

ElastiCD: Resolution-Invariant RGB-DSM Fusion for Multi-Modal Change Detection

Dekel Shalgi, The Max Stern Yezreel Valley College

High-resolution remote sensing faces a persistent challenge: the "resolution gap" across different sensors and temporal acquisitions. We introduce **ElastiCD**, a multi-modal framework designed for robust Change Detection (CD) by fusing bitemporal RGB imagery with Digital Surface Models (DSM).

ElastiCD addresses cross-resolution inconsistency by employing a **Swin-V2 UperNet** backbone integrated with **Log-spaced Continuous Position Bias (Log-CPB)**. This architecture ensures that the model remains invariant to variations in Ground Sample Distance (GSD), allowing for seamless generalization across diverse datasets. To mitigate topographic noise and urban clutter, we implement a **Dynamic DSM Normalization** module that isolates structural height deviations from regional elevation trends.

Experimental evaluations demonstrate that ElastiCD exhibits a **significantly accelerated convergence profile** compared to traditional Fully Convolutional Siamese Networks (FSN). Our model reaches state-of-the-art performance levels in a **fraction of the training time** required by standard convolutional baselines, while showing superior robustness in complex environments containing dense vegetation and artifacts. These results position ElastiCD as a highly efficient and scalable solution for real-time urban monitoring and disaster response.