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Multi-temporal Interferometric Synthetic Aperture Radar (InSAR) is a space-borne monitoring technique capable of detecting cumulative surface displacements with millimeter accuracy in the Line of Sight (LOS) of the radar sensor [1-3]. Several developments in the processing methods and the increasing availability of SAR datasets from different satellite missions, have proven the viability of this technique in the near-real-time assessment of bridges and the health monitoring of transport infrastructures [2-4].

This research aims to demonstrate the potential of satellite-based remote sensing techniques as an innovative health-monitoring method for structural assessment of bridges and the prevention of damages by structural subsidence, using high-resolution SAR datasets integrated with complementary Ground-Based (GB) Non-Destructive Testing (NDT) techniques. To this purpose, high-resolution COSMO□SkyMed (CSK) products provided by the Italian Space Agency (ASI) were acquired and processed.

In particular, a multi-temporal InSAR analysis was developed to identify and monitor the structural displacements of the Rochester Bridge, located in Rochester, Kent, UK. To this extent, a clustering operation is realised to collect the identified Persistent Scatterers (PSs) over the structural elements of the bridge (i.e., bridge piers and arcs). Furthermore, several sub-clusters with a comparable deformation trend were identified and located over the bridge elements. This operation paves the way for an automatisation of the process through a Machine Learning (ML) clustering algorithms to assign each PS data-point to specific groups, based on the structural element type and the trend of seasonal deformation time-series.

The outcomes of this study demonstrate how multi-temporal InSAR remote sensing techniques can be synergistically applied to complement non-destructive ground-based analyses, paving the way for future integrated methodologies in the monitoring of infrastructure assets.

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