

# **Automatic railway monitoring using satellite radar**

Ling Chang, Rolf Dollevoet, Ramon Hanssen

Delft University of Technology

[L.Chang@tudelft.nl](mailto:L.Chang@tudelft.nl)

Satellite synthetic aperture radar interferometry (InSAR) has the capability to monitor railway tracks and embankments with millimeter-level precision over wide areas. The potential of detecting differential deformation along the tracks makes it one of the most powerful and economical means for monitoring the safety and stability of the infrastructure on a weekly basis.

Yet, the mere capability to detect such small deformations is not sufficient for an operational application of the technique. Handling huge data volumes, homogenizing independent datasets, and the connection with expert knowledge to identify risk areas are challenges to overcome.

Here, we use a probabilistic method for InSAR time series postprocessing to efficiently scrutinize the data and detect railway instability. Moreover, to detect high-strain segments of the railway, we propose a short-arc-based method to focus on localized differential deformation between nearby InSAR measurement points.

Our approach is demonstrated over the entire railway network of the Netherlands, more than 3000 km long, using hundreds of Radarsat-2 acquisitions between 2010 and 2015, leading to the first satellite-based nationwide railway monitoring system.