5,500 Summer Research Grant (PI) – DCUR, 3D Gaussian Splatting research 2025

NASA EPSCoR Research Contributor – Co-designed $51K funded project on tiny VLMs 2025

Lead Organizer – Google Developers Group (GDG) On Campus at USM 2025 – Present

Research Liaison – School of CSCE Student Ambassadors 2025 – Present

$500 Checkpoint – Funded to build XR application for dyslexia 2024

Best Local Project + Global Nomination – NASA Space Apps Challenge 2022 2022