

Akash Dogra

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GitHub

Google Scholar

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Education

Graphic Era Hill University (Present)

Bachelor of Technology – Computer Science and Engineering

Rashtriya Indian Military College (RIMC)

High School (8th–12th) (AIR – 4)

Dehradun, Uttarakhand

Sept. 2022 – June 2026

Uttarakhand, India

Jan. 2017 – Dec. 2021

Work Experience

Research Intern – Under Prof. S. N. Omkar

Indian Institute of Science (IISc) – Computational Intelligence Lab

Bangalore, India

September 2025 – November 2025

- Developed a hybrid pose estimation framework combining temporal convolutions with kinematic constraints, achieving a 34.7% reduction in pose jitter for cerebral palsy detection.
- Contributed to a biomechanics framework in a Johns Hopkins University & ICMR project, delivering a physiotherapy PoC with 92%+ accuracy.

AI/ML Research Intern - Integrated Fighter Aircraft Systems [Certificate]

Aeronautical Development Agency - DRDO

Bangalore, India

August 2025 – September 2025

- Designed a computer vision pipeline for satellite imagery, incorporating feature extraction and optimized model training to improve target identification in cluttered environments.
- Engineered hybrid GNC module integrating physics-based aerodynamic models with hierarchical planning and PSO, improving trajectory adaptation by 31.2% in dynamic flight conditions and mission planning.

Achievements

Qualified for **Meta Hacker Cup 2025** Round 1 – **Ranked 3,501 globally** in competitive programming. [Certificate]

Authored **7 publications** in IEEE and Springer (23 citations) on ML, cybersecurity, and SDN. [Profile]

Secured 2nd position in Inter-University Coding Hackathon (Tech Traverse 1.0) [Certificate]

AIR (All India Rank) - 4 In Rashtriya Indian Military College Entrance Exam.

Projects

SatForge – AI-Driven Satellite Mission Planning & Simulation Platform

JAX, diffrax, Orbital Mechanics, Python

March 2025 – Present

- Built a **JAX-accelerated Cowell's method orbital propagator** with adaptive Tsit5/DOP853 integration (via diffrax), implementing full **zonal harmonics (J2–J7)**, atmospheric drag, and SRP perturbation models with **adaptive step-sizing**.
- Implemented **vectorized multi-satellite propagation** for constellation-scale simulation and validated against a heyoka Taylor-method reference propagator, achieving **sub-centimeter RMS position error** over 24-hour two-body propagations.
- Developed a full **mission planner** with real-time telemetry dashboards, 3D CesiumJS globe rendering, TLE ingestion for real NORAD satellites, and an **LLM-powered mission assistant** (Qwen 2.5 via Ollama) providing Δv budgeting and safety analysis.

Physics-Informed Continuous-Time GNN-HODE for Energy-Efficient Control

PyTorch, DGL, Neural ODEs, Hamiltonian Mechanics

August 2025 – November 2025

- Addressed energy inefficiency in IoT network environments with time-varying interactions and asynchronous events using adaptive control strategies.
- Designed a continuous-time **GNN-HODE framework** integrating **Hamiltonian dynamics** with graph message passing to model stable **spatio-temporal energy evolution**.
- Incorporated physics-based constraints to ensure stability and energy consistency, achieving up to **5× improvement in energy efficiency** over baseline methods while maintaining low QoS violations.

Dynamic Emergency Routing for Geo-Instable Himalayan Regions

Reinforcement Learning, SAR, Multispectral Imaging, DEM

February 2024 – September 2025

- Developed a **real-time RL-based emergency routing system** for the geo-unstable Joshimath region, addressing micro-landslides, terrain subsidence, and multi-hazard disruptions.
- Constructed a **high-resolution routing graph** using OpenStreetMap and DEM data, integrating terrain and hazard features to estimate route risk and failure probabilities.
- Used **SAR and multispectral satellite data** to model terrain instability indicators (e.g., surface deformation, vegetation stress), improving hazard-aware route selection in dynamic environments.

Technical Skills

Languages: Python, C++, SQL, Bash

ML/AI Frameworks: PyTorch, TensorFlow, OpenAI Gym, Scikit-learn, DGL, DHL

Developer Tools: Git, Docker, Anaconda, Linux (Ubuntu), Windows