

# Ganesh Sapkota

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## Summary

Ph.D. Candidate in Computer Science with 4+ years of **Army Research Laboratory (ARL)-funded** research in GPS-denied visual localization, multi-sensor fusion, and deep learning for autonomous navigation. Designed and deployed stereo-vision-based localization systems for GNSS-denied outdoor environments, evaluated SLAM/VO systems on real-world datasets, and built UAV geo-localization pipelines with EKF-based sensor fusion — directly relevant to resilient navigation for defense and aerospace platforms. Published IEEE author (3 peer-reviewed venues) with end-to-end experience from algorithm prototyping to field validation. Proficient in Python, C++, PyTorch, and OpenCV; experienced with multi-GPU Linux training environments.

## Education

### Missouri University of Science and Technology

Rolla, MO

Ph.D. Candidate, Computer Science — GPA: 3.7/4.0

Aug 2021 – Present

- Advisor: Dr. Sanjay Madria (Army Research Laboratory funded)
- Focus: GPS-Denied Visual Localization, Deep Learning, Multi-Camera Stereo Systems, Sensor Fusion
- Relevant Coursework: Advanced ML in Computer Vision, Machine Learning, Data Mining, NLP

### Tribhuvan University, Institute of Engineering

Nepal

B.E., Computer Engineering — GPA: 3.5/4.0

Nov 2013 – Jun 2017

## Research Experience

### Graduate Research Assistant — Army Research Laboratory Funded

Rolla, MO

Missouri University of Science and Technology

Aug 2021 – Present

- **GPS-Denied Localization Framework (LanBLoc):** Designed and implemented a stereo-vision-based absolute localization system for GNSS-denied outdoor environments; integrated YOLO-based object detection with stereo ranging for landmark-referenced positioning.
- **Navigation Pipeline:** Developed vision-driven navigation pipelines coupling visual localization with obstacle avoidance and path optimization for autonomous ground platforms in GPS-degraded scenarios.
- **Sensor Fusion & Multi-Metric Localization:** Built an image-retrieval-based localization method using dynamic vicinity clustering and multi-metric descriptor scoring (centroid similarity, PCA reconstruction error, k-NN matching) to handle geometric ambiguity in landmark-sparse environments.
- **SLAM/VO Evaluation:** Installed, configured, and benchmarked multiple SLAM and visual odometry systems (DROID-SLAM, DPV-SLAM, GO-SLAM, DPVO, ORB-SLAM3) on real stereo datasets; developed evaluation pipelines for trajectory accuracy (ATE/RTE metrics).
- **Cross-View Geo-Localization (HCVGLoc):** Engineered a multi-GPU DDP training pipeline in PyTorch for UAV-to-satellite geo-localization, incorporating domain adversarial training, rotation-aware modules, and uncertainty quantification for GPS-denied UAV navigation.
- **Dataset Collection & Validation:** Built and released a real-world stereo landmark dataset; designed end-to-end data collection, annotation, and validation pipelines for large-scale outdoor image datasets.
- Authored **3 peer-reviewed IEEE publications** (WoWMoM 2025, WoWMoM 2024, AIPR 2023); active peer reviewer for IEEE conferences and journals.

## Professional Experience

### Graduate Teaching Assistant

Rolla, MO

Missouri University of Science and Technology

Aug 2024 – Present

- Led Data Structures lab sessions in C++ and delivered hands-on big data technology sessions (Hadoop MapReduce, Spark, HBase, MongoDB).

### Lecturer, Computer Science

Nepal

- Taught programming, databases, and operating systems; supervised undergraduate ML/CV capstone projects.

## Software Engineer

Pioneer Solutions LLC (acquired by Hitachi Energy)

Denver, CO

Dec 2017 – Feb 2019

- Developed and maintained ERP modules using SQL Server, PHP, and JavaScript.

## Skills

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**Languages:** Python, C/C++, Bash, R, JavaScript, SQL

**Navigation & Perception:** Visual SLAM/VO (ORB-SLAM3, DROID-SLAM, DPV-SLAM, GO-SLAM, DPVO), Stereo Vision, Structure-from-Motion (SfM), Multi-View Stereo (MVS), 3D Reconstruction

**Sensor Fusion:** Extended Kalman Filter (EKF), Multi-Sensor Fusion (stereo cameras, IMUs), Sensor-Agnostic Localization

**Deep Learning & CV:** PyTorch, TensorFlow, OpenCV, MMCV, Object Detection (YOLO, DETR, SSD, RCNN), Transformers, CNNs

**Simulation & Tools:** ROS (familiarity), Git/GitHub, Docker, Linux/UNIX, Jupyter, NumPy, Pandas, Matplotlib

**Hardware Familiarity:** NVIDIA GPUs (multi-GPU DDP training), Stereo Camera Rigs, Edge Deployment Pipelines

**Transferable Skills:** Independent Research Scoping, Project Ownership, Cross-Functional Collaboration, Technical Mentorship, Initiative & Organizational Leadership

## Selected Publications

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- [1] Sapkota, G., & Madria, S. (2025). *SafeNav: Safe Path Navigation using Landmark Based Localization in GPS-denied Environment*. **IEEE WoWMoM 2025**.
- [2] Sapkota, G., & Madria, S. (2024). *Landmark-based Localization using Stereo Vision and Deep Learning in GPS-Denied Battlefield Environment*. **IEEE WoWMoM 2024**.
- [3] Sapkota, G., & Madria, S. (2023). *Landmark Stereo Dataset for Landmark Recognition and Moving Node Localization*. **IEEE AIPR 2023**.

## Selected Projects

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### HCVGLoc — Hierarchical Cross-View Geo-Localization for UAVs

- Designed a 3-stage hierarchical localization pipeline for GPS-denied UAV navigation using satellite imagery, incorporating domain adversarial learning, uncertainty quantification, and Extended Kalman Filter (EKF) fusion.
- Trained on multi-GPU DDP setup (4× GPU) with datasets CVUSA, CVACT, VIGOR, and University-1652; implemented gallery-based evaluation with Recall@K metrics.

### Radiogenomic Brain Tumor Classification

- Deep learning pipeline for MGMT methylation prediction from MRI integrating DenseNet-169 and SAM; achieved 70% accuracy and 67.54% AUC (RSNA-MICCAI).

## Honors & Activities

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- **Best Poster Award (1st Place)** — ISC Poster Presentation, Missouri S&T, Nov 2024
- **Best Poster Award (1st Place)** – Pathways Symposium, NextGen Precision Health 2026
- **Founder & President**, Nepali Students' Association (NSA-MST), Aug 2023 – Present
- **Finance Director**, Council of Graduate Students (CGS), Missouri S&T, Aug 2024 – Present
- **Certifications:** Scientific Computing with Python; ML & Statistical Analysis (WorldQuant University)