

Project Title:

Quantifying Glacier Retreat and Snow Cover Changes with Aerial Imagery Using Deep Learning

Summary:

Develop a deep learning pipeline that uses satellite, UAV/drone, and thermal/infrared imagery to automatically measure glacier retreat, detect snow cover changes, and interpret their environmental impact. The solution fuses multi-source image data with climate, hydrological, and carbon datasets to enable high-resolution, real-time mapping and predictive analytics for glacier-driven ecological monitoring.

Focus Areas:

1. **Data Fusion:** Combine satellite, aerial/UAV, and thermal/infrared imagery with climate, hydrological, and carbon data for contextual analysis.
2. **Enhanced Model Robustness:** Build CNN models capable of handling low spatial/temporal resolution, integrating high-frequency multi-source imagery for improved sensitivity to minor and rapid changes.
3. **Domain Adaptation:** Develop models resilient to variation in geography, imaging conditions, and cloud/shadow disturbance using advanced preprocessing and transfer learning.
4. **Environmental Impact Assessment:** Link measurements of glacier retreat and snow cover change with real data on local water resources, climatic trends, and carbon sinks, producing actionable findings.
5. **Automation:** Implement unsupervised/semi-supervised segmentation and automated anomaly detection systems for early warning and continuous monitoring.
6. **Reproducibility & Benchmarking:** Create modular code and open benchmarks for transparent comparison, reuse, and scaling.